Exploring the obesogenic environment: understanding the health impact of contemporary living.

SIBSON, R.H.

2019

Exploring the obesogenic environment: Understanding the health impact of contemporary living

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A thesis submitted in partial fulfilment of the requirements of the
Robert Gordon University
for the degree of Doctor of Philosophy

August 2019

Declaration

Except where explicitly stated, this thesis in candidature for the degree of Doctor of Philosophy has been composed entirely and is the original work of the author. This thesis has not been submitted in any form to any other university.

All views expressed here are the authors own and are not endorsed by any other organisation.

All sources of information contained within, which have not arisen from the results generated, have been specifically acknowledged.

Rachael H Sibson

Abstract

Introduction: Obesity exists in the complexity of everyday life and arises from individuals' interactions with the obesogenic environment, different behaviours/dispositions and biological factors. In order to develop better intervention strategies to attenuate obesity prevalence, this research applied an ontological approach to investigating some of the factors and/or underlying preconditions for obesity to occur. Previous research has taken an epistemological approach to the study of obesity, and used siloed approaches, which may have assumed knowing what the cause of obesity was, or that its findings were the cause/s of obesity. In contrast, an ontological approach asks the question of 'what the world or reality must be like for obesity to occur'. The aim of this study was, therefore, to explore the multiple, interrelated processes with respect to individuals' behaviour, attitudes and dispositions towards food, self and life.

Methods: Because obesity arises from complex origins, a methodology that attends to the complexity of a phenomenon, such as obesity, was required and critical realism (CR) was used to explore causal or generative mechanisms (i.e. multiple and interrelated factors) that may be involved and/or contribute to obesity: drawing on both qualitative and quantitative methods, semi-structured interviews (SSi) and validated questionnaires were used to explore how different individuals of various body weights relate to food, self-perceived body image and self-esteem/confidence and orientation to life. CR's modes of inference, namely abduction and retroduction, were then applied to understand the underlying preconditions of what reality must be like for obesity to occur; in addition to identifying demi-regularities (i.e. semi-predictable patterns) among individuals' behaviours/attitudes and/or dispositions towards food, self and life; and transfactual conditions (i.e. necessary conditions) for obesity to be what it is. The findings from the first part of this study, carried out on a convenience sample of participants, served as a framework for the second part which focused on individuals 20-40 years old. Full body scans, anthropometric measurements, body-fat percent and blood samples were collected, in the second study, to support findings from SSi, questionnaires, and theoretical suppositions from the first study.

Results: The findings from the combined studies showed that individuals, who have an overall negative embodied disposition towards food, viewed food as an unimportant part of life, and yet experienced a dissonant relationship with food (i.e. more food dependent because of stress and/or negative emotions) (instrumental profile). These same individuals perceived themselves (i.e. body image and self-esteem/confidence) in a more negative light and had a lower salutogenic outlook, and overall lower physical and mental wellbeing. Additionally, they had higher body-fat

percent and higher proinflammatory biomarkers. In contrast, individuals who had a more positive embodied disposition towards food (i.e. food was an important part of life), themselves and life, experienced a lower or no dissonant relationship with food, had a stronger salutogenesis and overall, higher physical and mental wellbeing (aesthetic profile and, to some extent, disciplined profile). These individuals had lower body-fat percent and lower levels of proinflammatory markers.

Discussion: This study gave insights into how human behaviour and disposition towards food, self and outlook on life, links to overall wellbeing, body-fat and bio-chemical profile. Findings provided a new way of understanding and thinking about the complexity of obesity and laid a new path, or framework, for carrying out further research and studying obesity. Moreover, this research suggested that, in order to attenuate obesity prevalence, intervention strategies must employ a multi-dimensional approach, crossing different disciplines from the natural to the psycho-social sciences, and also consider a more targeted approach (stratified interventions) for individuals in function of their embodied dispositions: instrumental, discipline or aesthetic.

Keywords: Obesity, complexity, critical realism, abduction, retroduction, mechanism, eating behaviour, 3D body-shape, somatotype, inflammatory markers

Acknowledgements

Thank you, to every one of the participants who volunteered and contributed their time and insights to this study, without which this thesis and research would not have been possible.

Thank you to each of my supervisors, Dr. Giovanna Bermano, Dr. Chris Yuill, Dr. Arthur Stewart and Prof. Iain Broom, without your help and guidance this work would not have gone very far. Special thanks and gratitude to my primary supervisor Giovanna, whom I cannot express in words the deep gratitude and appreciation I feel for your commitment in helping me to succeed in this thesis, and who kept me on the straight and narrow when my ideas would wander (which was easily done with this type of work)! To my whole supervisory team, I could not have asked or wished for a more stellar, more committed team, thank you. I am humbled by this journey and experience and appreciate each one of you being a part of it.

Thank you to Andrea MacMillan for your help in any question and always being available and pointing me in the right direction, and for your humorous anecdotes.

Thank you, Hector Williams, for guiding and helping me to better understand statistics. Not to mention all the wonderful conversations and ideas we came up with, in solving the world's problems!

A huge thank you to the RGU Library; Colin MacLean for the one-on-one sessions for 'how the library works', search engines, etc, Irene Brockie, Susan Cowling, Lyn Mair, Irina Radu and Heather Bain, thank you to each of you for helping with referencing and the many, many ILL renewals over the years, during this thesis writings.

Thank you to the Gatehouse printing facility; Neil Harrison, in making sure this thesis got printed in time for submission; and thank you Mary and Janice for assuring that it did.

Thank you to Graham, and his Mum and Dad. I appreciate your support, especially the homemade breads and the frequent visits to the Scottish countryside when I really needed a break.

Thank you to my dear, dear friends, Bruce Hutt, Nettie and Ian Hamilton, Rosemary Benham and Jenny Harbottle, for your very precious friendship, love and support, and rooting for me, your friendship is invaluable to me. And thank you to all the wonderful friends I have met and made along this journey, especially to Twinnie (Olivia Robertson-Gray) for your support and laughter, always being able to see the funny side of a situation, especially when Arthur was around; and Zoi

Papadatou for your support, commiseration, treats, tea and laughter, each of you have been a bright ray of sunshine through this passage.

A special thank you to my dear friends and colleagues in New York City, Dr Stephen Doty, Dr Janane Diouri and Orla O'Shea, whom without your encouragement and recommendation, there is a high probability that I would not have ventured outside of the US to further my education and thus obtain the position and placement of where I am today. Thank you so very much for your support. I miss you guys.

Dedication

Dedicated to my two biggest mentors, firstly, my Sweetie, Irwin M Echtman, who was the first to believe in me and recognise my potential, who supported me in so many ways and as my best friend, and who still supports me now. It was because of our many discussions about health and nutrition that ultimately set me on this course. I love and miss you so much, and I miss our deep conversations, thank you for your love and support; we can finally open that 'JD/PhD' bar now! Also, dedicated to my Mom, Sarah Sibson, who is the strongest and most patient person I know, and who taught me what it is to be strong, brave and endure, and 'where there is a will there is a way'. I love you so much Mom.

A journey of 1,000 miles begins with the first step, Lao Tzu

A black belt is a white belt who trains every day, Gracie jiu-jitsu

…so too is the process of undergraduate to post grad to Dr and beyond…

A…problem with scientific classification is that "things" are often distinguishable only after classification, rather than presenting themselves to be classified in full-fledged thingness (Dupré 2006:30).

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Abbreviations and acronyms

3D	3-dimensional
AE	Appearance evaluation
AN	Anorexia nervosa
ANOVA	Analysis of variance
AO	Appearance orientation
BAS	Body appearance satisfaction
BDD	Body dysmorphia disorder
BED	Binge eating disorder
BF	Body fat
BIQLI	Body image quality of life inventory
BMI	Body mass index
BN	Bulimia nervosa
BP	Bodily pain
BP	BOD POD
CCL2	CC-chemokine ligand 2
CDC	Center for Disease Control and Prevention (USA)
CHD	Coronary Heart Disease
CLL	Clearly labelled emotions
Comp	Comprehensibility
COPD	Chronic obstructive pulmonary disease
CPP	Chronic physical problems
CR	Critical realism
CRP	C-reactive protein
CV	Cardiovascular
CVD	Cardiovascular disease
DA	Dopaminergic
DE	Diffuse emotions
DEBQ	Dutch eating behaviour questionnaire
DHHS	US Department of Health and Human Services
DIT	Diet-induced thermogenesis
DXA	Dual energy X-ray absorptiometry
EE	Energy expenditure
Emo	Emotional
Ext	External
F	Female
FAD	Food addiction diagnosis
FCV	Food choice value
FFA	Free fatty acid
fMRI	Functional magnetic resonance imaging
FT	Full-time
GH	General health
GM	Genetically modified
GRR	General resistance resources
HDL	High density lipoprotein
Hgt	Height
HPA	Hypothalamic-pituitary-adrenal axis
HR	Hazard ratio
IDA	Instrumental Disciplined Aesthetic
IFN-γ	Interferon gamma

IL-1β	Interleukin-1 beta
IL-1ra	Interleukin-1 receptor antagonist
IL-6	Interleukin-6
IL-8	Interleukin-8
IL-10	Interleukin-10
IQR	Interquartile range
IR	Insulin resistance
IRR	Incidence-rate ratio
ISAK	International Society for the Advancement of Kinanthropometry
IWQOL	Impact of weight on quality of life
LTPA	Leisure-time physical activity
M	Male
Ma	Manageability
Max	Maximum
MBSRQ	Multidimensional body self-relations questionnaire
MCP-1	Monocyte chemoattractant protein-1
MCS	Mental component survey
MESA	Multi-Ethnic Study of Atherosclerosis
Mdn	Median
Me	Meaningfulness
MH	Mental health
MHO	Metabolically healthy obese
Min	Minimum
MONW	Metabolically obese normal-weight
MRI	Magnetic resonance imaging
mYFAS	modified Yale food addiction scale
NAc	Nucleus accumbens
NAFLD	Non-alcoholic fatty liver disease
NASH	Non-alcoholic steatohepatitis
NBS	Norm-based scoring
NCI	National Cancer Institute
NEAT	Non-exercise activity thermogenesis
NGT	Normal glucose tolerance
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NIH	National Institute of Health
No.	Number
NW	Normal weight
OA	Osteoarthritis
OAT	Omental adipose tissue
OB	Obese
OFC	Orbitofrontal cortex
OP	Overweight preoccupation
OR	Odds risk ratio
OW	Overweight
P	p-value
PA	Physical activity
PALS	Pharmacy and life sciences
PBS	Phosphate buffered saline solution
PCS	Physical component survey
PET	Positron emission tomography

PF	Physical functioning
PHE	Public Health England
PR	Prevalence ratio
PT	Part-time
QOL	Quality of life
RBC	Red blood cells
RE	Role emotional
Res	Restrained
RMR	Resting metabolic rate
RP	Role physical
RPM	Rotation per minute
RR	Relative risk ratio
SAD_1	Sagittal abdominal diameter
SAD_2	Seasonal affective disorder
SAD_3	Somatotype attitudinal distance
SAM	Somatotype attitudinal mean
SAT	Subcutaneous adipose tissue
SCS	Symptom count score
SCW	Self-classified weight
SD	Standard deviation
SE	Standard error
SES	Socio-economic status
SF	Social functioning
SF-36v1	Short form health survey version 1
SHeS	Scottish Health Survey
SOC	Sense of coherence
SPAQ	Scottish physical activity questionnaire
SPICe	Scottish Parliament Information Centre
SSi(s)	Semi-structured interview(s)
T2D	Type 2 diabetes
TNF-α	Tumour necrosis factor-alpha
US	United States (of America)
UK	United Kingdom (includes England, Wales, Scotland and Northern Ireland)
VAT	Visceral adipose tissue
VT	Vitality
VTA	Ventral tegmental area
WAT	White adipose tissue
WC	Waist circumference
Wgt	Weight
WHO	World health organisation
WHR	Waist-to-hip ratio
WSR	Waist-to-stature ratio
WHtR	Waist-to-height ratio
WTPA	Work-time physical activity
YFAS	Yale food addiction scale

Units of measurement

cm	centimetre
dL	decilitre
g	gram
kg	kilogram
L	Litre
m	metre
mg	milligram
mL	millilitre
µm	micrometre
µg	microgram
µL	microlitre
ng	nanogram
pg	picogram

List of symbols

α	alpha
β	beta
F	parametric test statistic
γ	gamma
n	Sample size (i.e. number of participants)
p	test statistic, level of significance
r	Pearson correlation (parametric)
r_s	Spearman correlation (non-parametric)
r_{IT}	Item-total correlation
U	Mann-Whitney U test (non-parametric)
µ	Mean
z	Standardised test statistic

List of Conferences / Presentations

RGU Graduate School Poster Presentation, April 2016

RGU GradGet Power-point presentation, May 2016

ASO UKCO –Poster Presentation- University of Nottingham, September 2016 (Appendix 24)

Research Presentation day in Dundee, Scotland - Oral Power Point Presentation, 29 April 2017 (Appendix 25)

European Sociological Association, Athens, Greece - Oral Power Point Presentation, 31 August 2017 (Appendix 26)

Chapter 1 Introduction

1.0 Overview

Obesity exists in the complexity of everyday life, and yet most traditional approaches for the study of obesity prevention and/or management have unidimensional and fragmented viewpoints. The majority of research carried out is from one single discipline's point of view, examples of which would include biological, or sociological aspects, and even though the research may be in depth, it tends to operate at a certain level of limited abstraction. However, one single factor alone does not induce obesity. Increased body weight is the outcome of multifactorial processes, behaviours, drivers and/or mechanisms, including, but not limited to, food production and supply, dietary patterns, psychological, genetic factors, environmental, societal and political influences (Chatterji, Green & Kumanyika 2014; Johnston, Matteson & Finegood 2014; Thibodeau, Perko & Flusberg 2015; Ulijaszek & McLennan 2016; Rush & Yan 2017).

As early as 1863, obesity was recognised as being associated to numerous pathologies, and its aetiology was considered to arise from complex origins (Csergo 2016). The Foresight Report on Obesity was a project commissioned by the UK government to understand the aetiologies of obesity (based on scientific evidence) and how to reduce its prevalence in UK society over a 40-year period (i.e. 2010-2050) (King 2007). It challenged the assumption that obesity was a simple issue of personal willpower. Instead, the authors believe that the causes of obesity are extremely complex and multifaceted, encompassing behaviour and biology, set within an environmental, cultural and social framework (Butland et al. 2007). As a result of integrating different scientific disciplines' understandings of the cause/s of obesity; a systems-map network was created (i.e. influence diagrams which shows factors that can have an influence on body weight) and shows how variables can coexist and lead to obesity, (Figure 1.1). This map is an attempt of conceptually illustrating the number of multiple components, interlinked and interdependent that could cause and affect obesity.

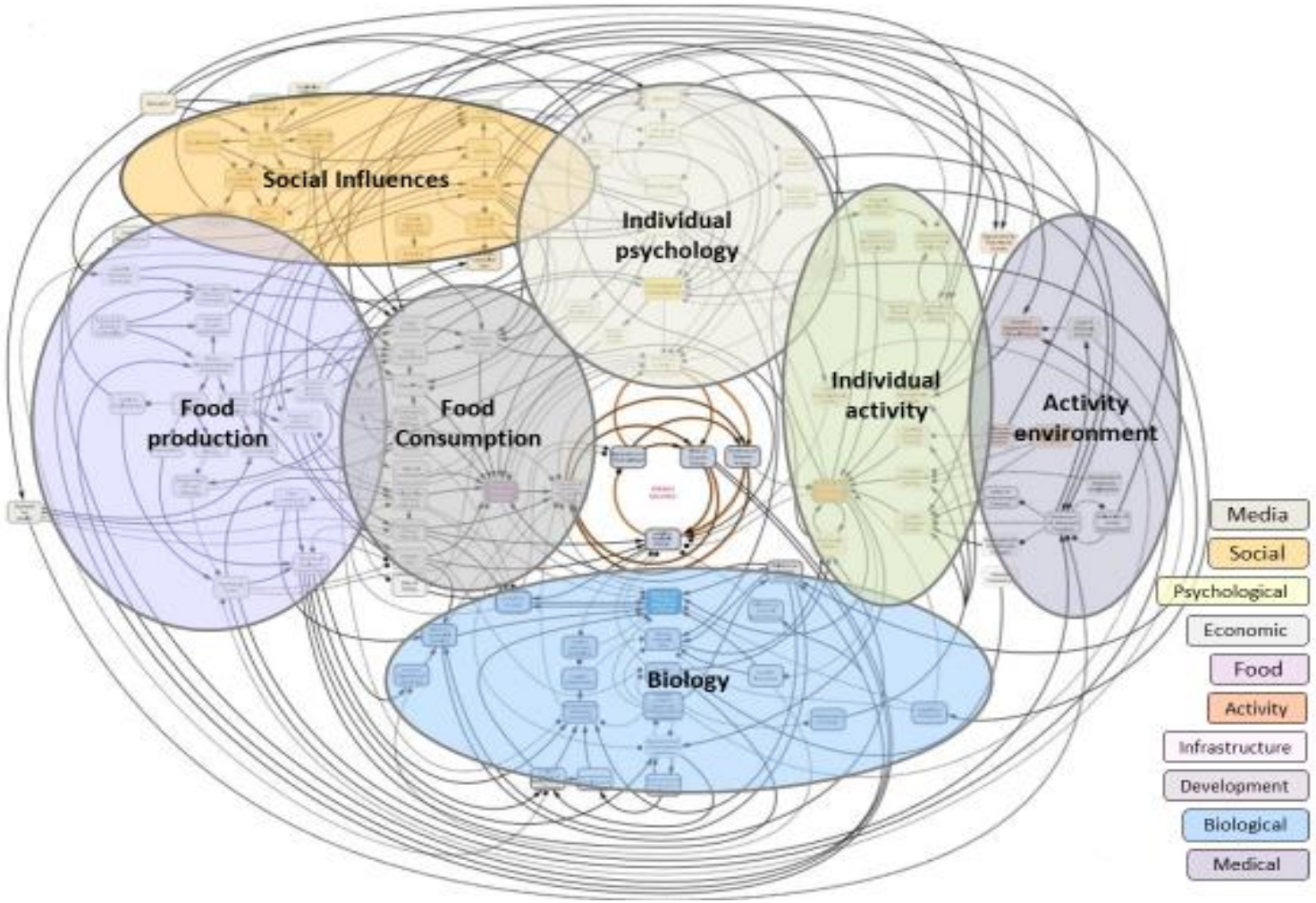

Figure 1.1 Conceptual representation of the complexity of obesity.
Foresight, Obesity Systems Map, adapted from Vandenbroeck, Goossens & Clemens (2007).

The introduction to this thesis provides an overview of specific areas of research which have been explored in investigating factors and mechanisms affecting, or associated to, body weight and obesity. It follows a traditional approach by which each potential factor is considered in isolation and not interacting with any other factors. Referring to the Foresight map, each highlighted section, on its own, is a prime example of how obesity has been explored in a unidimensional fashion.

The introduction of this thesis will first provide a definition of obesity according to the World Health Organisation (WHO), followed by figures related to the prevalence and associated costs of obesity, in Scotland, and in the UK. The introduction will then explore, mainly through an empirical (uni-dimensional) approach, public health policy's beliefs about the aetiology of obesity, and what an obesogenic environment is. Brief sections on individuals' psychology, food consumption patterns, somatotype and biology that could affect body weight or associated to obesity will be presented. This approach has been chosen to emphasise that with all the various, individual view-points of research that have been carried out on obesity, an explanation and understanding of why obesity occurs is still lacking.

Finally, an argument for a broader way of thinking about obesity is provided to reflect the aims and objectives of this research. A multidimensional approach is warranted in order to achieve a better understanding of why and how obesity occurs or can occur, and to design more effective strategies in reducing its prevalence.

1.1 Obesity definition

The World Health Organisation (WHO) defines overweight including obesity as "*abnormal or excessive fat accumulation that may impair health*" (WHO 2016). The surrogate measure of body-fat used by the WHO is body mass index (BMI), which refers to the ratio of weight in kilograms (kg) divided by height expressed in metres (m) squared (kg/m^2). In 18 years and older adults, moderate obesity is defined as having a BMI between 30 and 39.99 kg/m^2. Massive, or morbid obesity is defined as having a BMI $\geq$ 40 kg/m^2. Overweight, but not obese, which is classified as 'pre-obese' by the WHO, is defined as a BMI between 25.00 to 29.99 kg/m^2, and will be referred to as overweight throughout this thesis. Overweight is the point where a person is considered as having an 'unhealthy' weight. Normal 'range' or normal weight is defined as a BMI between 18.50 to 24.99 kg/m^2. The National Institute for Health and Clinical Excellence (NICE) refers to this BMI as 'healthy weight' (NICE 2014). A BMI under 18.50 kg/m^2 is considered underweight and the

National Health Service (NHS) deems this BMI to be considered as having weight that is too low to be healthy (NHS 2017). The implications, both physical and psychological, of being overweight or obese, in addition to adipose tissue's function will be discussed in following sections.

1.2 Prevalence and cost of obesity in the UK

Obesity continues to be a major public health concern throughout all well-developed countries (Prentice 2005). It is among the top three global social burdens created by humans (Dobbs et al. 2014). According to the Scottish Health Survey (SHeS), from 2003 to 2016, obesity has increased 5% in all adults (aged 16 years and older) from 24 to 29% (Bardsley 2017). The prevalence of obesity in UK adults in 1966 was approximately 3% and has nearly doubled approximately every decade since (Harcombe 2010, p. 2). In 1980, obesity prevalence was approximately 7% (Prentice & Jebb 1995). Figure 1.2 compares the percent prevalence of obesity in adults, for Scotland, England, Northern Ireland and Wales. Scotland has a higher increase and percentage of obesity than other UK countries, whereas Wales has the lowest percentage of obese individuals. As the information on BMI in Wales are self-reported, precautions should be used when comparing them with other UK countries (Baker 2018). A projection of the prevalence of obesity in developed countries, by the year 2030, produced from the Organization for Economic Cooperation and Development (OECD 2017) is reported in Figure 1.3.

Figure 1.2 Percentage of obese adults in the UK from 1993 to 2016.
Note, England percent obese in 1993 was 15%, but not displayed (Bardeley 2017; Public Health England, PHE 2017).

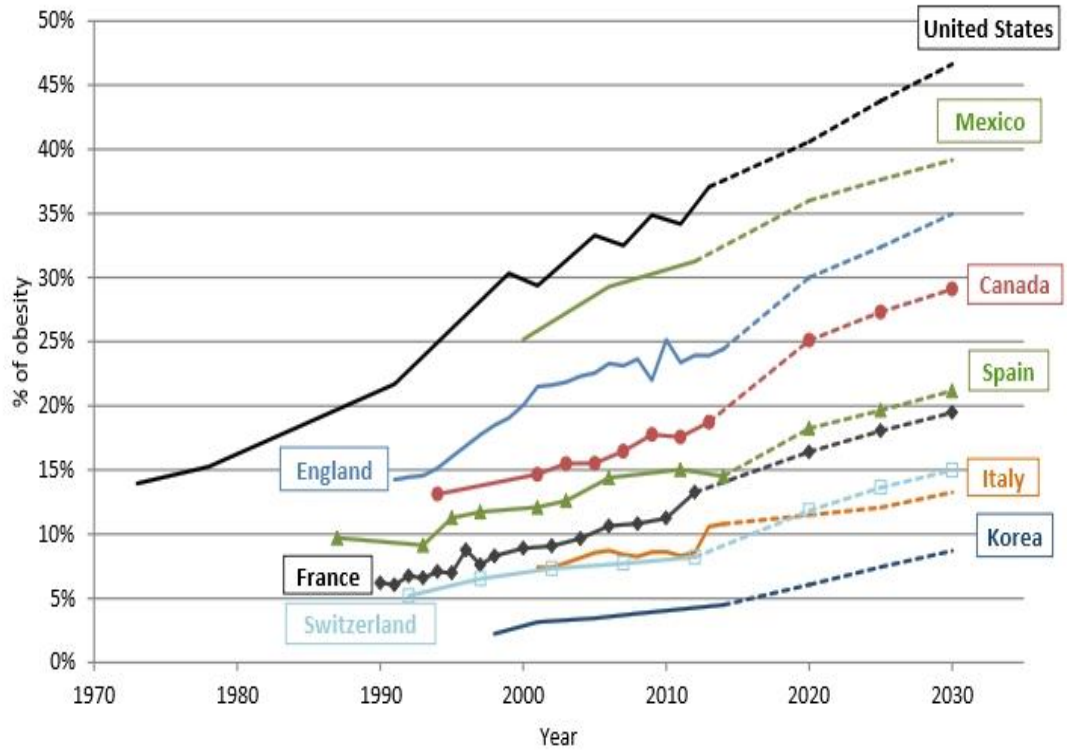

Figure 1.3 Projected rates of obesity in developed countries.
Adapted from the Organization for Economic Cooperation and Development (OECD 2017). Note, England is not representative of all of the UK, and Korea is believed to represent South Korea.

Quantifying the cost of obesity is difficult because risk factors associated to carrying extra weight can lead to many other conditions, of which some are not fully known (Castle 2015). However, the Scottish Parliament Information centre (SPICe) reported that the annual health care cost to Scotland for overweight, including obesity has nearly doubled (from 2003 to 2015) from £171 million to £363 million (Castle 2015). If obesity-associated comorbid diseases are included, the cost has been estimated to be as high as £600 million (Castle 2015). Moreover, the latest report states that obesity at present has been estimated to cost Scotland between £0.9 billion to £4.6 billion per year (Grant 2017). Considering Foresight projections, obesity prevalence could increase to be as high as 55% (both men and women combined) by 2050 (McPherson, Marsh & Brown 2007) and inaction could result in costs of up to £49.9 billion per year (Butland et al. 2007). In view of the size of the problem and cost of obesity, it is paramount to fully understand the aetiology of it, but not necessarily through using a mono-disciplinary approach.

1.3 Aetiology of obesity

Obesity is influenced by 'highly complex' factors such as biology, evolution, genetics, epigenetics, psychology, economics and society, but at the basis, it is the result of energy imbalance. Individuals are naturally motivated towards consuming more energy than is required because of human history having to cope with starvation in the past (Speakman & O'Rahilly 2012; Grant 2017). Moreover, it has become widely accepted that the ability to store fat in times of food abundance has given humans an advantage during the evolution of mankind (Haüner 2009). Likewise, individuals with low energy expenditure or who were able to reduce energy expenditure during times of famine or food scarcity had a greater chance for survival. This potential explanation for the aetiology of obesity was termed the 'thrifty gene' hypothesis and was originally proposed by Neel (1962). It is based on the concept of genetic selection in periods of food scarcity, suggestive that particular genotypes have predisposed individuals to obesity and related diseases. This hypothesis is supported by data from twin, and adoption studies, as well as from populations who are more obesity-prone, such as the Pima Indians (e.g. Ravussin et al. 1988).

To say 'eating too much and doing too little' causes obesity is too simplistic (King 2007). The Foresight team examined a range of factors which could contribute to the aetiology of obesity and therefore affect energy balance. These factors included, genetic, biological and metabolic factors; growth patterns and impact of early life; activity behaviours and opportunities for physical

activity; the living environment, in addition to technology and working practices; food and drink availability, access and intake, in addition to the pricing, marketing and purchasing capacity of food and drink and its impact on eating patterns; as well as the beliefs, habits and morals around food. The conclusion of this investigation was that the aetiology of obesity was complex and multifaceted. Additionally, the human body struggles to maintain homeostatic energy balance in an environment that has outstripped human evolution, with technological advances that have changed our lifestyles (Smith 2011). Therefore, the simple expression of obesity being caused by energy imbalance does not capture the full picture; food intake and energy expenditure are not straightforward processes, but two complex processes which are determined by many central and peripheral neuronal, hormonal and biochemical signals (Hauner 2009, p. 120). In addition, beliefs, psychology, and attitudes towards food, and food choice play an important role in the aetiology of obesity. Lack of knowledge about diet and exercise affecting health; knowledge about buying and cooking food; availability and cost of healthy foods (Drewnowski & Specter 2004; Klohe-Lehman et al. 2006), along with opportunities to exercise and the safety concerns involved in exercise, are among other factors affecting obesity aetiology. Physical disabilities, low levels of fitness or lack of time required to exercise, may affect individuals' ability to exercise and therefore contribute to obesity (Dishman, Sallis & Orenstein 1985). Moreover, family views or members of the community and religious beliefs (social and cultural environment) may pose as barriers to healthy eating (Counihan & Esterik 2013; Douglas 2013). Furthermore, individuals, lack of self-esteem or assertiveness, feelings of low self-esteem may lead individuals to eat more, as in comfort eating (Sassaroli & Ruggiero 2005).

In summary, cultural, psychosocial and situational factors interrelate to determine habits in food purchasing, along with methods of preparation and consumption of these foods (Shatenstein & Ghadirian 1998, p 225). Recognition of the complexity of factors involved in obesity aetiology remains therefore, one of the barriers for designing effective strategies for attenuating its prevalence and optimise treatment (Prentice & Jebb 1995). Moreover, factors affecting obesity in one person, may not necessarily be the same in another individual. Understanding more about the causes of obesity *via* an interdisciplinary approach, the better equipped we will be in finding effective strategies for attenuating its rising prevalence.

The following sections (1.4 through 1.6) are summary reviews of the various ways in how obesity has been explored in previous research and how it is believed to emerge. These research paths from particular disciplines (i.e. genetics, environment, body image, food choice) highlight factors related to obesity, but each is a siloed approach with its own unidimensional way of thinking. The

purpose of this review is to illustrate what has been done and said; and while these views are part of the story, they are not the whole story. Once the review has been completed, we will introduce a critical point as to the weaknesses of these singular approaches.

1.4 Genetic and environmental factors in obesity

Shriner et al. (2012) have proposed that obesity phenotype is determined by both genetic and environmental influences. Kopelman (2000) and Jebb (1997) have stated that an individual's body weight is ultimately determined by her/his internal and external environment coupled with psychosocial factors, all acting through physiological mediators of food and beverage intake and energy expenditure (Jebb 1997; Kopelman 2000). Mela & Rogers (1998) have expressed that obesity has long been recognised to run in families (p.62) *via* a genetic component (Jebb 1997); however, there is a consistent lack of evidence for shared family environmental influences having a direct effect on obesity (Hewitt 1997, p. 353). More specifically, because genetic studies in twin and adoption studies have narrowed down heritability estimates for BMI to range between 60 and 70%. This suggests that the remaining 30 to 40% of the variance of BMI can be explained by environmental factors (Shriner et al. 2012, p. 99). However, Gesta & Kahn (2017, p. 174) state that genetics accounts for 30 to 70% of the variability of BMI and waist-hip-ratio (WHR), used as surrogate measures of obesity. Independently of the percentages due to genetics, these studies reveal that environmental factors play a very large role. Moreover, Haüner (2009) explains that our genetic heritage has remained unchanged during past centuries, suggesting that the current and high prevalence of obesity is largely a consequence of recent changes in our environment and lifestyle.

Changes in obesity prevalence over a short period of time have been reported in different countries and among different ethnic groups. National surveys in the United States (US) have shown a noticeable increase in prevalence of obesity over a short period of time. More specifically, from 1980 to 1987, obesity in US adults aged 25 to 74 years, climbed 4.6% in men, and 6.1% in women (Kuczmarski et al. 1994). Additionally, overall, obesity prevalence in the US, in 1960 was 12.8% and had reached 22.5% by 1994, nearly a 10% increase in under 35 years (Flegal et al. 1998), less than two generations.

Other examples come from communities where there has been a dramatic change in diet and lifestyle, particularly the 'westernisation' of diet over a very short period of time. More specifically, Africans migrating to the Caribbean islands showed a significant increase in obesity

prevalence. As an example, in Barbados, from 1968 to 1981, an increase in adult obesity was observed in men from 7% to 16.2%, and in women from 31% to 37.9%. However, in women over 40 years of age, the increase was even more dramatic, from a prevalence of 32% to 50% in the same 13-year period, compared to their counterparts in West Africa. Obesity prevalence at the clinical level among Barbadian women was 47% in those attending general practices, and 63% in outpatient hospitals (Wilks et al. 1996).

Moreover, the pronounced increase in prevalence of obesity in age-standardised Polynesians in Western Samoa and in Naurians in Micronesia, is greater than 60% in women and men, and is closely aligned with the alterations in their diet and lifestyle (Kopelman 2000, citing James 1996). Additionally, Pima Indians living in the US, average 25 kg more weight compared to their counterparts living in Mexico (Ravussin 1995). Similarly, Africans migrating to the US have a mean BMI of 27.1 kg/m^2 in men and 30.8 kg/m^2 in women, compared to their counterparts living in Nigeria, where the men have a mean BMI of 21.7 kg/m^2 and women, 22.6 kg/m^2 (Wilks et al. 1996).

1.4.1 Obesogenic environment

From an environment perspective, Egger & Swinburn (1997) first described an environment that was 'unsupportive' and promoted obesity as an 'obesogenic environment', thus, suggesting the cause of obesity. The term unsupportive was not defined, but in a later paper Swinburn, Egger & Raza (1999) described an environment where "*people struggle against environments, which increasingly promote a high energy intake and sedentary behaviours*"; and commented that the challenge was to create a 'supportive' environment where an individual is better able to make healthier choices based on educational messages through public education programmes. An obesogenic environment was then defined as the sum of influences of surroundings, environmental factors, and opportunities that life has on individuals helping to promote obesity at a population level (p. 564). Other researchers have defined an unsupportive environment as one where an individual is unable to walk or cycle, especially to work, due to adverse environmental conditions, such as heavy traffic (Guell, Panter & Ogilvie 2013). Later, Swinburn & Egger (2002) discussed environmental influences, that could be interpreted as unsupportive, in terms of lacking physical activity choices, recreational facility, financial situation of the consumer, and advertising, as determining factors for how individuals make decisions relating to food choice and energy expenditure.

In summary, an obesogenic environment has been defined as an obesity promoting environment full of modern conveniences where individuals must go out of their way to avoid sedentary behaviour and deliberately incorporate healthy eating. It is the 'passive over-consumption' of ubiquitous, ready-made snacks and/or meals, processed foods, large portion sizes; food comprised mainly of simple carbohydrates, processed fats/oils which are calorically dense and usually manufactured in a food factory (Swinburn, Egger & Raza 1999; Prentice & Jebb 2003; Lake & Townshend 2006; Stanton 2006; Colls & Evans 2014; Wansink 2012; Hobbs et al. 2015).

An obesogenic environment is a world where families spend less time cooking homemade meals together and more time spent in front of the television eating ready-made meals, or 'carry out' meals from fast food takeaways or restaurants (Prentice & Jeb 2003). Less time is spent walking and more time is spent driving, sitting, escalator/elevator taking etcetera. More specifically, physical energy output is at a minimum and food consumption has been radically changed by the food industry (Castle 2015).

1.5 Individual's psychology and obesity

A prodigious amount of work and research has gone into understanding the mechanisms linking poor health and obesity. Much of this research has focused on the biological mechanisms of how weight impacts blood pressure, lipid dysregulation and insulin resistance, but the impact that biasness and discrimination towards weight affects the health of obese individuals has been often overlooked.

1.5.1 Discrimination and stigma

Negative attitudes towards individuals with obesity appear to arise from the belief that gluttony, self-indulgence and/or laziness causes obesity and is therefore interpreted by others as immoral (Wadden & Stunkard 1985). The belief that individuals with obesity are directly responsible for their condition and that obesity can easily be overcome has been termed by Goffman (1963) as the naïve "stigma theory" (DeJong 1980). As early as the late 1960s and early 70's, both Cahnman (1968) and Kurland (1970) chastised the medical profession for its contribution to this kind of "moralistic diagnosis", a diagnosis which has completely ignored the complex aetiology of obesity and needlessly reduces the probability of successful treatment (DeJong 1980, citing Mayer 1968).

Moreover, the psychological and behavioural consequences of these perceptions are not known (Falkner 1999).

It is therefore important to identify what the health consequences that arise from social consequences are. Brownell (2005) stated; it is plain and clear that individuals with obesity suffer, "*they live in a socially constructed world that determines what is right and wrong, what is pleasing and disgusting, how blame is assessed, and who deserves some version of a scarlet letter*" (p. 2).

Stereotyping individuals who are overweight or with obesity perpetuates bias against these individuals and has far reaching effects in multiple life domains, including day-to-day life, educational institutions, workplace, interpersonal relationships, the media and health-care settings (Brownell et al. 2005; Puhl & Heuer 2009). Puhl et al. (2014) explored health professionals' attitudes towards individuals with obesity and discovered that 56% had observed other professionals in their field (i.e. doctors, nurses, dietitians, medical students, psychologists and fitness professionals) making negative comments about obese patients. This biasness serves as a barrier and has important implications for the quality of care given out to individuals who are overweight or with obesity (Puhl et al. 2014). It increases the health risks of obesity associated with functional ability (Schafer & Ferraro 2011), and health-related quality of life (Latner, Durso & Mond 2013). Moreover, one's perception of her/his own weight is affected by weight-based discrimination, which mediates the relationship between health and perceived discrimination (Schafer & Ferraro 2011).

Discrimination in general may affect health: a study in racial discrimination has shown that for individuals who have suffered from racial discrimination, self-rated health, blood pressure, chronic conditions, disability and depression were affected (Schnittker & McLeod 2005). Even the anticipation of discrimination has stressful consequences as the individual lives in a state of 'heightened vigilance' (Williams & Neighbors 2001). Carr & Friedman (2005) stated that perceived mistreatment based on one's weight explains, for instance, the higher prevalence of psychological distress and lower self-acceptance among severely obese people. However, Puhl & Brownell (2001) expressed that "fatness" offers far less leverage as a protective identity (as does race) to buffer the stress of perceived mistreatment.

1.5.2 Body image

In the 1800s, the ideal female body was voluptuous and slightly overweight, which demonstrated wealth and good health. By the 1920s however, there was a growing obsession for women to have short hair and thin bodies, the 'flapper girls' whose bodies revealed no curves. This shift to a thinner body ideal was viewed as sophisticated, elegant and glamorous. During the 20th century the ideal body went through some changes, but never really strayed from being thin. As a result of this desire for this body ideal 'thinness', different diets emerged, as well as smoking cigarettes to suppress appetite. The dieting craze never fully subsided, nor did the desire for the 'ideal body' (Reel 2017, p. 11).

An individual's attitude toward their body is linked to their level of self-esteem, emotional stability, interpersonal confidence, sexual behaviours, grooming activities, as well as exercise and eating behaviours (Cash & Pruzinsky 1990; Thompson et al. 1999; Cash 2004). A poor body image has been associated with greater adiposity and greater body dissatisfaction with lower psychosocial functioning, which includes a greater investment for one's appearance (Cash, Jakatdar and Williams 2004). Body image can be described as an individual's subjective appraisal of her/his own physical characteristics or qualities, it encompasses how the individual experiences her/his own body (Cash 2004). However, body image is a multifaceted construct where familial, interpersonal experiences and cultural influences are some of what makes up the complexity of an individual's body image perception (Thompson & Smolak 2002; Cash & Pruzinsky 2004, p. 279). It is not a fixed or static state, it develops over the course of life, as a result of sensory and behavioural experiences. It is affected by age-related, natural bodily changes and how the mind responds to those changes. Additionally, it is affected by society and individual's reactions to others' physical appearance (Chrisler & Ghiz 1993; Whitbourne & Skultety 2004).

Body dissatisfaction and excessive body image investment is equated with a negative body image and can have adverse psychosocial consequences, including depression (Noles, Cash & Winstead 1985), poor self-esteem (Powell & Hendricks 1999), impaired sexual functioning (Wiederman 2002), social anxiety and inhibition, and day-to-day interactions (Cash & Fleming 2002, p. 281) in addition to disordered eating (Cash & Deagle 1997). In contrast, a positive body image potentially facilitates comfort and social confidence (Cash & Fleming 2002, p. 277).

There is clear evidence that obese individuals suffer from low self-esteem, body image disturbances and depression (Myers & Rosen 1999). However, Schwartz & Brownell (2004) have expressed that the wide assumption that all obese individuals must feel bad about their bodies,

reflects the powerful societal stigma against individuals with obesity (p. 200): not all individuals with obesity suffer from a low body image, but among those who are affected, severity varies considerably (Myers & Rosen 1999, p. 200)

Analysis of body-image perception in women and men across the weight spectrum, consistently shows that women are more dissatisfied with their bodies than are men. Moreover, there is evidence that among women with obesity, compared to their normal-weight peers, their risk for body dissatisfaction is magnified. There is less empirical attention for the association between obesity and body image in men, however, there is evidence which suggests that overweight men might not necessarily experience body image distress in the same way as a woman who is overweight (Schwartz & Brownell 2004, p. 204). Cash & Hicks (1990) found that men who were overweight and labeled themselves as overweight, had greater body satisfaction when compared to normal-weight men who labeled themselves as overweight. Cash & Hicks (1990) hypothesized that the overweight males probably saw themselves as 'big and strong' as opposed to 'fat'. Whereas, in overweight women who labeled themselves as overweight, they were less satisfied with their bodies compared to their normal-weight peers who also labeled themselves as overweight.

A meta-analysis on the psychological correlates of individuals with obesity, by Friedman & Brownell (1995) revealed that few consistent differences distinguished individuals with obesity from their normal weight counterparts. It concluded that individuals with obesity are psychologically heterogeneous: factors which protect some individuals from having a poor/low body image, make others susceptible (p.16).

1.5.3 Eating disorders associated with body image disturbance

In Western cultures, eating disorders associated with body-image disturbances, are a significant physical and mental health problem (Thompson & Stice 2001). The internalisation of society's standards of attractiveness, 'it is in to be thin', - is a causal risk factor for eating disturbances (Thompson & Stice 2001, p. 181), and appears to operate in combination with other acknowledged risk factors, including dieting and negative affect (i.e. eating helps manage negative affect) (Killen et al. 1996; Hohlstein, Smith & Atlas 1998). Individuals who internalise 'thin-ideal' attitudes, promoted by respected others, (e.g. media, social peers and family members) (Kandel 1980), potentially foster body dissatisfaction, especially girls, as this ideal is nearly unattainable

for most females (Hohlstein, Smith & Atlas 1998). Moreover, Stice et al. (1994, p. 838), using questionnaires in a university sample in the US, found significant direct effects between ideal body stereotype internalisation and body dissatisfaction; and between body dissatisfaction and eating disorder symptomatology suggesting that media does have an effect on some young individuals' perception about what an ideal-body is supposed to be.

It is generally considered that body dissatisfaction leads to dieting because of the prevalent belief that this is an effective weight-control method. For women in Western society, appearance is a central evaluative dimension and, as a result, may foster negative affect. Dieting is posited to result in a greater risk for bulimic symptoms because individuals might binge-eat to counteract the effects of caloric deprivation. Finally, negative affect may increase the chance of bulimic symptoms because of the belief that eating provides comfort and distraction from negative emotions (Thompson & Stice 2001, p. 181).

The overemphasis on slenderness in the media may promote dietary restraint which has been linked to binge eating in controlled experiments (Polivy & Herman 1985). Binge eating is a form of 'disordered eating' which is associated with loss of control with excessive eating. Additionally, it is associated with loss of control over eating and eating related psychopathology (Klesges, Klem & Bene 1989; Kober & Boswell 2018, citing Donahue 2003). Research has suggested that individuals with binge eating disorder (BED); have greater body concerns and dissatisfaction about weight and shape compared to individuals with obesity and without this disorder (Schwartz & Brownell 2004, p. 201). Wilfley et al. (2000) found that individuals with BED, have higher levels of body dissatisfaction than obese individuals who did not binge eat. Furthermore, a study by Milkewicz & Cash (2000) revealed that higher levels of BED were associated with a more negative body image and poorer psychosocial adjustment in overweight women and in women who had never been overweight. This suggests that individuals who binge eat, are at a higher risk of body image disturbance and poor psychological functioning (Schwartz & Brownell 2004).

1.5.4 Sense of Coherence/Salutogenesis

Sense of coherence was formed from a 'Salutogenic' theory, which is an individual's resolve, or capacity to create health and make sense of her/his world. Two key elements comprise the salutogenic theory: one is an individual's orientation towards problem solving and the other is her/his ability to use whatever resources are available to her/himself (Lindström & Eriksson 2005).

In 1979, Dr Aaron Antonovsky, an American-Israeli medical sociologist, introduced the framework of searching for 'the origin of health'. Instead of focusing on the cause of disease, he was interested in understanding what caused health (Antonovsky 1979). He believed that an individual's outlook on life was a factor which affected the 'health ease/dis-ease continuum'. More specifically, the salutogenic view sees individuals as occupying a place along a continuum of health-disease (Antonovsky 1993). By creating this 'salutogenic model' he would stimulate discussion among other life scientists and health professionals to answering the question of what promotes health. Antonovsky's model was formulated in part by studying Holocaust survivors and their subsequent ability to adapt to the experiences they had endured and "*to still be in reasonable health*" (Antonovsky 1988, p. xi).

Antonovsky's salutogenic model was considered to be radically different from the traditional, medical approach of understanding disease or the disease process. His objective was to highlight the inadequacy of the pathogenic approach which dominated all biomedical and social science disease research; and searched for factors or 'breakdowns in the body' which led to diseases. Secondly, if individuals adapted and moved towards the healthy end of the health ease/dis-ease continuum, attention should be given to what resources an individual possessed for this to occur. These resources, called by Antonovsky as 'general resistance resources' (GRRs), could be within or outside of the individual, and include factors such as ego strength, wealth, social support, cultural stability, etcetera. Antonovsky came to the determination that the ability to harness these resources was the individual's 'sense of coherence' (SOC). More specifically, these GRRs that an individual comes to rely upon, are a result of life experiences, and these life experiences could lead to a strong SOC. Thus, a strong SOC is a way of seeing the world, and this 'view' is facilitated through successfully coping with the complex and innumerable stressors life confronts individuals with in the daily course of living.

The stronger an individual's SOC is and her/his ability to comprehend, manage and find meaning in life, the more capacity s/he has to deal with life stressors and the more resilience s/he has to unfavourable life situations. These individuals are more likely to seek out solutions by themselves and to cope with health problems (Wolf & Ratner 1999). A cross-sectional study by Skär, Juuso & Söderberg (2014) explored whether levels of SOC among individuals with obesity were correlated with BMI, gender and age. The observation that a low SOC was more common among the participants with higher BMIs is consistent with Antonovsky's salutogenic framework that explains that degree of illness will influence the level of an individual's SOC. Skär, Juuso & Söderberg

(2014) concluded that their results suggested that for individuals with obesity and a low SOC, these individuals are in need of more support for health management (p.5).

1.6 Food consumption in obesity

One obvious factor affecting food consumption or intake, is the physiological state of hunger which motivates a person to seek out food. In the past, one challenge for humans was finding enough food to consume, and eating sufficient calories to maintain the body's functioning, health and survival. Not only was the challenge to avoid starvation, but food had to be found on a continual basis (Woods 1991, p. 488). Today, that problem is less of a challenge in most developed countries but does remain a condition in some areas of the world where malnutrition remains a significant challenge.

A wide variety of factors influence an individual's food intake, such as biological, genetic, psychological, cultural and environmental variables. Most scientists studying appetite regulation would probably agree that food environments are much more influential in determining food intake than are beliefs about how healthy food is (Lowe, Bocarsly & Del Parigi 2008, p. 96). Food intake has traditionally been viewed as the basis of energy homeostasis and a behavioural contributor which helps to maintain body fat content and energy balance. The extent by which food intake is influenced by regulatory factors (i.e. hormonal feedback signals, brain neuropeptide systems and gastrointestinal factors) or non-regulatory determinants associated with the food environment (ex. food palatability and cognitive influences) has been a debate for a long time (Lowe, Bocarsly & Del Parigi 2008, p. 96; Vasselli 2012, p. 133).

1.6.1 Regulation of food intake

The intake of food is affected by a wide variety of naturally occurring changes in the external and internal environments. For example, when ambient temperatures are decreased, food intake is increased (Stroebele & De Castro 2004). An abnormally large appetite and eating (hyperphagia) ensues following lesions in certain parts of the brain (ventromedial hypothalamus) and metabolic effects can be seen in brain damage, or a tumour in the hypothalamus (Seeley, Stephens & Tate 1995, p. 871). At a molecular level, uncoupling proteins involved in metabolism, if altered or

defective in anyway, can alter food intake by increasing the uptake of food (Fine & Feinman 2004).

"*The regulation of energy intake is poorly understood*", food seeking behaviour and appetite are continually and spontaneously stimulated by neurons innervating the hypothalamus. After ingestion of food, a number of mechanisms are responsible for decreasing further food intake: feeding inhibition can result from neural mechanisms registering a distention of the stomach. Research carried out in rats has shown that if ingested food fails to distend the stomach or enter the small intestine, satiety does not occur, an example of this occurs with liquid diets (Mela & Rogers 1998, p. 23). The release of a number of hormones from the gastrointestinal tract and the pancreas can inhibit feeding (ex. cholecystokinin, somatostatin, insulin, glucagon and other hormones), and the levels of glucose, fatty acids and amino acids in the blood also provide the brain with feedback on how appetite needs to be adjusted (Seeley, Stephens & Tate 1995, p. 871). The fact that the body does not have a strong inhibitory feedback system for food intake, suggests that the whole system instead anticipates its needs for long-term nutrient supplies, rather than the maintenance of energy balance on a daily level (Mela & Rogers 1998, p. 13).

There are numerous other factors, which are not under any regulatory control mechanisms, that can result in increased food intake (Wansink 2010): eating as a way of dealing with stress (Oliver & Wardle 1999; Adam & Epel 2007), or negative emotions (van Strien et al. 1986; Geliebter & Aversa 2003); mindless eating (Wansink 2010), or the sight and/or smell of food, or the palatability of food (Mela & Rogers 1998). Moreover, restricting certain foods may actually increase the intake of these foods (Jansen, Mulkens & Jansen 2007), or lead to binge eating (Polivy & Herman 1985; Polivy et al. 1994; Mathes et al. 2009).

1.6.2 Emotional eating

The idea that obesity is caused by overeating in response to emotional stimuli, is known as the 'psychosomatic theory of obesity' and was introduced by Kaplan & Kaplan during the 1950s (Mela & Rogers 1998, p. 161; Canetti, Bachar & Berry 2002). For many years, obesity had been viewed as a psychopathology disorder manifested as overeating and it was believed that individuals with obesity ate in response to negative emotions, including sadness, insecurity and frustration, and that food was used as a means of assuaging negative emotions and providing comfort in lieu of other means. Moreover, these individuals had been portrayed as having problems with food

because they were not able to establish interpersonal and satisfactory relationships. They were often viewed as lonely, having self-hate, self-contempt and self-rejection, and if they displayed any happiness it was only superficial (Becker 1960, p. 322). This concept was however challenged by Wadden & Stunkard (1993) who hypothesised that when psychopathology has been observed in individuals with obesity, instead of seeing emotional eating as a cause of obesity, it is now seen as a consequence of the discrimination and prejudiced that these individuals have been subjected to (p. 163). However, emotionally triggered eating has found a firm place as an aetiological model of obesity, but whether or not it has a truly causal role has not been established (Wardle 1987). This concept is supported by research in the psychosomatic theory which has shown that individuals with obesity eat no more than normal weight individuals under similar circumstances (Bruch 1964, p. 120; Meyers & Stunkard 1980, p. 1135).

Emotional states of arousal (i.e. depression, sadness, anxiety, anger, joy, or other emotions) do affect eating behaviour in some individuals (Mela & Rogers 1998; Singh 2014), and this type of excessive eating may be attributed to a confusion between hunger and internal arousal states, perhaps due to early learning experiences. Overeating has been suggested as a learned behaviour used as a coping mechanism in response to internal or external stress. Robbins & Fray (1980) proposed that internal cues are either confused for a 'natural' state of hunger or are activated making the individual more responsive to food-related stimuli (p. 114). Additionally, research has shown that normal weight individuals are no better at discriminating hunger cues and internal cues than are individuals with obesity (Robbins & Fray 1980, p. 123).

Whether individuals merely overeat in response to negative emotional cues or other cues as well (i.e. the smell and sight of food, or after long periods of restraint) are questions researchers have tried to understand. Herman & Mack (1975) were the first to identify the term 'restrained eater', for individuals who were able to display restraint regardless of internal or external cues. Whereas, individuals who were unable to restrain themselves during their dieting, from internal (emotional) or external (food) cues, were identified as 'disinhibited eaters'. More specifically, disinhibited eaters who gave into external food cues, were considered 'external eaters', and disinhibited eaters who gave into eating because of internal cues (i.e. emotions) were termed 'emotional eaters'.

The 'Restrained Eating' theory, enveloped both emotional and external eating and came to be considered as consequences of intense dieting: constantly denying hunger pangs could potentially result in loss of contact with feelings of hunger and satiety (Polivy & Herman 1983; van Strien et

al. 1986). Thus, it has been considered that emotional and external eating have contributed independently to the development of disordered eating (Wardle 1987).

1.6.3 Food addiction

Certain foods such as sugars and fats may serve as potent rewards (Lenoir et al. 2007) and promote eating even in the absence of hunger, which can trigger learned associations between stimulus and reward (Volkow, Wang & Baler 2011, p39). Food intake is not necessarily a straight-forward process, it comprises both hedonic and homeostatic pathways, and is complex (Singh 2014, p. 6). More specifically, the hedonic pathway, also known as the reward-based pathway, can override the homeostatic pathway during periods of food abundance. The hedonic pathway increases the desire to consume highly palatable foods (Lutter & Nestler 2009), and is the same pathway used by 'substances of abuse' and is modulated by the neurotransmitter dopamine, which appears to also regulate food intake. Specifically, dopamine appears to modulate food reward *via* the meso-limbic system of the brain, which is the same system substances such as alcohol and drugs act on (Martel & Fantino 1996).

Research on the concept of food addiction has been around for several decades and encompasses the belief that certain foods, (e.g. calorically dense, highly processed foods, made to be highly palatable) may have an addictive potential, or at least contain certain additives, nutrients or properties that could be addictive (Avena & Gold 2011; Canella et al. 2014).

In an effort to understand the increasing prevalence of obesity, the concept that food could be addictive or have addictive properties was proposed as a causal mechanism leading to obesity (Cocores & Gold 2009; Davis & Carter 2014). Uncontrollable overeating was commonly believed to be one of the root causes of obesity, even if this type of eating or the cause of it was not well understood (Cocores & Gold 2009; Ifland et al. 2009).

In the 1950s, the term 'food addiction' was first defined in scientific literature by Theron Randolph (1956), who defined it as "*a specific adaptation to one or more regularly consumed foods to which a person is highly sensitive, producing a common pattern of symptoms descriptively similar to those of other addictive processes*" (cited by Meule 2015, p. 296). The addictive foods, at that time, included wheat, corn, potatoes, eggs, milk, and coffee as well as other foods that were frequently consumed; whereas, today, this view has shifted instead, to highly processed foods (Davis & Carter 2014) consisting of a high content of sugar and/or fat; and salt (Cocores & Gold

2009; Gearhardt, Corbin & Brownell 2009; Davis & Carter 2014; Schulte, Avena & Gearhardt 2015, cited by Meule 2015).

In order to 'diagnose' individuals with food addiction, a questionnaire has been developed and a systematic review by Pursey et al. (2014) investigating the prevalence of food addiction in several study populations (i.e. age groups, weight status, and sex) reported that food addiction was found to be greater in overweight and individuals with obesity (24.9%, meta-analysis of 14 studies), versus 11.1% in normal weight individuals (meta-analysis of 6 studies). In adults younger than 35 years of age (9 studies), food addiction prevalence was less, (17%), than for adults above the age of 35, (22%, 11 studies). The mean prevalence for food addiction in individuals with a clinical diagnosis for disordered eating (anorexia, bulimia and binge eating) was 57.6% (4 studies) compared to 16.2% in individuals with no clinical diagnosis (16 studies).

Food addiction does not explain all cases of obesity and indeed the food addiction theory is still a hotly debated topic (Meule 2015). Although there is evidence that highly palatable foods activate the brain reward pathway, there has been no clear consensus of the validity of this concept, and its precise definition has drawn controversy and disagreement among researchers about what it is and what its symptoms should resemble (Corwin & Grigson 2009; Corsica & Pelchat 2010; Avena et al. 2012; Meule & Kübler 2012; Ziauddeen, Farooqi & Fletcher 2012a; Ziauddeen & Fletcher 2012b; Ziauddeen & Fletcher 2013; Meule 2014). The drug addiction model may help explain the overconsumption of food (Fletcher & Kenny 2018) and, the Yale Food Addiction Scale (i.e. questionnaire) is the most widely accepted and used tool that may help identify individuals who have a compulsive eating disorder towards food (Hone-Blanchet & Fecteau 2014, p. 86).

1.6.4 Food choice

Food choice and consumption have important implications for health. Certain aspects of food choice have been linked with the prevention of or contribution to various chronic diseases, such as type-2-diabetes (T2D) and coronary heart disease (CHD) (Bucher et al. 2002; Mente et al. 2009; Malik et al. 2010). The differences in the consumption of nutrient dense or nutrient poor food types have also been linked with differences in weight status in adults. Ledikwe et al. (2006) found that individuals who ate a low-energy-dense diet (i.e. nutrient dense high in fruits and vegetables), consumed more food by weight but had lower kilocalorie energy intakes, compared to individuals who ate a high-energy-dense diet (i.e. calorically dense, high fat foods) although less

food per day, and less food by weight, their food intake was calorically higher. Ledikwe at al. (2006) found that the individuals who ate a high-energy-dense diet were significantly heavier in weight (p. 1365).

The process by which individuals choose what types of foods they eat, incorporates not only automatic, subconscious and habitual factors, but decisions which are based on conscious reflection (Furst et al. 1996, p. 247). Because food choice is linked to weight and health status, there is great interest in understanding how distal and proximal factors affect food choice. Examples of distal factors are geography, culture and genetics; whereas, proximal factors are food availability, taste preferences, knowledge about food and beliefs (Lyerly & Reeve 2015, p. 47).

In relation to the proximal precursors of food choice, researchers have, embraced the idea of 'food choice values', defined as factors that an individual considers when contemplating which foods to buy and/or consume. This concept, called the Food Choice Process Model was developed by Furst et al. (1996) in a qualitative study exploring how individuals went about making food choice decisions. The researchers discovered that individuals' life course experiences, such as their resources, personal factors, ideals, social contexts and food context had major influences on food choice. These life course experiences inform the development of an individual's personal system when making food choice decisions, which incorporate value negotiations and behavioural strategies. Value negotiations included, monetary considerations, sensory perceptions, nutritional and health beliefs/concerns, convenience (in terms of food quality and time constraints), and social relationships.

1.7 Biomarkers of obesity

Carrying excess fat can lead to increased risk for various diseases; primarily type-2 diabetes (T2D), cardiovascular disease (CVD), osteoarthritis (OA), some cancers and premature death (Kopelman 2000). However, these risks are greater for individuals with obesity (Donnelley 2010).

1.7.1 Adipose tissue

Adipose tissue exists in both white and brown forms and is a special type of connective tissue which functions as a thermo-regulator, mechanical protector and serves as energy storage. Classically, it was believed that white adipose tissue (WAT) served only as a passive energy

storage organ; designed to store large amounts of surplus energy in the form of triglycerides, for times when food is scarce. However, in the last two decades, it has come to light that it exhibits numerous complex functions (Gesta & Kahn 2017). WAT maintains intensive crosstalk with many other organs such that it is now known as an endocrine organ in its own right (Mohamed-Ali, Pinkey & Coppack 1998; Ahima 2006; Kosteli & Ferrante 2012), involved in energy homeostasis of the entire body (Ronti, Lupattelli & Mannarino 2006; Gesta & Kahn 2017). Additionally, it plays a role in innate and adaptive immunity where it protects against trauma and infection (Tchkonia et al. 2010). It provides a number of secreted bioactive peptides (such as, growth factors, hormones and cytokines), proteins and lipids, many of which influence metabolism. WAT is distributed throughout the body, as subcutaneous and intra-abdominal (Kosteli & Ferrante 2012).

Although total adipose tissue mass predicts morbidities; a strong and independent predictor for adverse health outcomes is more closely associated with the anatomical distribution of fat tissue (Montague & O'Rahilly 2000). The relative distribution of these fat depots can vary considerably among individuals; and age, sex and genetic factors affect its distribution. Fat distribution and adipose tissue more commonly observed in men, is located in the upper body, is described as android, and is known as the 'apple' shape. Whereas, in women, fat distribution, which favours lower-body extremities (thighs and buttocks, also known as gluteal-femoral), is described as gynoid, known as the 'pear' shape (Wajchenberg 2000).

The size of adipocytes is one hallmark of obesity, and has been found to be an important, determining factor for the expression of proinflammatory adipokines -primarily produced from visceral adipocytes. More precisely, an increase in adipocyte size induces secretion of inflammatory cytokines, which include tumour necrosis factor alpha (TNF-α), monocyte chemoattractant protein-1 (MCP-1), interleukin-8 (IL-8) and interleukin-6 (IL-6) (Hocking et al. 2010). TNF-α and IL-6 circulating levels are directly associated with adiposity and insulin resistance (Fantuzzi 2005). In contrast, anti-inflammatory adipokines, [ex. adiponectin and interleukin-1 receptor antagonist (IL-1ra)] have not been found to be produced with increasing adipocyte size (Montague & O'Rahilly 2000; Skurk et al. 2007).

WAT contains macrophages, other immune cells and endothelial cells and their amount is directly associated with adiposity and adipocyte size (Fantuzzi 2005). Macrophages can become activated under pathological conditions (illness or disease) inducing chemokine production (e.g. MCP-1), which induces recruitment of inflammatory cells and proinflammatory cytokines (Kosteli & Ferrante 2012). The observable characteristics (or phenotype), the biology and the amount of each adipose tissue component are greatly altered in human obesity. A consequence of increasing

levels of adiposity is low-grade inflammation, both throughout the body (systemic inflammation) and at specific sites (local inflammation). This inflammation appears to have a key role in mediating metabolic and vascular comorbidities and affects increasing levels of adiposity (Dalmas et al. 2017). Inflammation is associated with higher levels of circulating inflammatory cytokines such as IL-6, TNF-α, MCP-1 and c-reactive protein (CRP), in conjunction with decreased concentrations of anti-inflammatory molecules, such as adiponectin (Florido, Tchkonia & Kirkland 2011; Dalmas et al. 2017).

1.7.2 Adipokines

Leptin and adiponectin are considered to be the primary adipokines for the reason that they appear to be produced mainly by adipocytes (Tilg & Moschen 2008). Additionally, there is an inverse relationship between circulating plasma levels of leptin and adiponectin (Matsubara, Maruoka & Katayose 2002). Adiponectin's expression and circulating levels are negatively correlated with increasing levels of BMI and in diseases associated with insulin resistance. It is believed that its main role is as an anti-inflammatory, because of its capacity to suppress the synthesis of inflammatory cytokines, such as TNF-α (Matsubara, Maruoka & Katayose 2002), and interferon-gamma (IFN-γ); as well as to induce the anti-inflammatory cytokine interleukin-10 (IL-10) (Tilg & Moschen 2008). However, an increase in TNF-α also inhibits adiponectin (Fantuzzi 2005), and a reduced concentration of circulating adiponectin is associated with impaired immune function, a reduction in insulin sensitivity and increased rates of atherosclerosis (Chandran et al. 2003).

Leptin is involved in controlling fat mass through appetite control and energy expenditure in the hypothalamus (Kostelli & Ferrante 2012; Gesta & Kahn 2017). Its primary role is to communicate to the brain the amount of body fat, by signalling to the brain, the size of long-term energy stores (Zhang et al. 1994; Ahima 2006; Morris & Hansen 2009). Additionally, it controls food intake by acting as a satiety hormone, interfering with hypothalamic regulatory systems that govern food intake (Haüner 2009). Both fat mass size and nutritional states are associated with the circulating plasma concentration levels of leptin. Specifically, an increased level of plasma leptin is associated with increased levels of obesity (Gesta & Kahn 2017). In other words, adipocytes secrete leptin in direct proportion to the amount of adipose tissue in the body (Ahima 2006). However, increased secretion of leptin may also contribute to macrophage accumulation by stimulating the transport

of macrophages to adipose tissue and promoting adhesion of the macrophages to endothelial cells (Shuster et al. 2012; Cevenini et al. 2010).

1.7.3 Cytokines

It is recognised that the increased levels of cytokine production in obesity (compared to lean humans) of TNF-α, IL-6, MCP-1 and interleukin 1-beta (IL-1β) occurs in adipose tissue and contributes to the low-grade, chronic inflammatory state of obesity. Additionally, it is now recognised that these cytokines are produced in other metabolic tissues, such as the pancreas, liver, the brain, and possibly muscle tissue, which all contribute to metabolic dysfunction including insulin resistance and cardiovascular disease (CVD) (Berg & Scherer 2005; Shoelson, Lee & Goldfine 2006; Gregor & Hotamisligil 2011).

It is believed that adipocyte hypertrophy causes a disparity and impaired secretion between pro- and anti-inflammatory adipokines, such that the immunological balance shifts toward the expression of proinflammatory adipokines; which promotes the chronic, low-grade inflammation state of obesity, thus laying the ground for the development of the above-mentioned diseases or disease states (Skurk et al. 2007).

In obesity, TNF-α appears to function as a feedback inhibitor, and induces cellular insulin resistance (Florido, Tchkonia & Kirkland 2011), whereas, IL-6 is released by adipocytes and increases fat tissue breakdown (i.e. lipolysis) which has been implicated in the hypertriglyceride-mia and elevated serum free fatty acid (FFA) levels associated with obesity and insulin resistance (Weisberg et al. 2003; Florido, Tchkonia & Kirkland 2011).

Studies have shown that increased adiposity is associated with increasing levels of infiltrating monocytes and macrophages into adipose tissue (Xu et al. 2003). MCP-1 [also known as CC-chemokine ligand 2, or CCL2 (Mosser & Edwards 2008)] plays a key role in recruiting macrophages into adipose tissue. This chemokine, along with the proinflammatory cytokines TNF-α and IL-6 activate intracellular pathways promoting macrophage accumulation (Kamei et al. 2006) and inflammation, which contributes to the development of insulin resistance, and T2D (Shoelson, Lee & Goldfine 2006). Specifically, MCP-1 is responsible for mediating the infiltration of macrophages into obese adipose tissue and possibly plays an important part in establishing and maintaining a proinflammatory state that predisposes the individual to developing insulin resistance and metabolic syndrome (Inadera 2008).

Macrophages produce high levels of immunosuppressive cytokine interleukin-10 (IL-10) which aids in suppressing the body's immune response, this helps in reducing inflammation (Mosser 2010). However, IL-10 also suppresses macrophage function (Esposito et al. 2003). IL-10 is an anti-inflammatory cytokine produced in response to systemic inflammation and is believed to be protective against development and progression of atherosclerotic plaque by negatively regulating proinflammatory cytokines (Jha et al. 2010; George et al. 2012; Mirhafez et al. 2015). Moreover, IL-1β in conjunction with TNF-α induces secretion of other cytokines such as IL-6 and MCP-1, increasing the vulnerability of atherosclerotic plaque by inducing monocyte migration and activation (Mirhafez et al. 2015).

C-reactive protein (CRP) is an acute phase protein: an inflammatory mediator which increases or decreases in response to inflammation levels, and is largely regulated by IL-6 circulating levels (Yudkin, Emeis & Coppack 1999; Pepys & Hirschfield 2003). It is a prominent marker used to help predict an event of a future heart-attack in men and women (Calabro et al. 2005; Gregor & Hotamisligil 2011; Whitney & Rolfes 2013). Additionally, elevated levels of CRP and IL-6 have been found to be associated with developing T2D (Pradhan et al. 2001; Festa et al. 2002). Yudkin, Emeis & Coppack (1999) found that CRP levels were moderate to strongly and significantly associated with IL-6 ($r = 0.37$, $p < 0.0005$) and TNF-α ($r = 0.46$, $p < 0.0001$), respectively, in humans. Participants with higher levels of CRP were more obese and had higher concentrations of IL-6 and TNF-α and higher levels of insulin resistance, compared to healthy participants.

To summarise, with increasing levels of adiposity, the adipokines adiponectin would be expected to decrease, and leptin increase. Proinflammatory cytokines IL-6, IL-1β and TNF-α would increase as well as the chemokine MCP-1. The inflammatory mediator CRP would also increase. Additionally, the anti-inflammatory cytokine IL-10 would increase in response to rising levels of inflammation.

1.8 Body shape, somatotype, temperament and disease

Throughout history, physicians, including Hippocrates (5th century BC), Aristotle (4th century BC) and much later Ernst Kretschmer (1888-1964), observed physique in relation to disease or temperament. The variations of physical types had different names for classifying physique, but essentially these classifications ranged from having either a slender (i.e. skinny), medium (i.e. muscular) or fleshy-body (i.e. fat) type. The belief was that individuals could be allocated into only one of these three categories.

Kretschmer was the first researcher and pioneer to make a scientific study of relating body phenotype (i.e. body shape) to psychoses or psychological profiles, such as manic depression and schizophrenia. He believed that, by studying the 'build of the body', he could identify the 'problems of its constitution' (Kretschmer 1936, p. 5). He resolved that body shape determined an individual's level of illness or psychoses.

Kretschmer identified 'manic depressive temperaments' as 'pyknic' types; they were considered 'circulars' or 'cycloids' because their physique was round and fat, with fatness distributed throughout the trunk of the body. He found that although the pyknic type (some of the) characteristics were 'good-natured, humorous, quiet and calm', they were more prone to depression, anxiety and feelings of inferiority. Additionally, they were susceptible to obesity, and diseases related to metabolism, diabetes, atherosclerosis and rheumatism, compared to their 'schizophrene' counterparts. Kretschmer observed that they (pyknics) were generally more likely to die of heart failure (Kretschmer 1936, pp.126-149). In today's terminology, the pyknic type might be equivalent to an obese individual.

The 'schizophrene temperament' was termed as 'asthenic' and 'athletic' type. The asthenic type individuals were generally linear with abnormal length to their limbs. Whereas, the athletic type had a strong, developed skeleton identifiable through the musculature of the body (Carter & Heath 1990). Kretschmer observed that the schizophrene temperament was more prone to contracting tuberculosis, but less susceptible to diabetes, atherosclerosis and rheumatism, and these individuals generally lived longer compared to those with a pyknic temperament. Kretschmer described the schizophrene temperament as having 'more depth' to their personality. Some of the characteristics he observed in individuals with the schizophrene temperament were 'reserved, sensitive and honest' (Kretschmer 1936p. 155). He also felt that it was more difficult to identify the (physically) healthy schizophrene from the diseased (p. 151), compared to the pyknic types. In today's terminology, the asthenic type might be related to a normal weight or even an overweight individual. Additionally, the athletic type might also be related to either a normal weight or an overweight individual.

However, William H Sheldon (1898-1977) was the first to recognise that individuals were a composite of all three types. Sheldon was a morphologist, psychologist, philosopher and medical doctor who first introduced the concept and term of somatotype rating as a method of classifying and describing individual physiques (Carter & Heath 1990). Sheldon's objective was to describe the human physique, using a three-dimensional (3D) system which would in turn aid in matching physique type to human temperaments (Carter & Heath 1990). Using nude photographs of bodies

standing upright in a standard pose, Sheldon developed a three-dimensional physique classification system based on subjective visual ratings (Olds et al. 2013). In line with Kretschmer's work, the pyknic type was equal to what Sheldon termed an 'endomorph', which is the degree or level of fatness on an individual. The asthenic type was termed an 'ectomorph' and is the degree of linearity, or how tall and skinny an individual is. The athletic type was termed a 'mesomorph', which is the degree of muscular robustness. Figure 1.4 is a flattened tetrahedron, 3D representation of somatotype ratings, and Figure 1.5 are images illustrating the somatotype categories.

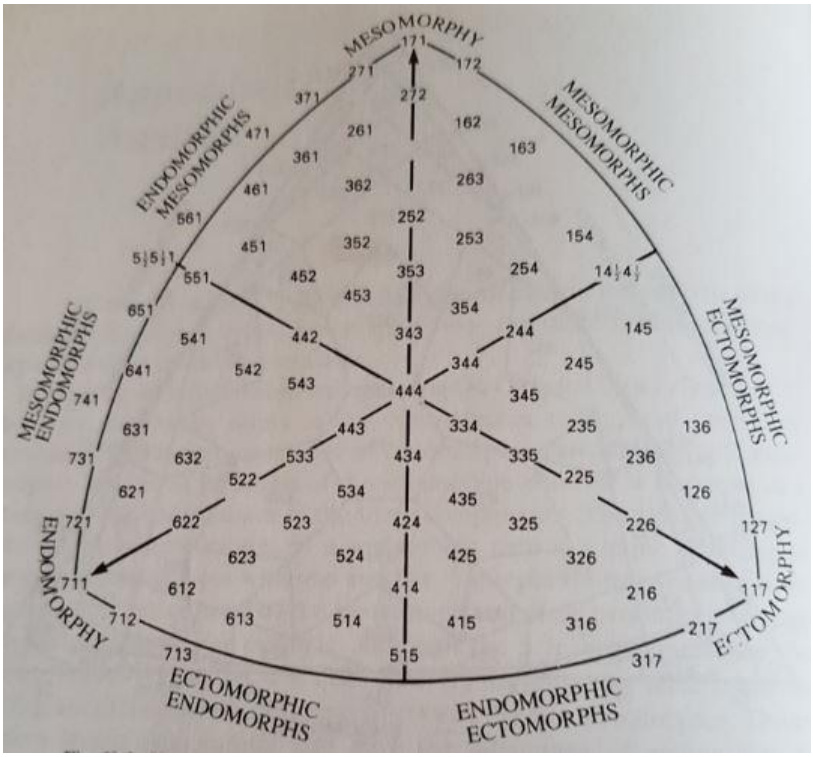

Figure 1.4 Example of a somatotype rating chart.
Adapted from Carter & Heath (1990), mesomorphy (muscular robustness), endomorphy (fatness) and ectomorphy (skinny and linear).

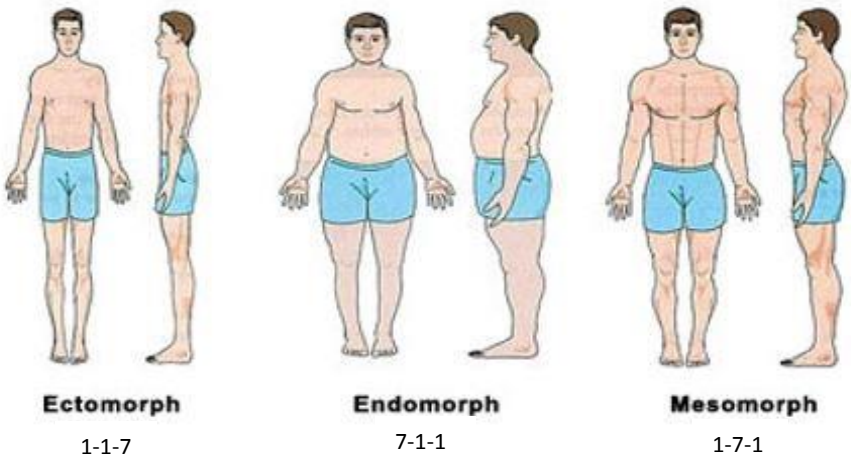

Figure 1.5 Somatotype categories.
Image adapted from Lowton Church of England High School (2018).

Sheldon believed that an individual's somatotype did not change during the course of her/his life; that it was predetermined, and the deposits or removal of fat did not change the somatotype (Carter & Heath 1990; Stewart 2012).

By 1966-67, Carter and Heath had modified Sheldon's methods for somatotype rating and used anthropometry in order to account for all ethnicities in both sexes, including age, as well as very muscular, athletic individuals, and for increasing levels of adiposity, to include individuals with obesity (Carter & Heath 1990).

Olds et al. (2013) endeavoured to describe body shape with an objective measure, and used 3D body scans to identify somatotype ratings of individuals with a range of BMIs from underweight to obese. They identified three different shape clusters in the male and female categories. The first cluster included men with high levels of adiposity which represented the endomorph somatotype (94% of these men had a BMI greater than 30 kg/m^2). The second cluster of men also displayed some degree of body fat, as well as a degree of muscularity, which represented a combination of endo-mesomorph (i.e. fatness and muscularity). Additionally, in this second cluster, 39% of these men had a BMI > 30 kg/m^2. The third cluster of men were identified as very thin, which represented the ectomorph (i.e. linear) somatotype, additionally, nearly all these men (94%) had a BMI < 20 kg/m^2.

In the female sample the first cluster of women had substantial adiposity, representing the endomorph somatotype. In this cluster, all women with obesity were classified as endomorphs,

and 91% of women who were overweight were also classified as having an endomorph somatotype. In their cluster 2 sample, women were relatively narrow, slim and muscular, representing an ecto-mesomorph somatotype (i.e. linearity and muscularity). Of this cluster 2 sample, 41% of the women had a BMI below 20 kg/m^2, and 62% had a BMI between 20 and 25 kg/m^2. The third cluster comprised women whose bodies had a slender build, which represented the ectomorph somatotype. Of these women, 59% had a BMI < 20 kg/m^2, and 19% had a BMI between 20 and 25 kg/m^2.

In essence, the study described above is another way of looking at body shape and adiposity, and possibly relating this back to health or disease. Specifically, other surrogates of fatness measures attempt to do this as well, such as the most commonly used BMI, waist circumference, waist-to-height (or stature) ratio, waist-to-hip ratio, and the sagittal abdominal diameter. All these different forms of measurements represent attempts at the best approximation to explain body shape, in terms of degree of adiposity, and susceptibility to diseases such as T2D, CVD, cancer, and other diseases related to obesity. To understand physique in relation to eating behaviour (and other types of dispositions such as body image, salutogenesis, physical and mental quality of life), is something which has not been done to date and this project will aim to address this.

1.9 Quality of life and obesity

The exact definition or meaning of 'quality of life' (QOL) is a matter of debate; it is not a well-defined term, nor does it have an agreed definition, (Evans 1997; Fayers & Machin 2000). There are hundreds of definitions and models as to what the term means (Cummins 1997; Pain et al. 1998) and the term QOL takes on different meanings depending on the context in which it is used by the researcher (i.e. in relation to health and/or a specific disease) (Ware 1998; Fayers & Machin 2000). The WHO expresses that "*Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (WHO 2018). Researchers have attempted to define quality of life linked to health according to the WHO definition (as originally defined in 1948), by emphasising components of satisfaction with life and happiness. QOL measurements were first introduced to understand medical and health care outcomes from the patients' point-of-view in order to monitor their quality of care (Manning, Newhouse & Ware 1982). It was a method for tracking changes in physical and total functioning over time; in order to improve the patient's overall health and quality of life, or predicting the course of a disease, or tracking the outcome of survival in the event of a given surgery (Ware 1998).

Researchers agree that QOL is a multifaceted concept, and inherently multi-dimensional (McHorney, Ware & Raczek 1993; Pain et al. 1998), encompassing all of life's scales, and incorporating both subjective and objective aspects including health, emotional wellbeing, intimacy, safety, material wellbeing, productivity and community (Ware 1998). Fayers & Machin (2000) expressed that it should include general health, physical symptoms and toxicity; physical, emotional, cognitive and sexual functioning, social wellbeing and existential issues. From a societal perspective, some objective aspects of QOL include parameters such as life expectancy, poverty, unemployment, crime, school, working hours etcetera. Whereas societal subjective aspects include sense of community, safety, happiness, job satisfaction, hobbies, sex life, relationships with family and 'life-as-a-whole' satisfaction (Rapley 2003).

The subjective measure of physical health or wellbeing concerns individuals' freedom from symptoms or sense of discomfort from symptoms that might possibly arise, and this extends to vitality or overall dis/satisfaction with their level of physical health (Muldoon et al. 1998). The subjective measure of mental health or wellbeing is generally interpreted as the absence of depression, anxiety, anger (i.e. psychological distress) and general positive affect, additionally, it can include the feeling of social support and emotional ties (Veit & Ware 1983).

Obesity has been known to have a profound, adverse effect on an individual's economic, physical and social aspects of life which can have a negative effect on their QOL (Yancy et al. 2002). This knowledge has become an increasingly important endpoint to clinicians and policymakers, in addition to those who suffer from the effects of obesity. As a result, studying QOL in this group has become important to assess as it may affect the results of weight loss interventions (Wee, Davis & Hamel 2008). Objective measures and aspects other than health can affect QOL, which can include discrimination in career advancement, or job security, or even entrance into university (Latner, Puhl & Stunkard 2012). Individuals with obesity are more prone to developing a poor self-image and can experience more difficulty in managing social interactions (Moore & Pi-Sunyer 2012). These challenges can create stress which may result in increased body weight and greater adiposity (WHO 2000). An association between obesity and anxiety, depression and other psychological dysphorias has been identified in some cross-sectional studies, which raises the question of whether depression is the result of obesity or if obesity is the result of depression (Moore & Pi-Sunyer 2012). Research has suggested that, as the level of obesity increases, individuals suffer from a lower health-related QOL. More specifically, as weight increases, physical functioning decreases and bodily pain increases. Individuals with a BMI between 25 to 30 kg/m^2

begin having difficulty with and experiencing bodily pain compared to their normal weight counterparts (Yancy et al. 2002).

Although increasing body weight may frequently impact the physical aspects of health-related QOL, it appears to not affect the mental aspects to the same degree (Doll, Petersen & Stewart-Brown 2000). Moreover, findings from clinical and epidemiology studies are not supportive of the idea that obese individuals suffer emotional disturbances any more than do their normal weight counterparts (Wadden & Stunkard 1987). Friedman & Brownell (1995) suggest that obesity may pre-dispose some individuals to psychological disturbances, but not necessarily all obese individuals will be affected: for individuals who may be susceptible to psychological distress, this distress may be a result of literature which consistently displays negative attitudes and cultural bias towards individuals with obesity.

1.10 Rationale for a multidimensional approach to obesity

The majority of studies carried out to investigate obesity and behavioural aspects related to it, have used unidimensional and siloed approaches. Most of the studies have used an epistemological approach which provides some understanding of what obesity entails but failed to approach the subject with an ontological view point. An ontological approach involves the understanding of the fundamental structure of what obesity is, and explore underlying factors which may not be empirically evident or observable. Moreover, because obesity is affected by a multitude of factors and has a complex aetiology, "*any attempt to link obesity to a single cause or a particular food without consideration of the complexity, is inherently simplistic and does not advance our scientific understanding*" (Fishbein 2001). Therefore, research on obesity should adopt a complexity approach in order to gain a holistic understanding of some of the conditions that exist for obesity to occur.

In order to study the complexity of obesity, the approach taken in this thesis in exploring some of the underlying conditions that might explain individual's phenotype and may be influenced by the obesogenic environment, is summarised in the diagram below (Figure 1.6) which is a simplified version of the Foresight's obesity systems map.

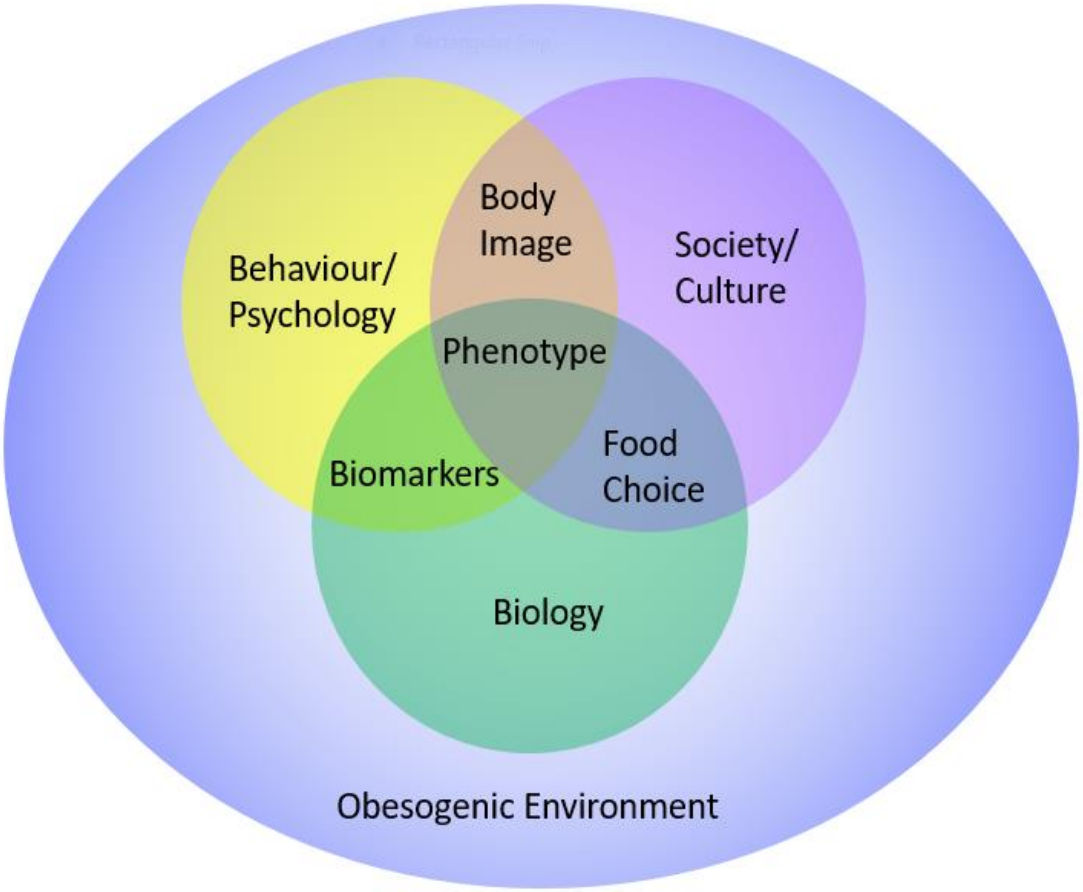

Figure 1.6 This study's interpretation of some of the causal factors (mechanisms) underlying obesity. The inter-relationships between and among some of the factors which affect the phenotypic expression and influence body weight, are not fixed constructs, but fluid and influencing each other.

1.11 Aims and objectives

Exploring individuals' attitudes and behaviour/disposition towards food and food practices is important as it may be possible to identify links with optimal health, disease and/or obesity, and/or identify individuals who might be more susceptible to an obesogenic environment: an individual who does not have a healthy relationship with food may be more susceptible to food cues in an obesogenic environment. Whereas, an individual with a healthy relationship with food may have better physical and mental health.

The overarching aim of this study is to gain a comprehensive and holistic understanding of how living in an obesogenic environment influences behavioural, social and biological aspects that may affect body weight and wellbeing, and how each of these individual factors may be linked.

This thesis focuses on exploring the relationship between individuals and the obesogenic environment: it investigates how individuals construct their day-to-day lives in terms of food, self-perception and their orientation towards life through studying their attitudes and behaviours in this environment. The researcher endeavours to understand the embodied experience of individuals through socio-cultural, psychological/behavioural and biological methods, and attempts to uncover, or understand why some individuals may be more susceptible than others to the obesogenic environment.

A new methodology for the study of obesity based on Bhaskar's Critical Realism *via* qualitative and quantitative multi-methods has been used: i) to understand and critically reflect on how participants comprehend the way in which their world is constructed in terms of how they shop and make food choices, how they see themselves in terms of body image and self-esteem, and their attitude towards life; ii) to contextualise this understanding through the individuals' lived and perceived experience of their socio-cultural, behavioural/psychological and biological profile.

The methodology, specifically critical realism, and methods used in this thesis are described in Chapter 2. Chapter 3 describes and discusses the main findings from the first part of the study, both in terms of BMI and then in light of findings that emerged from the participants' interviews, and highlighted a novel way to profile individuals attitudes and behaviours/dispositions (IDA profiles). Chapter 4 provides a summary of findings from the second part of the study, which involved a different group of participants with the aim to support and validate the IDA profile developed in the first part. Chapter 5 discusses the overall findings, including limitations and suggestions for future work.

Addressing obesity takes a combined effort from all sectors of society, and, in science, this includes a collusion between quantitative and qualitative methods, and the development of new methodologies, of which Critical Realism is one.

The outcome of this work is to gain a deeper understanding of the possible mechanisms and underlying semi-predictable patterns (demi-regularities) and the necessary conditions (transfactual conditions) for some of the relations and processes of how body weight status is linked to the environment in terms of the individual's predisposition and choices. This will help to understand better what obesity is and how it arises and aid to develop either better intervention strategies to and potentially change public health policies to recognise what signs (attitude/behaviour/disposition) might exist in children and younger adults that might make them susceptible to becoming obese.

Chapter 2 Methodology and Methods

2.1 Methodology

The Foresight map on obesity (Vandenbroeck, Goossens & Clemens 2007) is an example of displaying how obesity is a product of a number of forces and multiple components at play, interlinked and inter-dependent. If a population is undergoing a transformative change, as seen in the increasing prevalence of obesity, then making normative assumptions will not shed light (Given 2008) on the underlying causes of how obesity arises. By acknowledging the complexity of obesity; we can challenge simplistic assumptions such as the popular 'eat less move more'.

The common assumption that obesity can be tackled by eating less and moving more implies sole responsibility on the individual, suggesting this person is directly at fault; it takes no accounting of the external or internal (i.e. genetic, psychological) environment of the individual. Furthermore, it implies that an empirical solution of sequential actions is all that is necessary to reduce obesity prevalence. This overly simple approach to understanding obesity completely misses the deeper and wider influences affecting those with obesity. In fact, it is widely recognised that there exists a complex range of mechanisms which contribute to obesity, and many of which are not in a person's control (Thibodeau, Perko & Flusberg 2015).

Moreover, the 'eat less move more' statement further implies simplicity, but as Clark et al. (2012) explains when describing the differences between simple, complicated and complex problems; complexity contrasts with what is simple or complicated. In other words, a simple problem connotes, if one uses a recipe-like approach, then a successful outcome is almost certain. The 'eat less, move more' attitude is an example of what is believed to constitute a simple problem because it implies that losing weight is simple.

To contrast the difference between complicated and complex problems, it will help to first describe what is meant by a complicated problem. In order to understand and solve a complicated problem, it requires harnessing expertise, knowledge and experience, and then, with the use of formula/e and procedure, success is fairly certain. This approach is often used in science, where researchers believe they understand what constitutes the problem but then often do not get the expected outcome (Clark & Thompson 2010). Clark et al. (2012) explains that complicated approaches to solving social problems and social issues continue to prove inadequate, as what is really underlying the problem is complex.

Complexity connotes that there are many factors interacting and every situation is unique. Complex problems are constantly in flux and are fluid; the use of formulae has limited applications, regardless of the length of the formula. In relation to obesity, its' aetiology is complex because we all live in the same environment and yet some individuals are more susceptible to becoming obese than others. Studying complex issues, such as obesity, requires getting beyond what is readily measurable and observable, (i.e. normative measures) (Clark et al. 2012), and researchers need to look beyond the superficial and look deeper, in order to understand its complex aetiology and/or pre-conditions to aid in attenuating its prevalence.

To understand obesity, the first question to be asked is related to ontology: what must the world be like in order for obesity to occur? Additionally, what must exist for obesity to be possible? Ontology is essential to how researchers understand what they are looking at, how they see reality. Ontology is concerned with what is; it bids us to take into account the nature of social phenomena. Additionally, it is the assumptions made about the nature of social phenomena, and, in turn, these assumptions can influence the research process (Bryman 2012). What is therefore needed to answer the above questions and gain more insight into the complexity of obesity is both a methodology and methods which allow for the exploration of the complexity of obesity. In addition, the integration of different research methods with their different epistemologies is required, in order to understand the complex pathways by which obesity may arise. As Crotty (2005) notes, "*every piece of research is unique and calls for a unique methodology, we as the researcher, have to develop it*" (Crotty 2005, p. 13-14). Moreover, Johnson & Onwuegbuzie (2004) state "*choose the combination or mixture of methods and procedures that works best for answering your research questions*" (p. 17).

One scientific theory on its own cannot lay claim or give an exhaustive explanation for any given phenomena. Complex phenomena are better understood and explained through using different approaches and different theoretical perspectives (Danermark et al. 2002, p. 59-65). Additionally, because obesity is not caused by one single mechanism or event, this makes it an emergent property: many underlying properties exist that interact and give rise to obesity. Therefore, in the pursuit to seek answers related to the complexity of how obesity might arise, and to discover what the world must be like for obesity to occur, it is crucial that the underpinning methodology embraces both qualitative and quantitative epistemologies. In order to answer this complex research question, different modes of analysis are necessary; and, a new and innovative methodology is required to draw out this information. Thus, a methodology, which embraces complexity, allows for the merging of concepts and complex ideas, and provides an overall meta-

methodology for this study is the most appropriate and Roy Bhaskar's 'Critical Realism' is a possibility.

2.1.1 Critical Realism

Critical realism, also called complex realism, (CR) aids in the understanding of complex outcomes and researching bio-psychosocial pathways: it recognises that nature is complex (Clark & Lissel 2008; Given 2008). CR offers new ways of seeing, understanding and wondering; it is the wonder of 'why' (Clark et al. 2012). The question "Why" is important because it allows the researcher to ask, 'Why does obesity occur?' CR arose from a need to gain better understanding of complex concepts in research, the objective is to harness the strengths and address the weaknesses of other approaches in science, such as positivism, relativism and idealism. CR seeks middle ground, acknowledging that not everything has universal order (positivistic stance), nor is the world chaotic and unknowable. Additionally, it does not "*place objective truth value on the perspectives of human beings or remove the influence and importance of human perspectives*" (Clark & Lissel 2008, p. E68). A critical realist in social sciences treats the physical objects and processes as being no more important than an individual's beliefs, intentions, feelings or concepts: ideas and meanings are equally important. These two aspects of reality are not separate realms or inherently independent but are mutually influencing each other. Furthermore, critical realists believe that individuals in society attach meanings to things and there are real world consequences as a result of their beliefs (Maxwell 2012, p. vii-viii).

In the introduction to this thesis, different ways in which obesity has been researched, have been reported and the majority of studies, were carried out in a positivistic, closed system manner. Specifically, these forms of unidimensional research have shortcomings because they attempt to reduce their empirical findings as the cause of obesity, the positivistic approach applied does not recognise or acknowledge that there are or can be underlying causal or generative mechanisms generating forces which may be interacting with other forces that then give rise to obesity (Collier 1994, p. 104; Danermark et al. 2002, p. 153).

For an accurate representation of any phenomena, no one theory or position can claim to be a complete account, according to the constructivist epistemology of CR. "*Scientists should view every theory from both the 'believing' and 'doubting' perspectives*" (cited by Maxwell 2012, p. ix cf Elbow 1986), the insights and advantages of different methodologies and methods should be

considered as well as their blind spots and distortions (cited by Maxwell 2012, p. ix, cf. Maxwell 2010a). Most methodologies (i.e. positivism and interpretivism) are not compatible with other methodologies and thus do not subscribe to the use of research methods that do not pertain to its methodology. However, CR advocates the use of the various research methods with the objective being that the choice in methods depends on the nature of the object of study and what the researcher wants to learn about it (Sayer 2000, p. 19).

In any research, whether or not the investigator is aware, there is a strong presence of ontology (Bryman 2012). The basic principles of CR are ontological in nature. Ontology shapes not only which methods to use but "*also the questions that the research should and can ask*", (Clark et al. 2012), such as why obesity occurs in the first place. In discussing healthcare interventions and their complexity, Clark et al. (2012) state that these interventions should go ahead and measure outcomes by using appropriate methods, but what it is missing are the ontologies that adequately reflect complexity (p. 2). CR recognises that there is an independent reality from human perception, that is, regardless of humans' understanding or knowledge, social and physical entities have an independent reality. CR incorporates human experiences and meanings, and it recognises that these experiences and meanings can affect individual behaviour and sometimes influence wider social structures (Clark & Lissel 2008). CR does not subscribe to any one method, for conducting social science research, but instead, it lays down guidelines and starting points for the evaluation of already established methods (Danermark et al. 2002, p. 73). Thus, in understanding obesity, the use of one research method should not be expected to disclose the complexity and everything there is to know about obesity.

CR offers guidelines for conducting research which are justified by three fundamental methodological arguments: (as laid out by Danermark et al. 2002, p. 73-74):

1. "*All science should have generalising claims. Methods for acquiring knowledge of the general and for examining the validity of generalisations are fundamental for all social science research. Generalising may, however, mean different things*."

2. Essential for scientific methods are various modes of evaluation and inference. For analysis and inference of the causal mechanisms (also called generative mechanisms) and their demi-regularities. CR uses not only the modes of induction and deduction, but also abduction and retroduction. The concept of inference in the case of induction and deduction uses formal logic. In the case of abduction and retroduction, inferences are made through 'thought operations', i.e. "*different ways of reasoning and thinking in order to proceed from something to something else*" (Cited by Danermark et al. 2002, p. 73- Habermas 1972: 113).

3. To explain events and processes is the overall aim in social science. From a critical realist's perspective explaining something implies, firstly describing and conceptualising what generates and enables an event to occur, what are its properties and causal mechanisms; secondly, it

involves describing how different mechanisms may manifest themselves under specific conditions. Using a methodological approach based on abduction and retroduction is the type of analysis required for such an investigative approach.

The first approach in carrying out social science research from a critical realist's perspective, is to understand that reality is stratified into having three domains; the 'real', the 'actual' and the 'empirical' (Danermark et al. 2002). It is the stratification which allows for research to develop deeper levels of explanation and understanding (Parpio et al. 2013, p. 491). Because reality is stratified, this suggests the use of methodological pluralism. Methodological pluralism implies the use of more than one methodology and method which further implies there is no right or wrong way of looking at the world. Research should not be beholden to any one way of investigating, or any one epistemology (Lawson 1999; Mingers 2001; Mingers 2002). Figure 2.1 shows a critical realist's perspective on reality stratified into these three domains, the next section explains each of these domains.

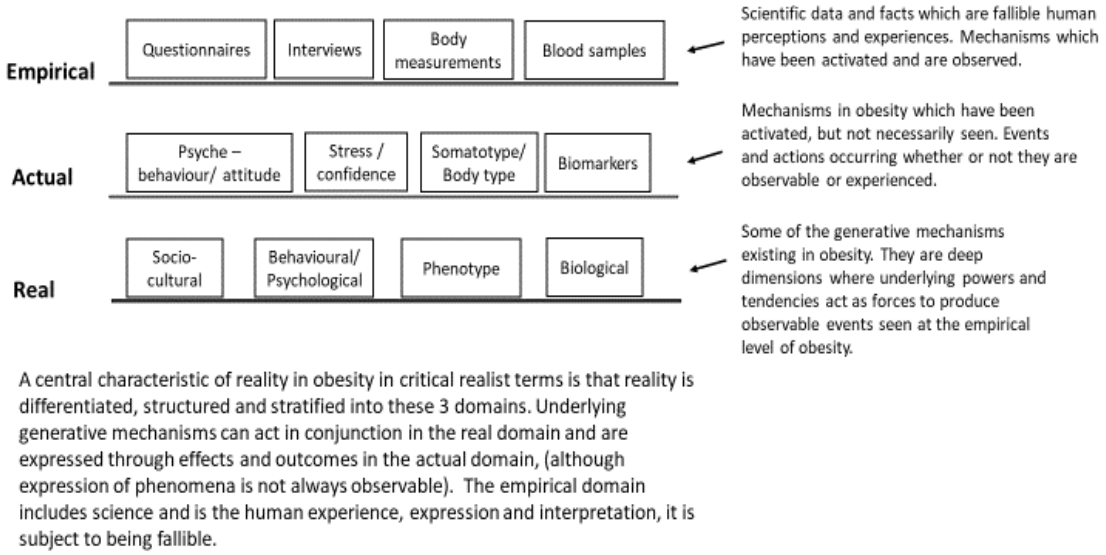

Figure 2.1 Reality stratified into three domains from a critical realist perspective.
This diagram is adapted from Danermark et al. (2002); Fletcher (2017) and Gorski (2013) to reflect what was studied in this research.

2.1.1.1 Stratified Reality

Beginning from the lowest level: the real domain is described as the level where underlying phenomena, or influences of structures, powers and tendencies, also termed as 'causal or generative mechanisms' give rise to those events and actions that have the potential to be observed in the actual domain. The phenomena (i.e. tendencies and/or generative mechanisms) that underlie the real domain do not always need to be expressed or exercised, and thus will not always be observable in the actual domain. Events and actions that are observable or experienced exist in the actual domain (the level above the real domain); however, these events may not always be observable (Fletcher 2017). Tendencies or mechanisms may be expressed under some circumstances, but not others (Williams & May 1996, p. 87). Additionally, mechanisms may not always appear because counteractive mechanisms may be involved, or the mechanism may be inactive. Real life mechanisms however, are not unsystematic or random (Danermark et al. 2002, p. 166). According to Lawson (1997, p. 204, cited by Danermark et al. 2002, p. 166) over a period of time, certain mechanisms may become more dominant than others and/or shine through, it is these mechanisms which give rise to demi-regularities (i.e. partial generalities or semi-predictable patterns, discussed in section 2.1.1.3).

Observing and detecting patterns requires looking at a situation or a problem not only in light of current understandings but using creativity by looking at it from different angles, at varying levels of generality to the more specific. In other words, to understand and explain mechanisms and their demi-regularities, it is helpful to form a general explanation to the more specific explanation (Lawson 1997, p. 165). The empirical domain, which sits above the actual domain, is the location of human interpretation, experiences and perceptions of the real and actual domains. Each domain is prone to fallibility. An individual's experience and/or inference is not always necessarily an accurate account of the truth, and this would include science: researchers continue to revise knowledge and what is known (Clark & Lissel 2008). Our knowledge about the world and people in it is never complete or infallible but is always partial and subject to revision (Maxwell 2012, p. vii); additionally, knowledge and theories may always be transcended by new theories (Danermark et al. 2002, p. 65). Moreover, it is the responsibility of the researcher to be aware of the assumptions and limitations of her/his research (Mingers 2002).

2.1.1.2 Causal Mechanisms - Open and Closed systems

Causal or generative mechanisms are deemed as tendencies which can be modified, suppressed or reinforced "*in a complex interaction with other mechanisms in an open system*" (Danermark et al. p. 163). Mechanisms are processes or tendencies that render an observable outcome, and in the natural sciences these observations are made at the empirical level (Danemark et al. p. 66). "*The actual outcome of a tendency will generally be co-determined by the activity of other mechanisms*" (Bhaskar 1989, cited by Williams & May 1996, p. 87).

To understand what an open system is, it is best to define what comprises a closed system. Closed systems are artificially established and where mechanisms operate in isolation (Bhaskar 2008, p. 118). In a closed system "*mechanisms may exist and operate*" where 'constant-conjunctions' of event sequences occur (Benton 1998, p. 300) and can therefore, be measured. In closed systems, event regularities provide causality and analysis is easily derived, or potentially easier to derive, i.e. for every event or set of events of *x* there is an event of *y* or set of events of *y*, which are regularly connected under some set of descriptions (Bhaskar 2008, p. 69; Fleetwood 2013). An open system necessarily implies a stratified reality (Danermark et al. 2002, p. 67), because a single, underlying mechanism cannot possibly explain why a complex event has occurred. An open system comprises the outcomes of the operation of multiple mechanisms, such that constant connections are occurring, and cannot be isolated (Benton 1998, p. 300). More specifically, there are no event regularities in open systems (Fleetwood 2013). What causes an event to "happen" in an open system is usually difficult to determine (William & May 1996, p 83). An example would be: observing which foods individuals place in their shopping trolley would not necessarily imply they eat what they buy, or that is the only place from where they obtain their food.

Most natural scientists study reality in an objectivist manner, in closed systems. Observed outcomes are caused by singular events "*from which generalisations are built up via induction*" (Williams and May 1996, p. 83). There is nothing wrong with this manner of investigation, this allows scientists to record patterns and events, but it must be remembered that the system is artificially constructed and closed for such exploration of science and nature to be possible in the first place (Bhaskar 2008, p.126). Moreover, most scientists approach their work with the ontological position that there is a single reality and that they have no influence on the outcome of what results from the experiment or the intervention. The researcher then uses either deductive (i.e. derives logically valid conclusions from given premises) or inductive logic (i.e. from a number of observations, universally valid conclusions are drawn; see Appendix 1) (Danermark et al. 2002) to analyse and describe the results. However, in discussing healthcare interventions,

Clark et al. (2012, p. 2) explains that outcomes alone do not tell a story; explanations of how the outcomes were generated is lacking. Improvements will only occur once we understand what has contributed to past outcomes. Furthermore, the absence of explanation in research interventions reduces the ability of research to improve outcomes, hence, explanation matters. In order to identify which components (mechanisms) have more influence on outcomes and why in healthcare interventions, more research and theory are needed (i.e. it enables explanation or understanding as to why or why not an intervention worked). Lewin et al. (2009, cited by Clark et al. 2012) stated that outcomes should be measured, and, studies should incorporate different quantitative and qualitative techniques to help explain their outcomes.

2.1.1.3 Demi-regularities

Beneath the surface of the real domain, it is possible to discover tendencies, partial or semi-predictable patterns of mechanisms, or what Bhaskar termed as 'demi-regularities'. It is not possible to investigate all the components/mechanisms in one study that comprise a complex problem (Danermark et al. 2002, p. 110). However, an example of a critical realist's approach to abstracting [i.e. breaking down, or a means of isolating the various possible mechanisms or each constituent part which make up the event or phenomenon (Danermark et al. 2002, pp. 42-43)] obesity into just a number of its component parts or what Bhaskar terms as causal mechanisms, is presented in Figure 2.2. Each mechanism has a valid claim about reality and therefore each has its own methodology and method pertaining to it. However, the individual study of each mechanism (i.e. using one methodology and method) is insufficient in capturing the totality of how obesity might arise. Thus, as shown in Figure 2.2, different levels are abstracted into generative mechanisms and each has its own level of analysis. After examination of each abstracted mechanism, and its individual analysis, it is then possible to integrate them and present a holistic view, with a higher level of understanding of each of the mechanisms (Danermark et al. 2002, p. 52) underlying obesity, thus leading to the total being greater than the sum of its parts. Using Bhaskar's work (2008) on critical realism allows for the exploration, integration and explanation required to study and understand the complex processes of how obesity might arise.

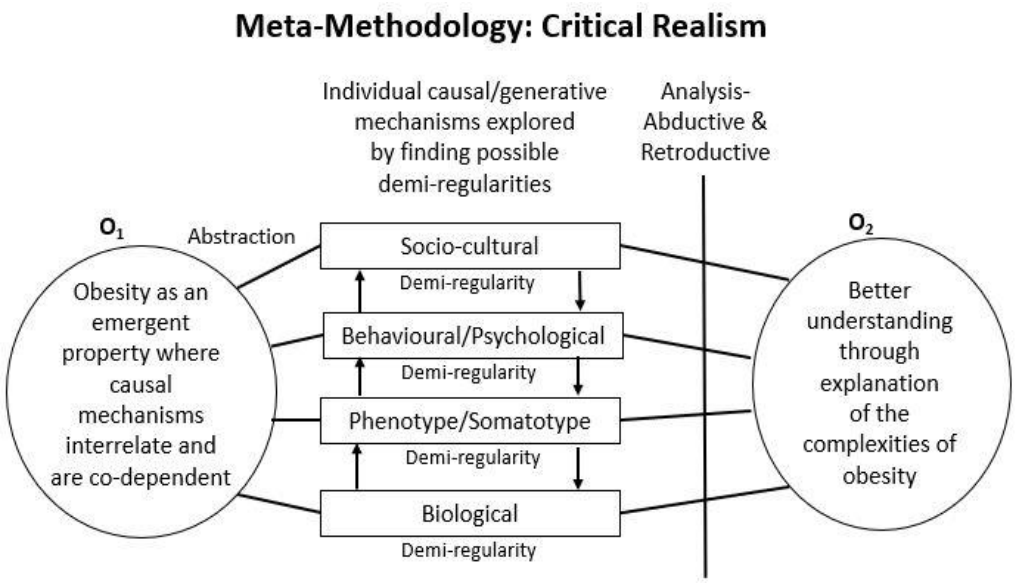

Figure 2.2 Critical realist's approach to breaking down obesity into its component parts.
Abstracting obesity into just a number of its complex causal or generative mechanistic parts. Diagram based on and related to Figure 2.1.

Bhaskar (1998) argued that to have observable events, underlying processes, structures and powers must act in conjunction under certain circumstances in order for experiments to be possible. Danermark et al. (2002, p. 55) explained that an observable event occurs when underlying processes (also known as generative mechanisms) are triggered. What causes the generative mechanism to be triggered is dependent upon the right circumstances and conditions. These generative mechanisms are not always operating; therefore, the event is not always observed.

In relation to this study, an example of a condition or situation where obesity would be less observable would be where a society would be under strain of famine. The generative mechanisms leading to obesity can still reside in a culture or the environment, but the circumstance of famine would reduce the prevalence of it. Alternatively, for obesity to occur, certain underlying processes, structures and powers must act in conjunction and under the right circumstances for obesity to be observed, hence in the case of famine (which is an example of a

transfactual condition) the mechanisms and their demi-regularities can still be present (i.e. behaviour, phenotype, biological), but not expressed, and therefore less likely to be observed because of the lack of food. As an example, the behavioural mechanism, by removing food from the equation does not remove the demi-regularity, such as emotions, boredom, stress, low self-esteem, which are examples of some of the reasons why some individuals will eat.

Obesity does not occur in a closed system, it occurs in an open system where very few, if any variables can be controlled. CR acknowledges that the fundamental task of research is to reveal the causal mechanisms of social phenomena (Danermark et al. 2002). In the case of this current study, it is the understanding of the causal mechanisms, the demi-regularities and the transfactual conditions which lead to obesity. CR recognises the social aspect of humans and science; it acknowledges the possibility of science to the extent that neither falls prey to problematic versions of positivism or relativism (Clark & Lissel 2008).

2.1.1.4 CR primary modes of analysis - Abduction and Retroduction

As explained by Danermark et al. (2002), the four modes of inference (i.e. deduction, induction, abduction and retroduction) used in analysing collected data are all considered as complementary in CR research practice. Therefore, the use of these four modes of analysis in conjunction with each other can aid in answering the research question. Each of these modes represents different ways of thinking; as well as different ways of moving from one thing to something else. The two modes which use 'formal' logic are deduction and induction. 'Formal' entails following the logical form of inference to arrive at a conclusion: the researcher must have the ability for logical arguments and reasoning. Formal logic is used to a certain degree in critical realist research, but abduction and retroduction are the primary modes of analysis for a critical realist researcher. Abduction and retroduction are mainly concerned with more comprehensive ways of reasoning and arguing and relating the individual to the universal or general rule *via* a process of 'thought operations', here the researcher uses imagination and creativity as methods for understanding complex problems (Danermark et al. 2002, p. 79 & p88). A table of the four modes of analysis can be found in Appendix 1.

2.1.1.4.1 Abduction

Abductive analysis does not observe structural conditions directly, instead it explores the internal relations and mechanisms which create social cohesion: examples include, rituals and symbolic meanings. Developing concepts and theories are required to gain understanding and knowledge about events which cannot be directly observed. The concept of abductive analysis is difficult to capture because on one hand it uses a kind of formal logic similar to that of deductive and inductive logic (Danermark et al. 2002, p.89). On the other hand, abduction (like retroduction) requires a perception of observation of what the researcher is investigating. Both abduction and retroduction are a way of thinking, reasoning and arguing in a broader sense (Habermas 1972, p. 113; cited by Danermark et al. 2002, p. 89). Abduction and retroduction involves an acceptance of the idea that the researcher is looking not for certainties but for understanding or partial similarities (that is the demi-regularities and/or transfactual conditions) (Willis & Jost 2007, p. 215). Abductive analysis is useful for discovering new things, new variables and the relationship between these variables. Moreover, abduction is used to explore the inter-relations between 'everyday language and concepts' (Dubois & Gadde 2002, p. 559).

Abduction is built upon creativity and imagination, and the ability to form associations. It requires that for researchers to better understand the phenomena, they should employ a creative reasoning process in order to discern connections and relations that are not apparent or obvious. For the phenomena being explored, new ideas should be formulated about the different ways in which mechanisms are inter-related and interconnected, to consider it in a different context (Danermark et al. 2002, p. 93), to see the phenomena in a different light. Danermark et al. explain abduction in this way: "*Science involves, not only describing the phenomena, but redescribing it in a way that is not given to our 'habitual way of perceiving' by using connections and detection of meanings. Theories and models, which express assumptions about 'more general contexts, are indispensable resources' in describing and recontextualising*" (p. 94).

Uggla (1994, p. 400) explains (as cited and translated by Danermark et al. (2002, p. 94):

"*For the use of models in science are not motivated by the ability of these models to empirically describe a pure reality. The strength of scientific models lies instead in their ability to break away from a descriptive discourse and provide a possibility to see 'something' as 'something else'. Since the purpose of using models in science is to explore reality by establishing new relations in it, the scientific model has a heuristic function in producing new hypotheses and so discovers new dimensions of reality*".

Habermas (1972) explains that abduction is a mode of inference which broadens our knowledge and stimulates the research process because new ideas are introduced through thought operations. Additionally, these thought operations are more important for scientific progress than is deduction. Specifically, because the use of deduction tells us nothing new about reality; its inference is logically valid, i.e. from premise to conclusion. However, abductive logic does not lead to definite truths; it is more a way to view the relationship between reality and science. It implies there are no ultimately true theories, but there are no rules either for deciding what the ultimate truth is. Furthermore, the use of redescribing the phenomena provides deeper knowledge about the phenomena. By redescribing phenomena, researchers can gradually test, modify and ground theories about the general contexts and structures of the phenomena, when relating these theories to new cases: theory not only provides deeper knowledge about the phenomena, but theory aids the researcher in understanding events such as symbolic meaning and rituals by detecting relations and mechanisms in these situations, which the researcher would not have otherwise known or discovered (Danermark et al. 2002 pp. 94-95).

Furthermore, through abductive analysis, the original framework and understanding of the phenomena can be successively modified. Modification occurs in part because of unexpected empirical findings, and because of theoretical insights which are gained during the research process. This approach creates new combinations and ideas through a mixture of combining what is already known about the phenomena and new concepts derived through abductive analysis (Dubois & Gadde 2002, p. 559).

2.1.1.4.2 Retroduction

Abduction allows for the introduction of new ideas about the structure and internal relations occurring in phenomena. Its central element uses redescription and recontextualisation in order to understand individual phenomena (Danermark et al. 2002). Retroduction is a form of analysis which tries to identify the generative mechanisms (Belfrage & Hauf 2017): the deeper dimensions of reality which are not directly observable (Danermark et al. 2002, p. 36). Retroduction is styled as a mode of inference by which we try to arrive at what is basically characteristic and fundamental of these structures. More specifically, by asking, what the basic characteristics of the general structures from which we start are, in abduction, we interpret and recontextualise particular actions and events. However, it is possible to explain observable phenomena by moving

backwards and asking the question: "*What must be true in order to make this event possible?*" (Easton 2009).

In order to describe the specific character of retroduction, it is helpful to clarify what it is not. Retroduction does not use formal logic. Formal logic being defined as a logically valid inference made from premise to conclusion. Retroduction is similar to abduction in that thought operations are employed enabling the researcher to "*move from knowledge of one thing to knowledge of something else*": it is a mode of inference whereby the researcher tries to arrive at what the basic characteristics and constitutive structures are, that were found during the abductive analysis (Danermark et al. 2002, p. 96). Sayer (1992) explains retroduction as a "*mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them*" (p. 107).

Social reality comprises internally related objects and structures consisting of causally operating properties that are not necessarily readily observable. Only by going beyond what is readily observable can we acquire knowledge of social reality. We do this by asking more fundamental questions and developing concepts of what underlying necessary conditions may be at play (or at work) for the event or phenomena under study. These necessary conditions also known as 'transfactual conditions' can and do work independently of any observable outcome, in other words, these transfactual conditions by themselves will not necessarily result in the event or the phenomena observed. Retroduction is about moving from the readily observable and reconstructing something new from exploring or looking for patterns in, among and between these transfactual conditions and reconceptualising the event or phenomena (Danermark et al. 2002, p.57, 96 & 208).

The basic element of retroduction is referred to as 'transcendental argumentation'. What is meant by argumentation is the researcher seeks clarification of the basic prerequisites or transfactual conditions for individuals' actions, social relationships, reasoning and knowledge. Within the basic elements of retroduction, the term 'transfactual conditions' is intended to convey the necessary conditions that must exist, because without these conditions the phenomena cannot exist (Danermark et al. 2002, p. 96). Alternatively, a transfactual condition can take something that exists fundamentally (ex. obesity) and relate it to something possible, in order to explain why the phenomena exists (Collier 1994, p.20). This is also referred to as 'transfactual argumentation', the argument is, that it is necessary to go beyond the empirical or readily observable to identify the transfactual conditions. Explained in another way, critical realists regard objects in social science as relational; that is, social and cultural phenomena are

what they are as a result of the internal relations they have to other phenomena. By taking this argument as the starting point for this current study, retroduction becomes a matter of trying to attain knowledge about what internal relations make obesity what it is. Through using retroductive analysis, the researcher can theorise about what basic conditions must be like for obesity to exist, by looking at the relations among, mechanisms and their demi-regularities and what societal or cultural (the transfactual) conditions must be for obesity to be what it is (Danermark et al. 2002, p. 100). That is, retroduction involves thought operations that reconstruct what necessary conditions must be like for the phenomena to exist, and it is through reasoning where we can obtain this knowledge and understand what properties are required for phenomena to exist. Therefore, transcendental argumentation is a form of retroduction where one seeks to understand transfactual conditions, and to go beyond what is immediately given or observable (i.e. go beyond the empirical) (Danermark et al. 2002, p. 206). This also implies an understanding of what the phenomena (obesity) is not.

Critical realism emphasises that deductive and inductive logic can and should be used in analyses of all scientific arguments, however the central modes of inference which constitute critical realism are abductive and retroductive analyses (Danermark et al. 2002, p. 106). These modes of inference allow for a richer and deeper understanding of the phenomenon under study, and aids in answering the research question.

There are five strategies a critical realist researcher can use for guidance when using retroductive analysis. They are: social experiments, counterfactual thinking, studies of extreme cases, studies of pathological circumstances and comparative case studies. These strategies have aided social scientists in producing broad and well-founded knowledge of mechanisms and social structures. Of these five strategies, the one most relevant for this current study is that of comparative case studies (for this current research a case study is each semi-structured interview). The aim in comparative case studies is to describe the fundamental conditions for X (obesity) to be what it is. The researcher uses a number of cases which are believed to manifest the condition/structure she wishes to describe, but each of the cases is different in other aspects. The researcher then develops a theory about the underlying structures of the condition. A question asked by the researcher during the process of generating theories, is ‘what qualities there must be for X (obesity) to be what it is?’ By comparing the cases with each other and finding where the similarities and differences lie, the researcher can infer the different qualities and structures involved for X (obesity) to be what it is. These “*comparisons provide an empirical foundation for*

retroduction, a foundation to sort out contingent differences in order to arrive at the common and more universal" (Danermark et al. 2002, p. 105).

2.1.1.5 CR Exploratory model guidelines

The critical realist 'explanatory model' for conducting research gives guidelines for how the researcher can relate research practice of the concrete to the abstract and the abstract to the concrete. Furthermore, the critical realist explanatory model approach rests on the supposition that the fundamental structures of explanatory social science can be explained as a movement from the concrete to the abstract and vice versa (Danermark et al. 2002, p. 109).

Table 2.1 below, is a critical realist explanatory model guideline which contains six different stages. The right side of the column in Table 2.1 shows how these guidelines are applied in this research. This explanatory model guideline is not a template, and therefore, it is used to guide the researcher in how to investigate the possible generative mechanisms, demi-regularities and transfactual conditions which may or may not occur for obesity to exist. Not all research processes are constructed in the same way, therefore each stage is meant as a guide only; to be mixed and intertwined as needed. Guideline was adapted from Danermark et al. (2002, pp. 109-111).

Table 2.1 Critical realist explanatory model guidelines for conducting research.
Adapted from Danermark et al. (2002, pp. 109-111).

	How each stage was applied in this research:
Stage 1: Description An explanatory social science analysis usually starts in the concrete. Researchers begin by describing the complex event/situation they wish to study. Everyday concepts are used to describe the elements that make the event/situation what it is. Here, it is important to use the interpretations of the individuals involved and their way of describing the event/situation. Both qualitative and quantitative methods should be used to describe the event.	**Stage 1:** Questionnaires and semi-structured interviews, and anthropometric measurements and blood samples to investigate the biological, are used to understand the individual.
Stage 2: Analytical resolution In this phase, the complex and composite elements are separated or dissolved by distinguishing the different aspects/dimensions or various components. The concept of scientific analysis implies that analysis is equal to a separating or dissolving examination. It behoves the researcher to confine her/his study of investigation (of the complex event/situation; obesity) to only certain components and not others, because it is not possible to study everything in all its different components.	**Stage 2:** IDA profiling is used to understand how individuals are different, and/or how they can be grouped.
Stage 3: Abduction/theoretical redescription The various components/aspects of the event/situation are redescribed using hypothetical conceptual frameworks, as well as using theories about the different structures and relations that could potentially make the event/situation what it is: at this stage, original ideas are developed by placing the object of study (i.e. obesity) in a new light or a new context. Several different theoretical interpretations and explanations can and should be presented, compared and possibly integrated with one another.	**Stage 3:** Abductive analysis is used in analysing the semi-structured interviews to understand how individuals are similar or different, i.e. finding patterns or similarities.
Stage 4: Retroduction In order to answer questions such as: What is fundamentally constitutive for the structures and relations of obesity? Or how is obesity possible? What properties must exist for obesity to be what obesity is? And what causal mechanisms are related to obesity? All the different methodological strategies (described above) should be used. Many established concepts are already present in research that the researcher has access to, to provide satisfactory answers. It is this stage (and stage 3) where obesity can be reconceptualised to aid in our understanding of obesity.	**Stage 4:** Retroductive analysis is used in analysing the semi-structured interviews to gain insight from the participant's perspective of her/his world, and then combined or separated according to what patterns emerge to understand how individuals are similar or different.

Stage 5: Comparison between different theories and abstractions "*In this stage one elaborates and estimates the relative explanatory power of the mechanisms and structures which have been described by means of abduction and retroduction within the frame of stages 3 and 4. (This stage can also be described as part of stage 4). In some cases, one might conclude that one theory – unlike competitive theories –describes the necessary conditions for what is to be explained, and therefore has greater explanatory power. In other cases, the theories are rather complementary, as they focus on partly different but nevertheless necessary conditions*." ***Stage 6: Concretisation and contextualisation*** "*Concretisation involves examining how different structures and mechanisms manifest themselves in concrete situations. Here one stresses the importance of studying the manner in which mechanisms interact with other mechanisms at different levels, under specific conditions. The aim of these studies is twofold: first, to interpret the meanings of these mechanisms as they come into view in a certain context; second, to contribute to explanations of concrete events and processes. In these explanations it is essential to distinguish between the more structural conditions and the accidental circumstances. This stage of the research process is of particular importance in applied science*.".	**Stage 5:** Merging the results of the qualitative and quantitative data, i.e. semi-structured interviews, questionnaires, anthropometric measurements, and blood biomarkers will help to gain an understanding of what the demi-regularities are for obesity to occur. The result should render a better/broader understanding and explanation of how obesity occurs. **Stage 6:** More research, based on the findings from this study, may be needed to answer concrete questions about the specifics of a specific condition that must occur or exist for obesity to be what it is, specifically, this research cannot have concrete evidence because mechanisms such as genetics or upbringing have not been investigated. Specifically, further research is needed on other mechanisms to integrate with this study to have concrete evidence of why obesity exists.

2.2 Methods

In order to best capture and understand the underlying generative mechanisms for how obesity might arise, and to help in answering the ontological question of what the world, (or what reality) must be like for obesity to occur (or exist), it is important to draw on methods from both qualitative and quantitative research. This section discusses the qualitative use of semi-structured interviews and quantitative measures obtained from administering questionnaires to the participants, collecting anthropometric measures and analysing blood samples, to create a broader picture and better understanding of how obesity can arise. The rationale in using both methods is to find complementarity between both approaches: this work is not a mixed methods research project, but rather (and as stated above), a critical realist's investigation of how it is possible for obesity to occur, using multiple methods.

2.2.1 Ethics

This project was reviewed and approved by Robert Gordon's University ethics committee as a continuation of a previous project (MacRobert Trust project) which involved taking body measurements, scans, conducting semi-structured interviews, and collecting blood samples. An amendment was submitted to include questionnaires and approval granted. See Appendix 2 for information sheet and Appendix 3 for consent form.

2.2.2 Semi-structured interviews

To identify each of the underlying generative mechanisms, it is helpful to refer to the previously presented diagram, which outlined a critical realist's approach to abstracting obesity into a number of complex parts. Figure 2.3 is used as a text navigator to relate back to each generative mechanism, (highlighted with a dark background and white font, for each relevant section), and each section discusses the method used to explore that mechanism.

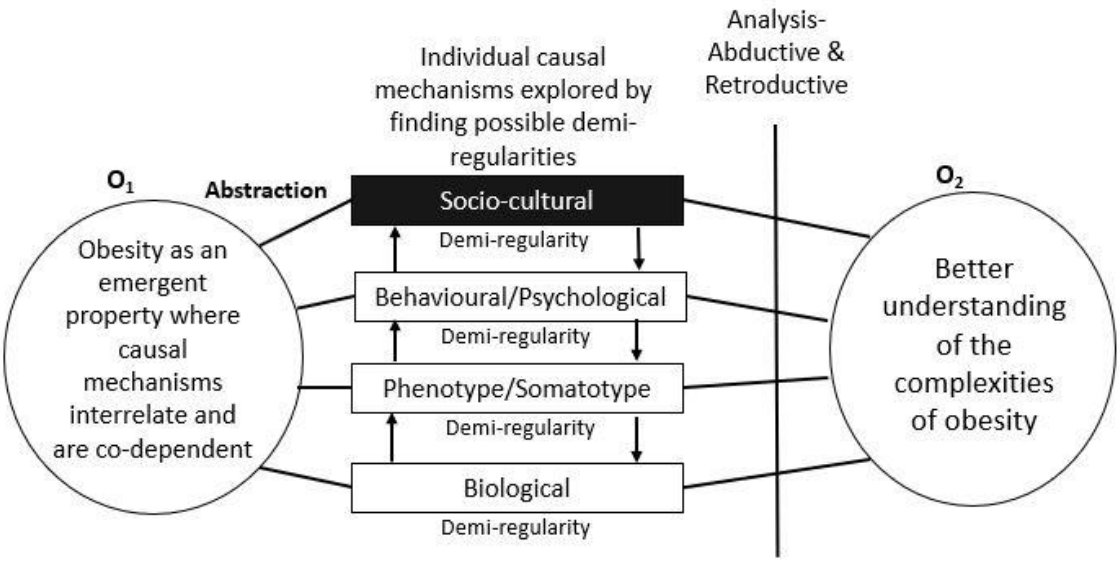

Figure 2.3 Socio-cultural generative mechanism in critical realist terms.
The first generative mechanism to be explored is highlighted in dark background with white font.

To explore the socio-cultural generative mechanism, and to a degree the behavioural/psychological mechanism, semi-structured interviews were chosen as the best method to access how individuals construct their day, in addition to understanding their attitude towards symbolic, social and cultural dynamics around food and eating. Questions asked during the interviews were used to explore how individuals subjectively, actively interpret and understand their world in relation to food, in the context of where they live and work, the culture they live in, the people they eat with, how and why they choose the foods they do. Additionally, questions were asked regarding how individuals feel about their body image and their self-esteem or level of confidence and if these feelings affected their choices in foods. In exploring and understanding the views and perspectives of individuals with respect to food, it may be possible to gain insight as to why some individuals are normal weight, overweight or obese: everybody must eat but not everyone shares the same attitudes or tendencies about food. The best way to explore these questions was through the use of semi-structured interviews.

Interviews were held in a private room and lasted on average, between 45-60 minutes. All interviews were tape recorded and transcribed verbatim. A guide for open ended questions used during the interview is provided in Appendix 4. Topics explored included individuals' attitudes and behaviour towards food; description of their diet and meaning of 'healthy diet'; effect of stress level on their eating habits; feelings about their body shape and image, levels of confidence and self-esteem, and if these feelings affected the way they eat. Once the interviews and transcription

process were complete; transcribed interviews were chosen at random and were analysed blind in order to reduce any bias. The following sections provide the justification for why semi-structured interviews were the chosen method and present topics explored during the interview.

2.2.2.1 Justification for use of semi-structured interviews

Semi-structured interviews are an effective technique for gathering information (Fern 1982), and determine the prevalence of any given attitude (Ward, Bertrand & Brown 1991). The investigator (or interviewer) uses a paper-based interview guide with a list of questions and topics to be explored, and the order of questions can vary. Questions are open-ended and allow for participants to answer in their own way which enables the researcher to gather rich and meaningful data. Participants are free to express their opinions and views in a safe environment with only the participant and the interviewer involved. On the contrary, focus groups, where a small number of people engage in discussions around a specific theme in an informal manner (Bryman 2012; Wilkinson 2016, p. 84), were not chosen as a method because the very nature of them would discourage some voices from being heard. Additionally, participant selection is usually based on some shared experience or concern by the group participants (Fossey et al. 2002). Moreover, the data generated from a focus group reflects the collective views of all participants (Fossey et al. 2002) and not of any one individual, and only 60-70% of ideas were expressed in focus groups compared to individual interviews, thus making focus groups less productive (Morgan 1996) in terms of gathering information, and especially individual information.

Ethnography is an alternative method used in qualitative research to gather information. It was not chosen because it uses field study in a particular setting (eg. grocery store shopping) and is based on direct observation in the natural setting (Nurani 2008). The investigator becomes part of the phenomena being studied while attempting to observe and describe all events and behaviours of the social setting (Gobo & Marciniak 2016, p. 105), which could result in participants altering their behaviours and attitudes for the duration of the observation. The amount of data obtained for one participant could result in recruiting fewer participants due to the challenging nature of data analysis. Furthermore, it would be difficult to capture participants' ideas, subjective thoughts and feelings as to how they construct their world.

Semi-structured interviews were also chosen over structured or unstructured interviews to allow for the investigator to ask relevant questions and the participant to answer in whatever way s/he chooses to: if the interview is too structured the participant is restricted to answering only specific (closed) questions and the interview does not flow freely resulting in the interview being more of a survey (van Teijlingen 2014). Frequently, structured interviews are used to generate quantitative rather than qualitative data (Whiting 2008). Whereas, unstructured interviews are used when an investigator is interested in exploring a general area and the conversation is allowed to flow and develop within the area of interest (van Teijlingen 2014). It is a guided conversation where questions emerge based on what is learned from the discussion (Whiting 2008).

2.2.2.2 Purposiveness and sampling strategy

Purposiveness relates to sampling strategy, an example in quantitative research is generalisability, which means the results can 'generally' be applied to a wider population. In contrast, with qualitative research the aim is to generate insight and in-depth understanding of the question or topic of interest (Braun & Clarke 2013). Purposive sampling relates to the number of units (i.e. organisations, departments, individuals or documents), with reference to the research question or topic being asked or explored (Patton 2002, p. 230; Bryman 2012, p. 418). The research question or the topic of interest is linked to or guided by the type of purposive sampling selected, and generally requires sampling of one kind or another. Within purposive sampling there are a number of different approaches which can be employed in a qualitative study (Bryman 2012, p. 418), see Table 2.2. Purposive sampling is based on the aims and objectives of the study, it utilises strategic selection of where, when and from whom the data will be collected. The general principle a researcher should consider when obtaining participants is to "*think of the person or place or situation that has the largest potential for advancing your understanding and look there*" (Palys 2008).

Table 2.2 Examples of some of the more prominent approaches in purposive sampling.
Adapted from Bryman (2012, p. 419).

1. Extreme or deviant case sampling: sampling cases that are unusual or that are unusually at the far end(s) of a particular dimension of interest.
2. Typical case sampling: sampling a case because it exemplifies a dimension of interest.
3. Critical case sampling: sampling a crucial case that permits a logical inference about the phenomenon of interest – for example, a case might be chosen precisely because it is anticipated that it might allow a theory to be tested.
4. Maximum variation sampling: sampling to ensure as wide a variation as possible in terms of the dimensions of interest.
5. Criterion sampling: sampling all units (cases or individuals) that meet a particular criterion.
6. Theoretical sampling: process of data collection for generating theory, the researcher simultaneously collects, codes and analyses the data, then decides what data to collect next and from whom. ***** Chosen to help develop theories about why some individuals are more susceptible to obesity.
7. Snowball sampling: a small group of individuals initially sampled to answer relevant research question/topic, these sampled individuals suggest other relevant individuals to the researcher (usually used in research when probability sampling is generally impossible (ex. organ donors)
8. Opportunistic sampling: capitalising on opportunities to collect data from certain individuals, contact with whom is largely unforeseen but who may provide data relevant to the research question.
9. Stratified purposive sampling: sampling of usually typical cases or individuals within subgroups of interest. ***** Chosen because this research project is investigating 3 different BMI categories.

Maxwell (2012) emphasises that there is no one perfect selection strategy. No one strategy will guarantee that the researcher has actually selected the best audience that will answer the research question. There is no fixed procedure the researcher can mechanically follow that will best meet her/his needs. The researcher is guided by all the information s/he has available to her/him in helping her/him decide which participants best meet her/his criteria (p. 95). However, bearing this in mind, and describing more specifically the form of purposive sampling this research project takes is in one sense a non-probabilistic (and then in another sense: probabilistic), stratified approach, combined to a degree with theoretical sampling, (i.e. probabilistic implies random sampling vs non-probabilistic which implies not randomly sampling; these are terms that are inclusive when determining which type/s of purposive sampling strategies will be used to answer the research question).

Firstly, the non-probabilistic, stratified approach has been chosen because this project aims to obtain participants of various body weights according to their body mass index. The rationale for this is to explore how attitudes and behaviours might vary in and among these different BMI groups. Moreover, this may shed light on why or how some individuals were/are more susceptible to weight gain. Additionally, non-probabilistic implies that participants are not chosen at random, this is due to the specificity of a research aim. In other words, the more specific a research question, the more the researcher will want to target a particular group of individuals (Bryman 2012, p. 418). However, because the nature of this study revolves around food where nearly everyone has an opinion - and even if they do not, this non-opinion still matters - obtaining individuals randomly (i.e. probabilistic), but within targeted BMI categories, is the best way to

ensure that the researcher gains access to as wide an audience as possible. This aids in establishing the many different attitudes, perspectives and opinions that are expressed during the interviews.

The objective in purposive sampling is to ensure variety in the sample such that, the participants differ from each other in terms of key tendencies or attitudes relevant to the questions (Bryman 2012, p. 418). In addition, random sampling (within BMI groups) can be a useful strategy when the participants represent some larger population and enough individuals are included. This allows for some form of probability sampling and extrapolating findings to a larger population. However, the researcher needs to be aware that there are pitfalls when making inferences (Huck 2009, p. 121, cited by Maxwell 2012, p. 94); and although Maxwell (2012) does not discuss the pitfalls, one can theorise that when gathering data (either qualitative or quantitative) the researcher must employ caution when extrapolating the data to a larger population, it is imperative to consider from where the sample originates, and who the individuals are which make up the sample.

Secondly, theoretical sampling is used to the extent that the aim of this project is to develop theories about why some individuals are more susceptible to weight gain than others. The development of theories is achieved by discovering categories or themes along with possible demi-regularities and/or transfactual conditions, and the possible inter-relationships that may exist among them. In theoretical sampling, saturation occurs when new data no longer suggests new theoretical understandings. Theoretical sampling is considered as an ongoing process whereas probability sampling is more or less a separate or single stage (Bryman 2012), and due to the nature of this study, a distinct, single timeline for gathering data was used for each of the two studies (i.e. each study had a distinct timeline where all data was gathered simultaneously). Specifically, theoretical sampling utilizes an iterative process (i.e. each stage of data collection determines the next stage of data collection), and probability sampling is a distinct, single timeline; by using a combination of stratified purposive and theoretical sampling approaches, the first study, the themes and/or narratives found are used to guide the second study. More specifically, the themes/narratives which emerge from the first part of the study serve as a template or a guide for the second part of the study, that is, the researcher explores if the identified themes/narratives are valid in, and shared by a different sampled group which differs in age.

2.2.2.3 Sample size – data saturation

Purposive sampling is not straight forward, it entails two forms of saturation, i.e. data and theoretical. Data saturation is reached when the phenomena explored have been fully described through the gathering of in-depth information, the themes have been fully developed and further sampling leads to redundancies (Fossey et al. 2002). For theoretical saturation, the research process is a controlled and ongoing process (i.e. data are collected in order to develop theories). How the researcher proceeds, is controlled by what theories emerge. It is driven by concepts that evolve throughout the research process. In addition, it is based on making comparisons between the individuals (or events) that renders maximum opportunities to discover variations among concepts between the individuals. Saturation is reached when no new categories emerge, that is, no new theories emerge, or the phenomena are well developed in terms of their properties, dimensions and variation between the categories. This type of saturation is often used in grounded theory (cited by Bryman 2012, pp. 411-412); however, this poses a question to the researcher of how s/he is to know when either limit of saturation has been met. Guest, Bunce & Johnson (2006), through a literature review of what the guidelines are for knowing the answer to these questions found that, although saturation was considered to be the 'gold standard' for purposive sampling, the definition was vaguely defined: there were no descriptions, determinations or practical guidelines for estimating sample size. However, Guest, Bunce & Johnson (2006) found that meta-themes were present in as few as six interviews, and no new themes developed beyond twelve interviews (i.e. data saturation had been reached). Based on their findings, we felt that a minimum of ten participants per BMI category would be sufficient to develop themes/narratives and to obtain a sufficient amount of information on the different attitudes and behaviours among the participants in the first part of the study. A similar number of participants per BMI category would suffice to validate such findings within a different age group of participants for the second part of the study.

2.2.2.4 Critical realism: approach to validity

In advocating a critical realist approach to validity, Maxwell (2012) describes 3 main types of understanding which pertains to validity: descriptive, interpretive and theoretical, which are commonly used in qualitative research and are the ones most directly involved in evaluating a qualitative account as it relates to the actual situation on which the account is based.

1) Descriptive validity or 'primary understandings' is the first concern for most qualitative researchers and is the factual accuracy of the participant's account. Questions such as: is this correct, did the participant really say this/that? In other words, it is verifiable.

For this current study, descriptive validity is addressed by having the interview recordings transcribed verbatim. In addition, if there are any questions about what a participant might have said, the interview recording is accessible to listen again to ensure accuracy of what was said by the participant.

2) Interpretive validity is concerned with what objects, events, values, beliefs, concepts and/or behaviours 'mean' to the individual. By 'meaning' Maxwell (2012) states that meaning is 'intention, cognition, belief, evaluation, affect or anything else that encompasses the 'individual's perspective'. These phenomena are as real as physical ones and the researcher's interpretation of these 'meanings' can be valid or invalid, given the researcher's own purpose and perspective. However, interpretation of these is inherently ideational or mental (i.e. ideas and concepts are formed by the researcher of the individual's meanings) so that the nature of them is understanding; and understanding is most central to interpretive research. The researcher using interpretive validity, seeks to comprehend phenomena from the perspective of the individual. "*These terms are often derived to a substantial extent from the individual's own language*" (Maxwell 2012, p. 138). Therefore, interpretive accounts are based in the language and thoughts of the individuals expressing them, and these accounts rely on the individuals' own words and concepts, as much as possible. However, because concepts are not based on the 'physical' (i.e. concepts cannot be directly measured or observed), the understanding of them is inherently a matter of inference. That is, the researcher infers what the individual's words and actions mean based on the individual's own statements. However, it is important to not treat the individual's accounts as inveterate or habitual, because the individual may be unaware of her/his own feelings or thoughts, may consciously or unconsciously conceal or distort her/his views, or may recall an account inaccurately. So that these accounts are never a matter of direct access, but are always inferred by the researcher, based on the individual's account, or other evidence (Maxwell 2012, p. 139).

For this study, interpretive validity is addressed by the researcher using direct quotes/words and/or expressions used by the participants, as evidence to support the account which will help to develop the themes or narratives found from the interviews.

3) Theoretical validity and understanding differ from the first two forms of understanding and validity by "*the degree of abstraction of the account in question from the immediate physical and mental phenomena studied*" (Maxwell 2012, p. 139). Theoretical understanding goes beyond concrete interpretation and description and it specifically addresses the researcher's theoretical constructions that s/he develops during the study, or the insights s/he brings to the study. Its purpose goes beyond describing the concepts. Theoretical validity refers to the account's validity as a theory of causal explanation and describing the phenomena being studied (p. 140).

For this study, theoretical validity is the themes/narratives developed from the interviews, where both abduction and retroduction are used to draw out themes and gain insight into what some of the demi-regularities and transfactual conditions are in order to explain how or why obesity can arise/exist.

Two other forms of validity exist which include generalisability and evaluative validity but are (Maxwell 2012, p. 134), not necessarily applicable to qualitative research.

Generalisability validity refers to the extent to which the research, of the account, can be applied to a population or settings, times, or other persons than those who were directly studied. In general, however, qualitative research is not designed to systematically generalise its findings to some wider population. Rather, generalising the accounts usually only takes place through the development of a theory that makes sense of the particular individuals or situation under investigation; however, it can also show how, by using the same procedure in a different situation, lead to different results.

This current study aims to understand how or why some individuals are obese or not, in an obesogenic environment. It does not aim to generalise its findings to all of Britain or outside of the UK, but to gain insight into how or why obesity exists in general.

Evaluative validity, rather than descriptive, interpretive or explanatory, refers to the application of an evaluative framework about the actions made by the individual/s, whether the action was legitimate or justified. In other words, it evaluates a specific action. Most researchers do not make claims about evaluating the things they are investigating (Maxwell 2012, p. 143). Indeed, this current study will not be evaluating any action/s made by the participants as an understanding of individuals' attitudes and/or pre-disposition towards food is the aim of this research.

2.2.2.5 Topics explored

The topics explored for the semi-structured interviews (Appendix 4) were developed from previous research exploring how socio-economic status (i.e. two different neighbourhoods in Aberdeen) affect individual's food and diet choices in on obesogenic environment (Spencer 2015). The interview topics and questions were adapted to gain better insight into individuals' everyday lives in an obesogenic environment and questions have been designed around distinct modules to capture the everyday experiences of how individuals construct their world around food, food culture and what their attitudes, behaviours and approaches are towards food and themselves – their body image and levels of self-esteem/confidence.

2.2.2.5.1 Food purchasing – Location and experience

One aspect of the interview explored the food purchasing experience. Such experience encompassed individuals' food shopping, including mode of transportation, who they shop with, how often they shop, what decisions influence what they purchase, what sorts of foods are purchased and whether or not they find it to be a pleasurable experience. Such practices are ingrained in a socio-cultural context in the way people exist or have existed (Mennell, Murcott & Van Otterloo 1992; Murcott 1995; Delormier, Frohlich & Potvin 2009; Wills et al. 2011). Moreover, these practices create social order and boundaries within families (Caplan 1997, p. 6) and strengthen bonds (Wright-St Clair et al. 2005, cited by Wills et al. 2011). An additional aspect to this topic, and explored in this study, was the attention given to food labelling and its importance.

2.2.2.5.2 Purchasing of 'take-away' foods

Take-away foods or ready-made meals have been considered as drivers for obesity (Bleich et al. 2007; James 2008), and therefore it was considered relevant to this study to relate some of the questions to the purchase of these foods. The topic related to eating foods that were not home cooked or eaten outside the home were also explored and questions regarding the frequency of take-away food purchases and restaurant meals were asked, in addition to exploring the reasons for these purchases.

2.2.2.5.3 Ideals

Not all individuals have the financial ability to purchase all the food they are interested in, and therefore their choices are influenced by their circumstance. The selection of food choice involves conditions structured around financial 'resources and rules', thus limiting the range of options (Delormier, Frohlich, & Potvin 2009, p. 220). Questions related to 'ideals' aim to explore what choices individuals would make if there were no restrictions; questions such as, 'what would an ideal shopping experience be like' and 'what items would you ideally purchase' were included as topics in the interview.

2.2.2.5.4 The eating of food

The way and the location of when food is eaten and if it is done in a social context with friends or family were explored during the interview, as this aids in conceptualising the individuals' connection between their lived food experience and habits to a wider social pattern. Fischler (1988) stated that food represents individual identity, and humans define cultures or groups of people by what they eat. Germov & Williams (2004) additionally state that "*because social patterns of food exist, a sociological explanation is helpful in understanding the social determinants of why we eat the way we do*" (p. 6).

The meaning of 'healthy diet' and its importance in health and disease prevention has been discussed and researched extensively. A review by Bisgoni et al. (2012) found that people interpret healthy eating in a variety of ways from the properties of food, ways of eating and physical outcomes, which is not surprising considering these definitions are how nutrition professionals define the term. Less recognised by nutrition professionals but defined by individuals are in terms of personalisation, psychosocial outcomes, and restriction/control (p. 293). In view of this, the question regarding whether or not participants felt they were eating a healthy diet was asked and allowed us to understand what this meant to the individual and whether or not they felt eating a healthy diet was an important aspect of her/his life. Additionally, the question of eating 5 portions of fruit and/or vegetables in a day was deemed important since provision of health promoting nutrients is determined by individuals' food choices and food consumed. However, individuals do not necessarily choose foods based on the possible nutrients that food will provide (Pollard, Cook & Cade 2002).

2.2.2.5.5 Additional questions

Earlier in the interview, participants were asked how they felt about the way they were eating and if there were any foods they were trying to limit or avoid. Later the participants were asked to describe their diet and what they thought a healthy diet was, as well as if they were trying to eat healthier, which foods would they include or exclude. This was done in order to have a better understanding of each of the participant's perception about her/his diet.

Participants were asked if they paid attention to the information that exists (either through the internet, radio, television, etc.), on health, diet and exercise, and whether or not they find it useful, not useful or confusing. Additionally, participants who initiate seeking out information regarding health and diet were asked questions relating to how they access this information, and how they chose between the available sources.

2.2.2.5.6 Body image / self-esteem / confidence levels

Body satisfaction is closely associated with overall feelings of self-esteem, and in some women, who have a low self-esteem, can present an eating disorder (Cash & Pruzinsky 1990, p. 200). The importance of these factors in relation to obesity has been presented in section 1.5.2. This project is not exploring eating disorders in individuals, and in fact individuals with a diagnosed eating disorder is one of the exclusion criteria in this study. The questions related to body image, confidence levels and/or self-esteem were asked and then a follow-up question about whether or not it effects the participant's food choice, because if individuals feel low self-esteem or poorly about themselves, this may have an effect on their food choices. These questions were asked to explore if self-perception about body image or esteem has an effect on food choice, and, it is not suggesting that individuals have an eating disorder, but that they may eat in order to feel better.

2.2.2.5.7 Patterns of work

Food choice in relation to employment and work patterns is less understood and has not been examined as extensively as other aspects of food choice (i.e. takeaways, convenience foods, ready-made meals etc.). Depending on length of work hours, inflexibility in job type, work can place competing demands in time and energy, leaving a person feeling tired, stressed and having little time to spend on food choice (Devine et al. 2009). Furthermore, jobs which entail long bouts of sitting are associated with increased adiposity. Moreover, research has shown that individuals with obesity and sedentary jobs are more likely to be less active during leisure time on their days off (McCrady & Levine 2009). Additionally, shift work, especially night shifts can affect eating

behaviour (Lowden et al. 2010). Therefore, questions regarding what general type of work an individual does and how it influences their choice in food were asked.

2.2.2.5.8 Where you live

Dietary patterns and practices, health-related behaviours and health outcomes can vary between neighbourhoods; each of these factors may have an effect on obesity and disease risk. Positive associations have been found between the proximity to a supermarket, dietary patterns and weight status (Popkin, Duffey & Gordon-Larsen 2005).

Questions related to where individuals live and the food shop choices in their neighbourhood are relevant questions. In addition, questions about what shops the individual would like to see, and if there is anything, they feel could improve the area, were asked. These questions may help in understanding if there is an impact of how choices in food selection may be affected by where participants live.

2.2.2.5.9 Levels of stress

Psychological stress is a factor which causes some individuals to overeat. Among the complex contributing drivers to obesity, stress-induced eating is hypothesised as one of the drivers and has received substantial attention (Greeno & Wing 1994; Tamashiro, Hegeman & Sakai 2006; Torres & Nowson 2007; Moore & Cunningham 2012). In this study, participants were asked about their stress level, and to what degree they felt stressed. Additionally, participants were asked if stress was an inducer for eating or if they lost their appetite. If stress induced participants to eat, they were asked about the types of foods chosen.

2.2.2.5.10 Financial circumstance

The economics of food choice, the lack/abundance of money or financial resources may have an effect on how individuals are able to shop, where they shop and what they buy. A systematic review carried out on different socio-economic statuses (SES) in Europe suggested that, among lower SES levels in Europe, nutrition patterns were likely to be unhealthier (De Irala-Estévez et al. 2000). However, Acheson (1998) investigated the inequalities in health in England, and found that individuals, regardless of age group, but in lower SES levels, consumed less fruit and vegetables and less dietary fibre, and as a result these individuals had lower intakes of vitamins, minerals and anti-oxidants (Acheson 1998).

2.2.2.5.11 Support structure

Social support in the context of health has been of great interest to researchers because emotional support from friends or family can potentially serve as a protective factor for health (Reblin & Uchino 2008). A decreased risk of mortality has been found in individuals who have high quality and/or quantity of social relationships, compared to those who have low quality or quantity of a social network (Berkman et al. 2000). Moreover, research studies have found that individuals which lack a social network or that are socially isolated are at increased risk for all-cause mortality (House, Landis & Umberson 1988; Tay et al. 2013). Therefore, whether participants in this study feel they have a support network of friends and/or family members was asked to help in understanding the complete picture of the individual. Furthermore, if an individual feels s/he does not have a support network, this may have an effect on food choice.

2.2.3 Questionnaires

Aspects related to the behavioural/psychological generative mechanism (Figure 2.4) were explored using validated questionnaires. In particular, individuals' body self-perception, how body image relates to quality of life, food addiction, psychological eating behaviour, individuals' shopping habits, and lastly, how individuals view their world, how much exercise they performed (study 1) and their quality of life (study 2) were some of the areas explored *via* questionnaires. All questionnaires related to how an individual has been feeling or experiencing a phenomenon (depending on the questionnaire) over the past 4 weeks, except for the physical activity questionnaire which was related to exercise over a 7-day period.

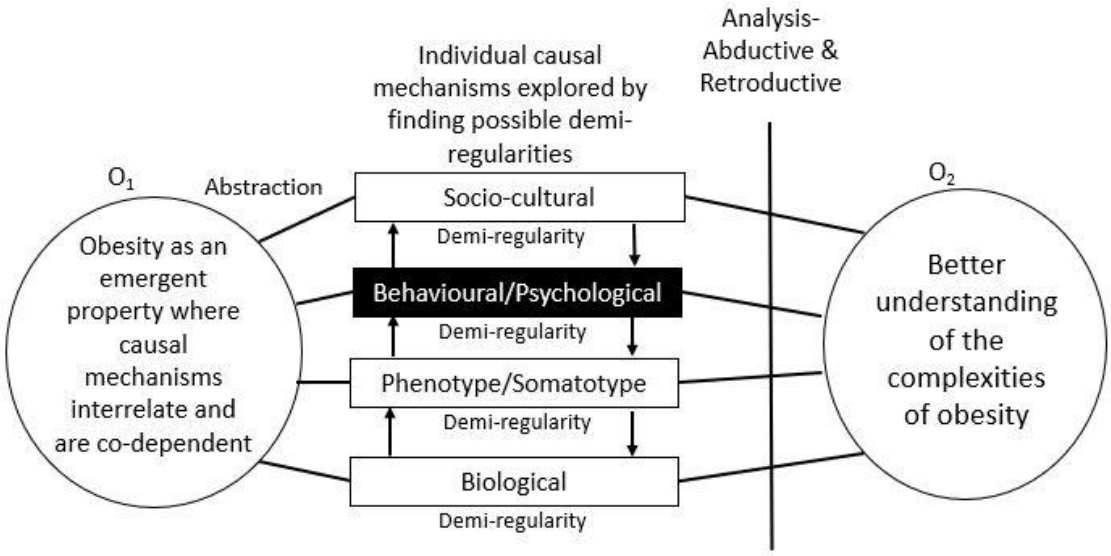

Figure 2.4 Behavioural/Psychological generative mechanism.
The second in line, generative mechanism, explored *via* validated questionnaires.

2.2.3.1 Multidimensional Body-Self Relations questionnaire–Appearance Scale (MBSRQ-AS)

The MBSRQ-AS (Brown, Cash & Mikulka 1990) is a validated, self-report inventory (Muth & Cash 1997; Cash 2000) 34-item body image assessment questionnaire (Appendix 5). The MBSRQ-AS questionnaire is widely used to assess body image (Cash 2000; Rusticus & Hubley 2006) and its use has been validated in numerous studies (Untas et al. 2009; Argyrides & Kkeli 2013; Vossbeck-Elsebuch et al. 2014; and Roncero et al. 2015). It contains five scales, which are considered to have "good psychometric qualities" (Cash 2000) to assess the attitude of one's body image and physical appearance. The five scales are: appearance evaluation (AE), appearance orientation (AO), body-area satisfaction (BAS), overweight preoccupation (OP) and self-classified weight (SCW), and are described below. The mean (or median) score is calculated separately for each scale.

Appearance Evaluation (AE): is a 7-item scale which measures an individual's feelings about levels of satisfaction or dissatisfaction with her/his looks, in addition to, feelings of physical attractiveness or unattractiveness. It consists of a 5-point response format that ranges from 1: Definitely disagree to 5: Definitely agree.

Appearance Orientation (AO): is a 12-item scale which assesses the extent of an individual's investment in her/his appearances. The response format is the same as it is for the AE format.

Body Area Satisfaction (BAS): is a 9-item scale which assesses the individual's feelings about her/his appearance, similar to how the AE scale measures; however, the BAS scale focuses more closely on discrete aspects of the body (ex. height, weight, muscle tone, upper, mid and lower torso, hair, face and overall appearance). Discrete aspects are measured because not every aspect of the body holds equal weight with levels of satisfaction or dissatisfaction. The response format ranges from 1: Very dissatisfied to 5: Very satisfied.

Overweight Preoccupation (OP): is a 4-item scale which assesses an individual's feelings of 'fat anxiety' (i.e. worrying about small changes in weight and/or the fear of being fat or becoming fat), eating restraint and vigilance at maintaining one's weight as well as if there have been attempts at dieting. The response format is as follows: 1: Never, 2: Rarely, 3: Sometimes, 4: Often, and 5: Very often.

Self-Classified Weight (SCW): is a 2-item scale, which is a reflection of how an individual perceives her/his weight and how s/he thinks others may perceive her/his weight. The scale measures from 1: Very underweight to 5: Very overweight.

2.2.3.2 Body Image Quality of Life Inventory (BIQLI)

The BIQLI (Cash & Fleming, 2002) (Appendix 6) is a validated questionnaire which assesses individuals' quality of life and how feelings about their body impact their wellbeing and quality of life. It is not a direct measure of body image, rather it was designed to measure the effect that body image has on various psychosocial domains of one's life (Cash, Jakatdar & Williams 2004). To our knowledge, it is currently, the only questionnaire to link an individual's body image effect on quality of life (Rusticus, Hubley & Zumbo 2008). It consists of 19 questions with broad scope for life domains from eating, exercising, grooming and sexuality to social functioning, emotional well-being and sense of self. It uses a 7-point Likert-scale response, ranging from +3 (very positive effect on one's life) to -3 (very negative effect on one's life). A response of 0 is equivalent to no effect or no impact either way regarding one's quality of life with respect to body image (Cash, Jakatdar & Williams 2004). A single composite score is computed as the average of all 19 items.

2.2.3.3 Sense of Coherence-13 (SOC-13)

This version of the SOC-13 is a shortened form from the original version which contained 29 questions (Antonovsky 1988; Feldt & Rasku 1998) (Appendix 7). It represents an innovative foray into identifying aspects in an individual that may serve as determinants of coping during times of stress and trauma (Flannery et al. 1994). It measures three different dimensions with respect to life which are interrelated: manageability, comprehensibility and meaningfulness (Antonovsky 1993; Feldt & Rasku 1998).

Manageability is the instrumental aspect the individual feels is at her/his disposal, that is, the resources s/he accords within herself/himself and/or are at her/his disposal, that are necessary when facing a challenging situation.

Comprehensibility is the mental process an individual has to the degree in which life makes sense in terms of order, structure and consistency.

Meaningfulness relates to how much meaning is given to life in terms of how motivated an individual feels towards life to the extent this individual feels that aspects of life are worth investing time and effort.

The questionnaire uses a 7-point Likert-scale response format where, depending on the question, 1 can range from: Very seldom or never; no clear goals or purpose at all; a source of pain and boredom to 7: Very often; very clear goals and purpose; a source of deep pleasure and satisfaction. For correct interpretation of this questionnaire a total score is obtained from all three components.

2.2.3.4 Dutch Eating Behaviour questionnaire (DEBQ)

This questionnaire was developed by van Strien et al. (1986), they believed that it would help improve the understanding of obese eating patterns, including those which may have 'latent obese' eating patterns, (Appendix 8). It contains 33 questions to identify three main eating traits of psychological eating behaviour. These three traits comprise external, restrained and emotional eating (van Strien et al. 1986). Within the emotional eating trait there are 13 questions which are further broken down into two eating categories, i.e. diffuse and clearly labelled emotions. The diffuse-emotions construct comprises 4 questions related to eating due to boredom, loneliness, restlessness or when 'let down' or disappointed by someone. The clearly labelled-emotions

construct comprises 9 questions relating to irritation, being cross or upset, depressed, worried or frightened. Slochower (1983) has stated that individuals who eat in response to diffuse emotions do not typically eat in response to clearly labelled emotions.

The restrained eating trait helps to identify individuals who attempt to control their weight through restricting calories and food intake; these individuals are considered restrained eaters (Ruderman 1983). Ten questions relate to this eating behaviour, examples include, eating less at meal times or watching exactly what you eat or refusing food because of weight concern or foods that are deliberately slimming.

Schachter, Goldman & Gordon (1968) state that individuals who cannot resist the external stimulation of food are considered 'external' eaters. Ten questions relate to external eating behaviour, examples are eating more than usual if food tastes, smells or looks good, not resisting buying something when walking past a bakery, snack bar or café, eating while cooking, or eating something nice straight away instead of savouring it later.

The response format to all 33 questions ranges from 1: Never to 5: Very often, an answer of 3 equates to 'sometimes'. The mean (or median) score is calculated separately for each eating trait.

In addition to identifying these behavioural eating traits, this questionnaire enquires about current body weight, if it has remained stable over the past six months, and the highest and lowest weights over the course of one's life. Additionally, if an individual ever had an eating binge; defined as "*an episode of eating an amount of food that others would regard unusually large*"; subsequent questions enquire about the past three months and how often the eating binge occurred.

2.2.3.5 Modified Yale Food Addiction scale – version 1 (mYFAS)

The mYFAS questionnaire is a scaled down version (9-item) of the original 25-item questionnaire, which was designed to identify those individuals who may suffer from food addiction (Gearhardt, Corbin & Brownell 2009) (Appendix 9). Because food addiction is a controversial concept (Long, Blundell & Finlayson 2015), and there is currently no medically established way of diagnosing 'food addiction' (Lutter & Nestler 2009, p.629), this thesis will refer to it as 'suggested' food addiction. Specifically, these food types (i.e. calorically dense, highly processed foods, made to be highly palatable) are the ones most highly reported and preferred by individuals who binge eat

and have eating problems (Kales 1990; Drewnoswki et al. 1992; Drewnoswki 1995; Allison & Timmerman 2007). In creating this questionnaire, a panel of experts on addiction, eating pathology and obesity helped to identify the relevant pool of item contents and question wording. Clinical patients being treated for binge eating also reviewed the scale for clarity and relevance. One question relates to each of the symptom sets that constitute the 7 diagnostic dependence criteria from the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition – Text Revision (DSM-IV-TR 2000).

The questionnaire contains seven questions, which are considered to be the 'diagnostic criteria for substance use disorders' (i.e. questions 1-5 and 8-9). Questions 6 and 7 refer to significant impairment or lead to significant distress for an individual, and suggested 'clinical significance' is assessed using these 2 questions.

The first 7 questions have a response format where the answers range from 0: Never to 4: 4+ times a week. The last two questions (8 and 9) are answered either 'yes' or 'no'. For scoring the questionnaire, a combination of frequency (or continuous) and dichotomous scoring were judged to be the most suitable to capture the diagnostic criteria. There are two summary scoring options, one is the 'Symptoms-count score' (SCS) which uses frequency scoring and is used to measure behaviours that could conceivably occur occasionally in non-problem eaters (i.e. criteria associated with excess consumption, dieting, emotional eating). The other scoring option is a suggested 'Food addiction diagnosis' (FAD) and employs dichotomous scoring, it is used for questions which are considered more severe in terms of indicating an eating problem (such as, "*significant emotional and/or physical problems do not deter the overconsumption of the same types of foods*").

Both summary scores are based on a threshold response for each question where the first two questions must be answered with a response of 4 (equivalent to 4+ times a week). Questions 3-7 must be answered with a response of 3 (equivalent to 2-3 times/week) or higher. Questions 6 and 7 are dichotomous, a response of 'yes' is considered only for the suggested food addiction score but does not count towards the symptom-count score. An example for how a score is calculated: if either one of the first two questions is answered with 4, followed by any one of the questions 3-5 with answer of 3, additionally answering either question 6 or 7 with a 3 and one of the last two diagnostic questions are answered as yes, then this individual's total food addiction score is equal to 4 and s/he has met the threshold for suggested food addiction. However, s/he would have a symptom-count score of 3. Specifically, the score range for the summary symptom count is 0 to 7, where a median score of 1 suggests 'food dependence' (Gearhardt, Corbin & Brownell 2009). The

score range for the suggested food addiction is 0 to 9, where mild symptoms for food impairment or distress is equated with scores between 2 and 3. Moderate symptoms result in those participants who score 4 or 5. Scores 6 or greater suggest severe food impairment or distress (Schulte & Gearhardt 2017). Table 2.3 lists the threshold answer for each of the 9 questions and the score ranges for symptom count scores.

Table 2.3 mYFAS example for how questionnaire is scored.

Yale Food Addiction Scale summary scoring		FAD	FASC
Qu. 1 - diagnostic criteria for substance use disorders	Threshold answer is 4	1	1
Qu. 2 - diagnostic criteria for substance use disorders	Threshold answer is 4	1	1
Qu. 3 - diagnostic criteria for substance use disorders	Threshold answer is 3	1	1
Qu. 4 - diagnostic criteria for substance use disorders	Threshold answer is 3	1	1
Qu. 5 - diagnostic criteria for substance use disorders	Threshold answer is 3	1	1
Qu. 6 - significant impairment and distress	Threshold answer is 3	1	0
Qu. 7 - significant impairment and distress	Threshold answer is 3	1	0
Qu. 8 - diagnostic criteria for substance use disorders	Threshold answer is Yes	1	1
Qu. 9 - diagnostic criteria for substance use disorders	Threshold answer is Yes	1	1
Highest Possible Total score		9	7
Food Addiction diagnosis score (FAD); Food Addiction Symptom count score – (FASC). Criteria for FA, must meet the threshold for at least 3 questions in the diagnostic criteria for substance use disorders and meet the threshold for at least 1 question in the significant impairment and distress. If threshold for qu. 6 and/or 7 is not met a symptom count score can be carried out. High scores are indicative of "*patterns of neural activation implicated in other addictive disorders*" (Gearhardt et al. 2011).			

2.2.3.6 Food Choice values questionnaire (FCV)

The FCV questionnaire (Appendix 10) used in this study is the updated version which investigates factors influencing food choices, and also considers food safety and organic food choice (Lyerly & Reeve 2015). Additionally, items to identify food choice in terms of mood or in a manner to control weight were added. The questionnaire contains 8 scales with a total of 25 questions and is more comprehensive in covering the full range of food choice values. The detail of each scale is explained in Table 2.4. Response format is a Likert scale which ranges from 1: Not at all important to 5: Very important (whilst 2: is a little bit important; 3: moderately important; 4: quite a bit

important). Each scale contains 3 questions, except for the organic scale, which contains 4 questions. The mean (or median) score is calculated separately for each scale.

Table 2.4 Food Choice Value questionnaire (adapted from Lyerly & Reeve 2015).

Convenience – how easily food can be prepared and eaten
Accessibility – how physically accessible the food is in terms of stores in proximity to home, and the cost
Tradition – how familiar or recognisable the food is with one's heritage or background
Comfort – the degree to which food elicits positive emotions or alleviates negative emotions
Organic – foods that have minimal impact on the environment, contain vitamins, minerals and natural ingredients
Safety – food that has been prepared or processed properly, to the extent in which it will not cause illness
Sensory appeal – the appearance of food that is pleasing to the senses in taste and smell
Health and Weight concern – food that helps in maintaining or losing weight

2.2.3.7 Scottish Physical Activity questionnaire (SPAQ)

This questionnaire, created by Lowther et al. (1999), was designed to recall two different levels of physical activity that were performed over a seven-day recall period specifically (Appendix 11). The individual is asked to recall both occupational (work) and leisure time activity in terms of the level of activity as being either moderate or intense. The individual is to answer in minutes, the amount of time spent in any given activity performed at work, at home or in leisure time. Although this questionnaire is considered reliable and valid, it was confusing and a bit complicated for the participant to understand. After using the SPAQ in the first study, and feed-back obtained from participants, it was decided that questions regarding physical activity would be asked during the interviews instead.

2.2.3.8 Short Form - Health Survey version 1 (SF-36v1)

The Short Form - Health Survey version 1 (SF-36v1) (Ware & Sherbourne 1992; McHorney, Ware & RacZek 1993) (Appendix 12) is a questionnaire for generic quality of life health assessment and is a product of the 'Medical Outcomes Study' (MOS)[1] in 1986 (Tarlov, Ware & Sheldon 1989; Ware & Sherbourne 1992; Hays, Sherbourne & Mazel 1993). The health survey instrument was designed to obtain subjective information about the presence and the extent of physical and emotional

[1] The objective of the MOS study was to try to understand how certain components of the US health care system affected outcomes of care (Garrat et al. 1993, p. 144.).

limitations. It measures a core of general health concepts from the individual's perspective, (i.e. in contrast to specific disease conditions). It is a self-administered questionnaire which takes about 5 minutes to complete. It contains 36 questions with 8 subscales measuring physical functioning and emotional wellbeing. The health dimensions for this questionnaire were designed and based upon health concepts that are most frequently captured in widely-used health surveys and the items have been adapted from instruments that have been in use for the past 45 to 65 years on health (Ware and Sherbourne 1992).

Each of the subscales are discussed here and can be found listed in Table 2.5 where it includes the number of items asked for each subscale, the possible response range and the interpretation of low and high scores. The questions range from minor to severe physical limitations, which include carrying groceries, walking moderate distances, lifting, climbing stairs, kneeling and bending. 1) physical functioning (PF) assesses normal, everyday physical activities. 2) Role physical (RP) assesses physical health limitations at work and home in daily activities and everyday responsibilities. 3) Bodily pain (BP) assesses discomfort and frequency, as well as level of pain and the extent to which it may interfere with everyday life and activities. 4) Social functioning (SF) assesses the effect physical health or emotional problems have on social relationships or social activities. 5) Mental health (MH) assesses psychological wellbeing, loss of behaviour or emotional control, depression and anxiety; which are the four major dimensions of mental health. 6) Role emotional (RE) assesses limitations in an individual's emotional ability to function at work and in daily activities. 7) Vitality (VT) assesses feelings of wellbeing which include degree of fatigue and energy. 8) General health (GH) assesses current and prior physical health status. Thirty-five items (questions) are used in calculating the scores for each subscale, the 36th item is a self-report health transition (HT) question which asks how an individual would rate her/his health today compared to one year ago.

Table 2.5 Short Form-Health Survey, v-1, 8 subscales.
Response range, and high and low score interpretation (adapted from Ware & Sherbourne 1992).

Short Form Health Survey (SF-36v1)	No. of items	Response range	Low score interpretation	High score interpretation
1) Physical functioning (PF)	10	3 response range: 'Yes, limited a lot' to 'No, not limited at all'	Limited in performing all physical activities, including dressing or bathing	Able to perform all physical activities with no limitations, including the most vigorous
2) Role physical (RP)– due to physical health problems	4	2 response range: 'Yes' or 'No'	Problems with daily activities and work as a result of physical health	Able to perform daily and work activities (past 4 weeks)
3) Bodily pain (BP)	2	5 to 6 response range: 'Not at all' to 'Extremely' or 'None' to 'Very Severe'	Extremely limiting and very severe	No limitation or pain
4) Social functioning (SF)	2	5 response range: 'Not at all', or 'None of the time' to 'Extremely' or 'All of the time'	Interference (extreme & frequent) w/normal social activities due to emotional and physical problems	No interference, performs normal social activities
5) General Mental health (MH) -psychological well-being and distress	5	6 response range: 'None of the time' to 'All of the time'	Constant feelings of depression and/or nervousness	Constant feelings of happiness, calm and peacefulness
6) Role emotional (RE)	3	2 response range: 'Yes' or 'No'	Problems with daily activities and work due to emotions	No problems with daily activities or work
7) Vitality (VT) – measures energy and fatigue	4	6 response range: 'None of the time' to 'All of the time'	Constant feelings of tiredness and being worn out	Constant feeling of energy and pep (i.e. liveliness)
8) General health (GH) perceptions	5	5 response range: 'Poor' to 'Excellent' or 'Definitely false' to 'Definitely true'	Belief of poor personal health and is likely to get worse	Belief of excellent personal health
Health transition-1 (HT1) – estimates average change in health status during the year before the questionnaire administration. Five possible responses range from 'much better' to 'much worse'. All other (35) questions asked are in reference to the past 4 weeks.				

All calculations for scoring, coding, and transforming are performed by QualityMetrics Health Outcomes™ scoring software version 5.0 (2004-2016). Each of the subscales' items are scored, coded and summed then transformed on a scale from 0-100, where 0 represents the poorest state of health and wellbeing, and 100 represents the most optimal state of health and wellbeing (Saris-Baglama et al. 2010). Another scoring system which is performed by the scoring software, is called 'Norm-based scoring' (NBS) which standardises the 0-100 scores, which is performed *via* a linear *z*-score transformation, using the mean and standard deviation values from the 1998 US population normative data, where the NBS scoring values from that study have a mean value of 50 and a standard deviation (SD) of 10, (Ware & Kosinski 2003, p. 22-23).

The advantage of NBS is primarily to make interpretation easier, specifically, a score of 50 is equated with norms for both the 1998 and 2005-2006 US general population. Scores above 50 (moving towards better health) or below 50 (poorer health) are interpreted as above or below these US population norms. Moreover, the SDs are equalised to 10 for all 8 subscales, enabling for easier interpretation of results across these subscales, that is, how far above or below the mean score is in SD units. A 1-point difference is 1/10th of a SD unit, which has an effect size of 0.10.

From the 8 subscales, two summary health measure scores are also obtained and provide an overall portrayal of subjective physical and mental health status, specifically the 'Physical Component Summary' (PCS) which includes four subscales and correlates most highly with the subscales PF, RP, BP and GH and summarises physical health status; and, 'Mental Component Summary' (MCS) comprised and correlates most highly with the remaining four subscales, MH, RE, SF and VT and summarises mental health status (Ware & Kosinski 2003). These two summary scores help provide an overall picture of an individual's health-related quality of life (Skär et al. 2014). Scores are interpreted as 'best health' for a score of 70 and a score of 30 is interpreted as 'worst health', according to the QualityMetrics Health Outcomes scoring software 5.0.

The PCS and MCS scores are calculated from the 0-100, 8 subscale scores using a *z*-score transformation, they are multiplied by their respective coefficients (within the PCS and MCS factors) and added together (Ellert & Kurth 2013) weighted and then standardised using a linear *T*-score transformation so that they too have a mean value of 50 and a SD of 10 (Ware & Kosinski 2003, p. 28-30).

2.2.4 Anthropometric measures

To explore the phenotype/somatotype generative mechanism (Figure 2.5) anthropometric measurements including full-body scans and body composition (i.e. bodyfat percent) were acquired. All anthropometric measurements conformed to the guidelines of the International Standards for Anthropometric Assessment (ISAK) (2011) at a Level 1. The instruments used for measuring were instruments recommended in the ISAK manual.

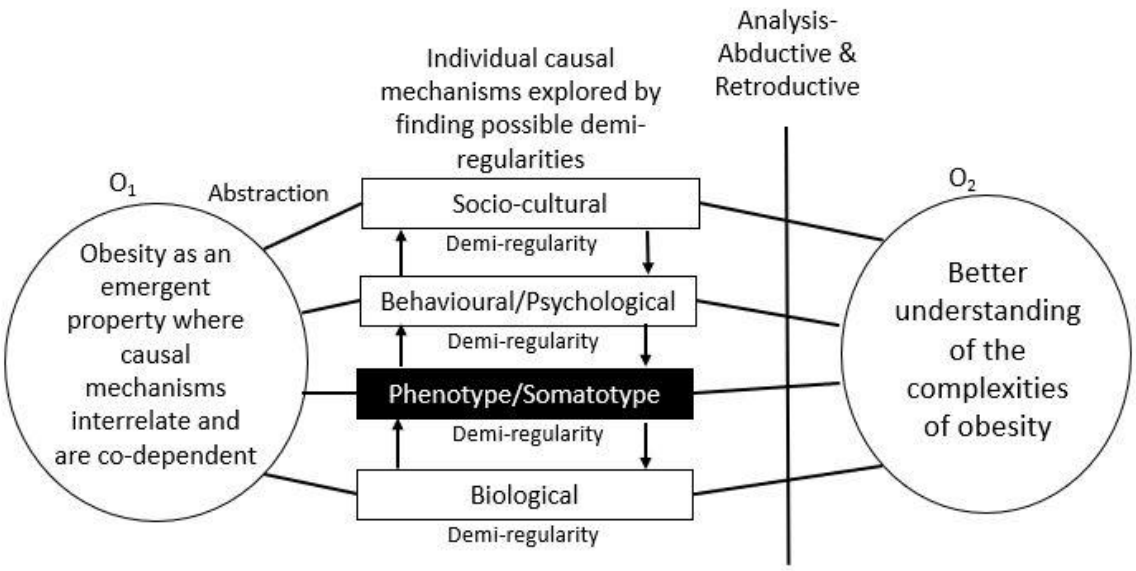

Figure 2.5 Phenotype/Somatotype generative mechanism.
The third in line generative mechanism is explored using anthropometric measurements and a full body scan.

All anthropometric measurements were conducted in a private room after being explained to the volunteers so that they would know what to expect. Measurements were taken with no shoes on and from the right side. Participants were asked during the recruitment phase, *via* emails, if they would bring their own clothing, which needed to be form fitting (for the body scan and Bod Pod measures). Clothing was provided if participant did not have appropriate attire. All measurements were taken and recorded at least twice: on some occasions more than two measurements were required when measures differed by more than 1%. The following measurements were taken: weight, stature, sitting height, waist minimum, gluteal maximum, arm span and sagittal abdominal diameter (SAD_1). From these measurements, BMI, waist-to-stature (a/k/a waist-to-height), waist-to-hip, sitting height to stature and height-to-weight ratios were calculated.

2.2.4.1 Body composition *via* BOD POD

The BOD POD (BP) Body Composition System (Life Measurement Instrument, CA, USA) (Figure 2.6) is a non-invasive way to determine fat mass and fat-free mass. It is based on Archimedes' Principle where the volume of an object can be calculated by measuring the amount of water displacement; the BP uses air displacement plethysmography to obtain the body volume of an

individual (Dempster & Aitkens 1995). It is based on the relationship between volume and pressure.

Figure 2.6 BOD POD image at Robert Gordon University.

The accuracy of the BP for percent body fat in adults and children is fairly accurate, where some studies have reported a mean difference of less than one-percent body fat compared to hydrostatic weighing (McCrory et al. 1995; Borel & Welch 1999; Fields, Goran & McCrory 2002).

Using the BP's own protocol, two separate measurements are taken for quality assurance compliance (each lasting approximately 40 seconds), which are used to determine body volume. Through measuring body mass and volume, the BP is able to calculate whole body density using the equation, density = mass/volume. Subsequent estimations of percent fat-free mass and fat mass *via* assumptions of their densities (McCrory et al. 1995) are then calculated. Because fat is less dense than fat-free tissue (approximately 0.9 and 1.1 g/cm^3, respectively, in a typical healthy

adult), a lower density reflects a lower proportion of lean tissue. The most common equation used to convert whole body density to percent body adiposity is the Siri equation:

% Fat = [495/Density] – 450 (Siri 1961; Dempster & Aitkens 1995)

Fat-free body mass can be calculated once the body fat percent is known:

% Fat-free body mass = 100 - % fat (BOD POD Manual 2004)

2.2.4.2 Body Composition *via* Bio-electrical impedance

The Tanita Model BC-418 MA (Tanita Corporation, Japan) is a bioelectrical impedance (BIA) device which was also used to assess fat mass and fat-free mass. It measures the bioelectrical impedance in the body and is based on the principle that the body is a two-compartment model consisting of fat mass and fat-free mass (Franssen et al. 2014). BIA measures the difference in impedance between these two tissues by transmitting a small electrical signal through the body *via* electrodes integrated in the stepping platform and the handles (Figure 2.7). It is based on the principle that normal body hydration of fat-free mass is 73% water (Kyle et al. 2004), and that fat, being anhydrous, is more resistant to electricity passing through it, while electricity can pass more freely through fat-free mass, with abundant water and electrolytes (Tanita Manual 2015).

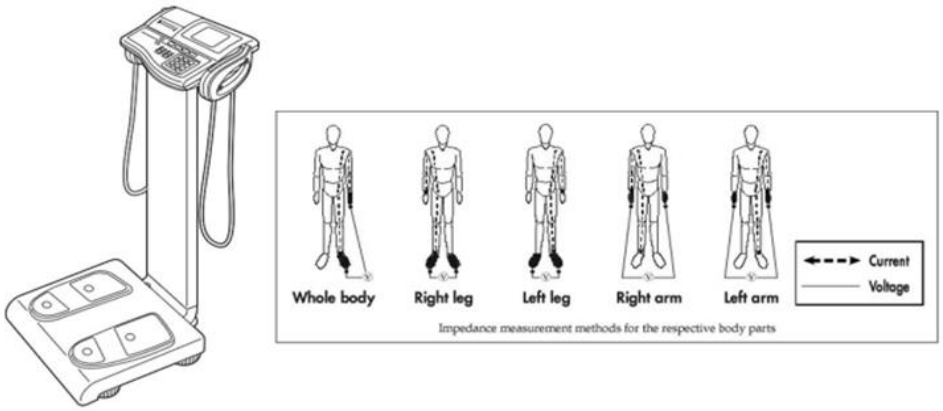

Figure 2.7 Tanita scale example.
Example of the flow of the current through the body (adapted from Tanita Manual 2015).

BIA measures total body water through a weighted sum of the amount of extra-cellular and intra-cellular water. Percent fat mass can be inferred from measurements of the resistance and the reactance, which yield a fat-free mass prediction. Its results "*are based on a mixture of theories and empirical equations*" (Kyle et al. 2004, p. 1229). BIA uses age, stature and mass as variables to derive bodyfat percent, fat tissue mass and fat-free mass. BIA was validated using data acquired from dual energy X-ray absorptiometry (DXA) studies of Japanese and Western healthy subjects, under controlled conditions (Kyle et al. 2004), BIA derived a formula through repeated regression analysis of these volunteers age, height and weight to produce highly reproducible readings for accuracy of its measurements (Tanita Manual 2015).

2.2.4.3 Blood pressure

Blood pressure was measured using an Omron 705IT device. Blood pressure was taken from the left arm of the volunteer. Volunteer was in a relaxed and seated position. Two readings were taken and recorded, from which an average value was calculated.

2.2.4.4 Full body scans

Full body scans were acquired in order to calculate a somatotype rating of the participant (somatotype rating explained below in Section 2.2.4.5). Body scans were taken using the Hamamatsu BLS Model 9036B (Hamamatsu City, Japan) scanner, and Version 1.3 Body Line Manager was used to view and aid in analysing the scans. Figure 2.8 shows an image of the scanner (top right-hand corner), with a brief explanation of how it works. It is a square, non-transportable, stand-alone scanner which contains four scanner heads in each corner. As the scanning takes places, each of the four heads which start at the top position, slowly move downwards scanning the body on all sides creating a 360-degree image.

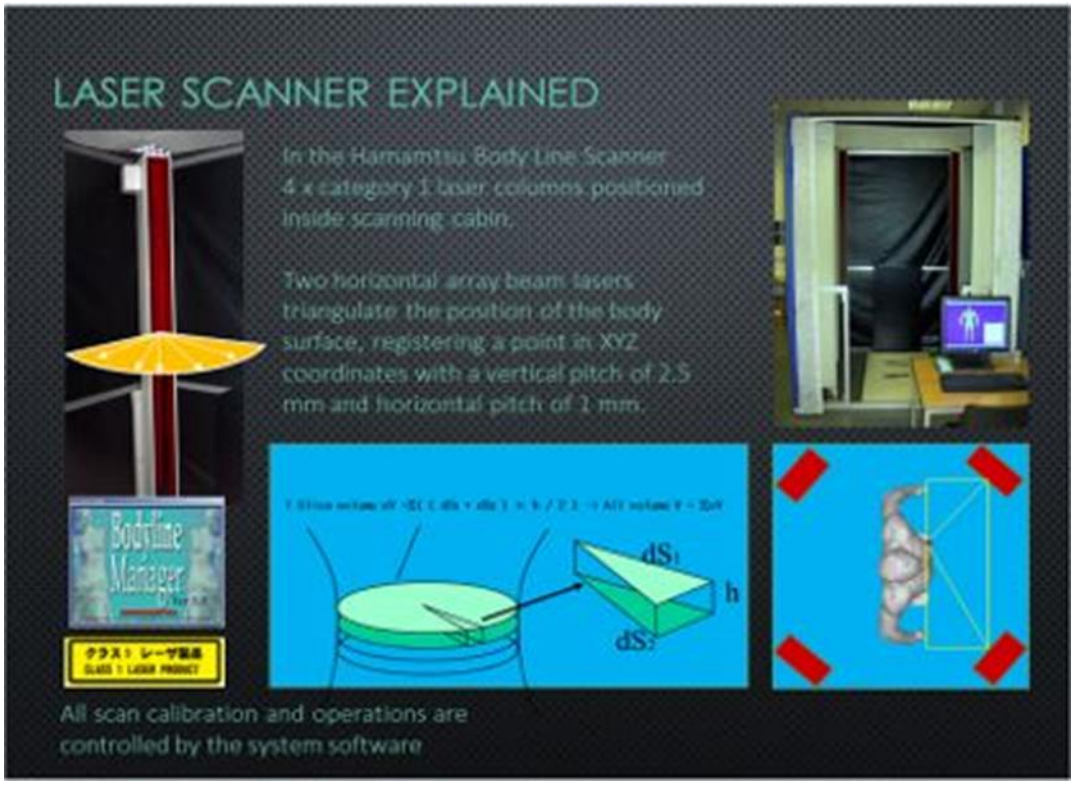

Figure 2.8 Image of Hamamatsu Body-Line scanner at Robert Gordon University.

To obtain a good and usable scan, the volunteer wore minimal, form-fitting clothing (ex. cycle shorts and a jog bra -if female) and a swimming cap (i.e. hair exaggerates head volume). Form-fitting clothing is necessary in order to obtain an accurate somatotype rating, where muscle definition and adiposity need to be visible. The scan was acquired end-tidally (i.e. at the end of normal expiration).

2.2.4.5 Somatotype rating

Somatotype rating is another method for looking at physique rather than body composition, it provides a surrogate measurement for adiposity and lean mass. Although it does not provide an adipose to lean tissue percentage, it is a visual inspection of the morphology of the body. The Heath-Carter somatotype rating (Carter & Heath 1990) is a quantitative method for describing the relative shape and composition of all ages in both females and males. Changes in physique can be recorded by using somatotype profiling, because it is sensitive to changes in physique over time. It is a dynamic anthropological identification tag and is used worldwide for quantifying the morphological variations in individuals. It is expressed in three numerals, with each number

representing three aspects of physique: (1) endomorphy, or relative fatness, (2) mesomorphy, which represents relative muscularity, and (3) ectomorphy, which is linearity based on the "stretched-outness", or slenderness of a physique. For all three aspects, Sheldon's original rating scale from 1 to 7 (see section 1.7.5 and Figure 1.4) has been extended so that more extreme physiques with larger numbers can still be depicted, when they fall outwith the somatoplot area. The numbering system can contain ½ integers when allocating the three-numeral rating.

The 3-numeral somatotype rating is based on a height (stature)-to-weight (or mass) ratio, where stature (cm) is divided by the cube root of mass (kg), or rather [stature/(mass$^{0.333}$)] called the H-W ratio. The somatotype ratings do not express absolute values, but relative values based on estimates of composition and gross morphology. It is a general summary of body shape where estimates of body composition can be inferred. An example, an individual who has a height and weight of 165.2 cm and 70.5 kg, respectively, has an H-W ratio of 40.03. Using a table constructed by Carter and Heath for 'somatotype distribution' (Appendix 13) and a full 3-dimensional body scan of the individual, (Figure 2.9), each of the three numerals are chosen according to the amount of adipose tissue, to muscle and linearity (relative weight to height), where this individual has a somatotype distribution rating of 6-4-1, (i.e. 6 represents endomorphy, 4 represents mesomorphy and 1 represents ectomorphy).

Figure 2.9 Full body scan for somatotype rating.
The participant in this figure has a somatotype rating of 6-4-1 (i.e. representative of endomorphy-mesomorphy-ectomorphy, respectively).

Deciding which numbers to assign is performed by a qualified somatotype rater. The researcher for this project was trained to carry out and ascertain somatotype ratings. To calculate where on a somatochart, [a flattened tetrahedron with *x*- and *y*-coordinates (see Figure 1.4)], an individual will lie, the formula to calculate the coordinates is: *X* = (ectomorphy – endomorphy); and *Y* = [2(mesomorphy) – (endomorphy + ectomorphy)] (Carter & Heath 1990, p. 401). Therefore, from the example above, this individual with a somatotype rating of 6–4–1 will have an *x*-coordinate equal to -5, and a *y*-coordinate equal to 1.

2.2.5 Blood sample collection

To explore the biological generative mechanism (Figure 2.10), blood samples were collected to measure a variety of biomarkers for inflammation. Blood samples were collected from volunteers when attending for interview, and were not fasted.

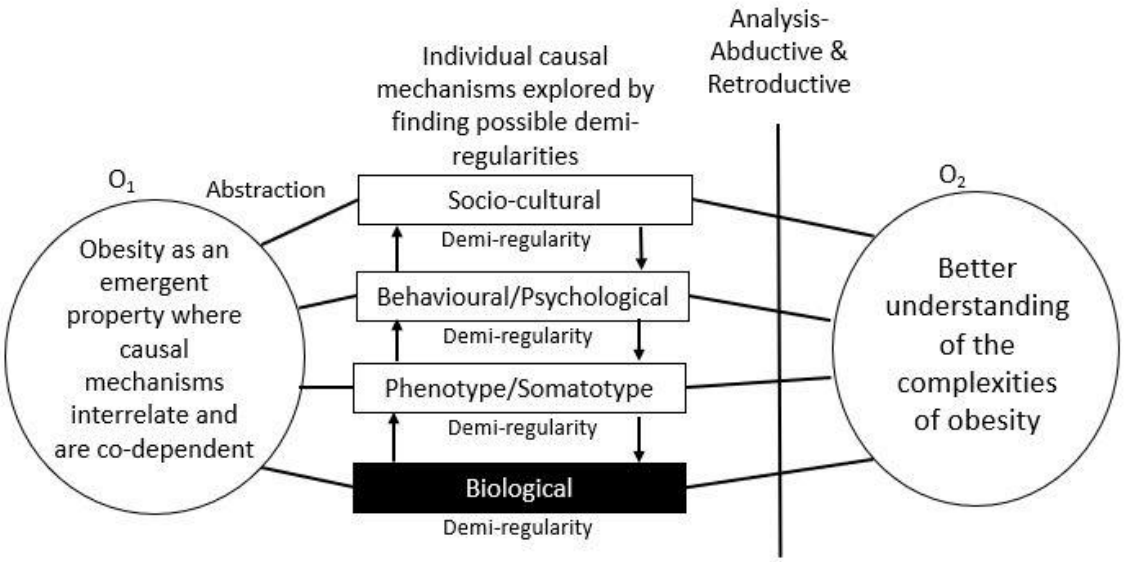

Figure 2.10 Biological generative mechanism.
The fourth in line generative mechanism explored *via* blood biomarkers.

A BD Vacutainer push button butterfly needle (21 gauge) with pre-attached holder was smoothly inserted into the most prominent vein in the antecubital area and BD Vacutainer LH 102 I.U. (Ref: 367885) was used to collect a blood sample of approximately 4.5 mL.

The blood sample was centrifuged approximately one-hour after collection using an ALC Multispeed refrigerated centrifuge PK 121R. It was spun at 2500g (1200 rpm) for 12 minutes at 4°C, with soft acceleration and soft break speed. After first centrifugation, plasma was collected and aliquoted into 3 Eppendorf containers, and immediately stored at -80°C. Red blood cells (rbc) were reconstituted to initial blood volume with Phosphate Buffered Saline solution (PBS) (0.01 M phosphate buffer, 0.0027 M potassium chloride and 0.137 M sodium chloride, pH 7.4) and washed 3 times by centrifugation until supernatant was clear. RBCs were reconstituted to their original concentration and aliquoted into Eppendorf containers and stored at -80°C.

2.2.5.1 Blood biomarkers analysis

Blood samples were analysed for interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), interleukin 1-beta (IL-1β), interleukin-10 (IL-10), monocyte chemoattractant protein-1 (MCP-1), c-reactive protein (CRP), leptin and adiponectin. Analysis of IL-6, TNF-α, IL-1β, IL-10 and MCP-1 were analysed (within the same year of collection) at the University of Aberdeen (Aberdeen, Scotland) *via* Bio-Rad's Bio-Plex Human Cytokine Group I 5-Plex Assay (Catalogue # Y00000DQD). This

multiplex immunoassay allows for the detection of multiple cytokines in a single sample (De Jager et al. 2009). This type of assay is essentially an immunoassay formatted onto a magnetic bead, an illustration of which can be found in Figure 2.11. Fundamentally, the biomarker of interest is captured by an antibody, the antibody is specific for the 'biomarker of interest'. Additionally, this antibody is covalently coupled to a magnetic bead. Once the 'biomarker of interest' has bound to the antibody-bead complex, an antibody for detection is used. The detection antibody is biotinylated, and streptavidin binds to biotin with high affinity: the entire complex can be detected with a fluorescent agent. Fluorescence is then read and analysed with special software, and readings are converted (*via* a standard curve) into a concentration. This bio-plex assay can detect 'biomarkers of interest' in as little as 12.5 µl of plasma or serum.

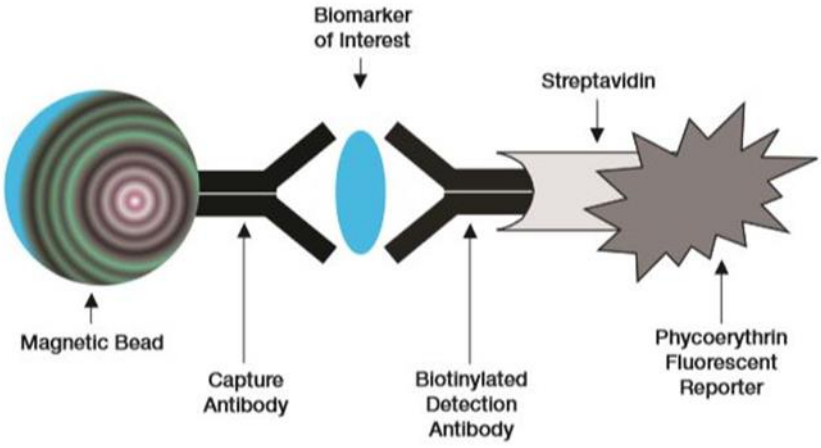

Figure 2.11 Example of an immunoassay onto a bead.
(Adapted from Bio-Rad 2019).

Leptin and adiponectin were also analysed (in the same year as collection) at the University of Aberdeen's laboratory. Adiponectin was analysed using the Bio-Plex Pro Human Diabetes Assay (Catalogue #171B7009M), and leptin, using the Bio-Plex Pro Human Diabetes Leptin Set (Catalogue # 171B7009M). CRP was analysed (within approximately 1½ years from collection, and less than 2 years) at Robert Gordon University's laboratory using an enzyme-linked immunosorbent assay (ELISA) by R&D Systems Human C-Reactive Protein DuoSet ELISA (Catalogue # DY1707), following the manufacture's protocols.

2.2.6 Statistical analysis

Unless explicitly stated, all analyses were carried out using International Business Machines Statistical package for the social sciences, version 21 statistical software (IBM SPSS 2012). Testing for normal distribution of the data was performed using Shapiro-Wilk significance and values above 0.05 (5%) were accepted as normal distribution. In addition, the use of histograms and Q-Q plots were used to further explore adherence to normal distribution. For data that followed a normal distribution, parametric test: one-way analysis of variance (ANOVA) with post-hoc Bonferroni test to explore if any significant differences existed between the BMI categories were used. Microsoft Excel, Word and SPSS were used to store and analyse data.

For data that did not follow a normal distribution, non-parametric testing using the median values of the BMI groups was explored using Kruskal-Wallis one-way ANOVA to explore differences among the BMI groups. To investigate the differences between BMI groups a Mann-Whitney *U* pair-wise test was performed. Values from a two-tailed test were considered significant for $p \leq 0.05$ (Field 2018, p. 79-82).

Tests that explored correlations between variables/scales, a Pearson correlation test was used when data followed a normal distribution and is denoted as *r*. When data did not follow a normal distribution, a Spearman's rho correlation test was used and is denoted as r_s.

Internal reliability for each of the questionnaires is reported with the Cronbach alpha (α), where a value of 1 denotes perfect internal reliability and a value of 0 denotes no internal reliability. A value of 0.60, in some research, is considered the minimum level for 'good' internal reliability (Berthoud 2000, cited by Bryman 2016, p. 158). The Cronbach α values can be found within the margins in the figures or tables relating to that particular questionnaire.

Although sample sizes were small, statistical analyses were performed on the questionnaires in relation to BMI, in order to test if there was a difference in participants' attitudes and behaviours among the three BMI categories.

Chapter 3 Study 1

3.1 Study aims and design

The first part of this study (study 1) aimed to explore the relationship between individuals with different BMIs and the obesogenic environment by applying different tools and approaches. To explore how individuals, construct their day-to-day lives in terms of food, self-perception and their orientation towards life, participants were asked questions pertaining to each topic, during semi-structured interviews (SSi). Seven validated questionnaires were also used to explore individuals' self-perceived body image, and how body image related to quality of life, individuals' orientation or outlook on life, psychological eating behaviour, possible food dependency, aspects important when food shopping, and exercise. Anthropometric measurements were taken in a sub-sample with the aim of relating phenotype to the various constructs listed above.

CR was used to find demi-regularities that might exist which could be potential factors (or links) that might give rise or are associated to obesity. By understanding and critically reflecting on how each of the different participants understand how their world is constructed in terms of how they shop and select food, how they see themselves and their embodied attitudes or disposition towards life, food and perceived body image, narratives of the various attitudes and dispositions were developed by using abduction.

The navigator tool, Figure 3.1, highlights the 3 generative mechanisms (highlighted with a dark background and white font), this result's section focuses on, from using semi-structured interviews to explore the 'socio-cultural' mechanism; questionnaires to explore the 'behavioural/ psychological' mechanism, and anthropometric body measurements to explore the 'phenotype' mechanism.

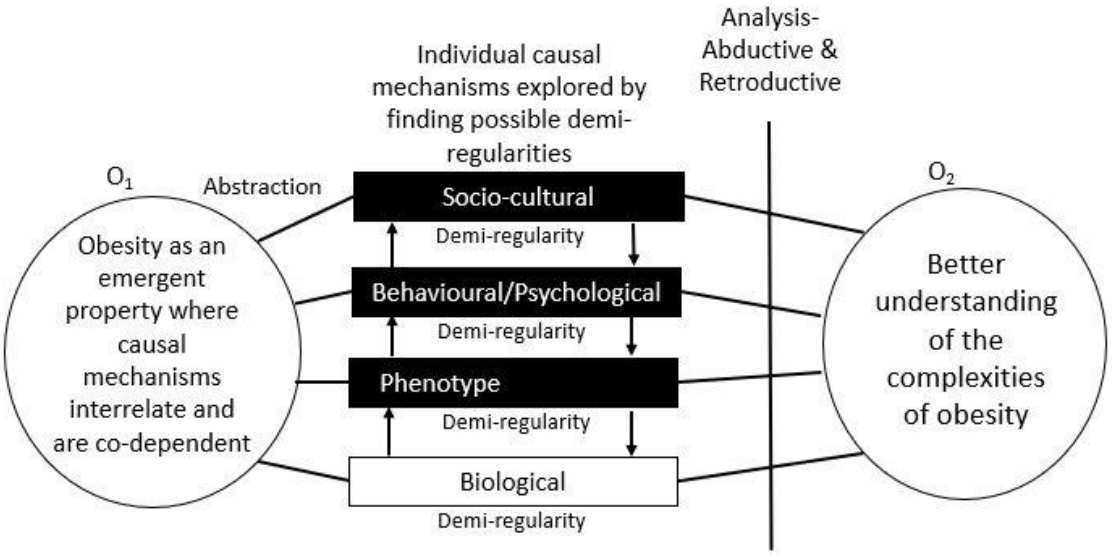

Figure 3.1 Socio-cultural, Behavioural/Psychological and Phenotype generative mechanisms. Socio-cultural mechanism explored *via* semi-structured interviews; Behavioural/Psychological mechanism explored *via* questionnaires and to some extent, the semi-structured interviews; Phenotype explored *via* anthropometric measurements.

Recruitment lasted approximately 1 year, from May 2015 to May 2016. The study involved the recruitment of participants of every age and from different BMI categories. Participants comprised colleagues and acquaintances either known by the primary investigator, or participants who had heard (*via* word of mouth) about the study from other participants. There were three main exclusion criteria, i) participants living outwith Aberdeenshire; ii) participants who had a known diagnosis of an eating disorder; iii) participants on a weight-loss programme. Participants were asked if they were willing to take part in the study and informed that their responses would remain anonymous and private. Consent was given, and a sub-group of participants gave consent to have body measurements taken and participate in a semi-structured interview. Questionnaire packs were distributed to the participants and included a demographic form (Appendix 14) asking about sex, age group and residence, and information regarding marital status, employment, income, health status, ethnicity, education, home ownership/rental status, number of cars owned in household and if their home had central heating. In addition, seven validated questionnaires (see Appendices 5-12) were used to obtain information on body image (Multidimensional Body-Self Relations-Appearance Scale), quality of life in relation to body image (Body Image Quality of Life Inventory), outlook on life (Sense of Coherence-13), psychological eating behaviour (Dutch Eating Behaviour), food addiction (Yale Food Addiction Scale), food choice (Food Choice Value) and physical activity (Scottish Physical Activity).

3.2 Findings and Demographics

Twenty-nine participants (16 female; 13 male) from North East Scotland were recruited into the study. Participants' age ranged from 21 to 69 years (mean age 41.4 ±14.7 years), and 6 participants were classified as OB, 11 as OW, and 12 as NW. No differences in age were observed among the groups. Table 3.1 contains a list of participants' descriptive characteristics and anthropometric measurements.

Anthropometric measurements taken included stature, weight, waist, hips, sagittal abdominal diameter (SAD_1) and the ratios waist-to-hip (WHR) and waist-to-stature (WSR). BMI was calculated using self-reported measurement for 5 participants (2 OB, 3 OW, 1 NW). Similarly, not all participants consented to have their measurements taken.

Table 3.1 Participants descriptive characteristics and anthropometric measurements.
Results reported as mean ±SD.

Characteristics/ Measurements	**Age** years & Range	**Stature** (cm)	**Weight** (kg)	**BMI** (kg/m^2)	**SAD_1** (cm)	**Waist** (cm)	**Hips** (cm)	**WHR** ratio	**WSR** ratio
Participants n = 29 (16 F, 13 M) (21)	41.4 ±14.7 21 to 69	169.0 ±6.6	79.3 ±26.1	27.5 ±8.8	24.9 ±7.0	89.8 ±19.3	106.7 ±17.6	0.84 ±.10	0.53 ±.11
OB (5F, 1M) (4)	44.6 ±18.6 21 to 66	165.5 ±3.0	116.4 ±42.8	43.3 ±14.7	37.5 ±7.1	119.3 ±20.3	135.6 ±25.7	0.89 ±.09	0.72 ±.12
OW (2F, 9M) (6)	46.5 ±14.8 26 to 69	172.8 ±7.6	80.0 ±8.1	26.7 ±1.4	24.9 ±2.5	93.6 ±8.9	102.4 ±3.8	0.91 ±.08	0.54 ±.04
NW (9F, 3M) (11)	35.4 ±11.5 26 to 63	168.2 ±5.9	63.9 ±7.1	22.6 ±1.6	20.3 ±1.4	75.0 ±5.4	98.5 ±5.3	0.77 ±.06	0.45 ±.03

F: female; M: male; SAD_1: Sagittal abdominal diameter; WHR: Waist-to-hip ratio; WSR: Waist-to-Stature ratio. Number of participants with taken measurements is reported in brackets (n) in the 'Participants' column.

Mean waist circumference (WC) for OB group was significantly higher (110.3 ±20.3cm) than OW (93.6 ±8.9cm, $p = 0.002$), and NW (75.5 ±5.3cm, $p < 0.001$). Significant difference was also observed between OW and NW ($p = 0.003$). WHO (2011) recommends that, men should have a WC less than 102cm, and women, a WC less than 88cm.

Obese and overweight individuals had similar WHR (0.89 ±0.09, 0.91 ±0.08, respectively), whereas, NW individuals had a significantly lower WHR (0.77 ±0.06) compared to the OW ($p = 0.001$) and OB ($p = 0.04$). The WHO recommended cut-off for WHR in women: >0.85, and in men: >0.90 (Alberti & Zimmet 1998).

WSR was significantly higher in OB group (0.72 ±0.12) compared to OW (0.54 ±0.04) and NW (0.45 ±0.03), $p < 0.001$. The recommended cut-off value for WSR is 0.50 or less in both men and women (Ho, Lam & Janus 2003).

The OB group had a significantly larger SAD_1 (37.5 ±7.1cm) compared to the OW (24.9 ±2.5cm, p = 0.01) and NW (20.3 ±1.4cm, p = 0.004). There was also a significant difference observed between the OW and NW ($p < 0.001$). The cut-off value is currently suggested to be less that 25cm for both sexes (Pouliot et al. 1994).

This analysis, among the BMI groups, where statistical significance was observed, should be interpreted with caution specifically because, these differences could be attributed to the differences between women and men. For example, the larger waist size observed among the OW group, may be related more to the number of men in that group as opposed to the number of women. However, because there is a low number of participants and unequal numbers of female and male participants in each group, it is difficult to attribute where a significant difference may actually lie. That is, if the significant differences are due to BMI groups or the difference between the sexes.

All 29 participants were Caucasian, either of British, European or American descent. Nineteen (65.5%) participants had a bachelor's degree or higher, 1 (3.4%) participant had other professional qualifications, 4 (13.8%) were educated up to HNC/HND/SQ4/L4 or equivalent level, 3 (10.3%) had GSVQ foundation or advanced, 1 (3.4%) had a Highers or A level education, and 1 (3.4%) had other schooling. Moreover, 13 (44.8%) participants were in full-time employment, 3 (10.3%) were in part-time employment, 1 (3.4%) unemployed; 9 (31%) were full-time students, and 2 (6.8%) were retired. Regarding income level, 8 participants (29.6%) had an income between £0 and £16,000 per year, 11 participants (40.7%) had an income between £17,000 and £30,000 per year, and 18 (29.6%) had an income of £31,000 or more per year. Only 2 participants chose not to report their income level. Twenty-three (79%) participants reported living in a region of Scotland that was 6 or above the Scottish index multiple deprivation (SIMD 2012), and the other 6 participants lived in a SIMD decile of 5 or below. More specifically, a SIMD decile of 1 is considered to be the most deprived data zone, and decile 10 is the least deprived. Regarding marital status, 16 participants (55.2%) were married or civil registered same sex marriage or other, 3 (10%) were divorced, and 10 (34.5%) were single. The number of individuals/participants in the study is small and information are not normally reported as percentages, however, to enable comparison with the literature, this approach has been used.

3.3 Semi-structured Interviews: stages of analysis

Semi-structured interviews (SSi) were carried out on a subgroup of participants (n = 17). Three broad narratives emerged from the analysis of the transcripts, which were developed through the iterative process of analysing each individual transcript, in order to find demi-regularities (partial similarities, see section 2.1.1.4.1 on abduction) and possibly understand transfactual conditions (see section 2.1.1.4.2 on retroduction) in and among the participants. To do this, the first stage entailed underlining and circling words or expressions that conveyed an attitude about food, shopping and/or cooking, and perceived embodiment, etc. Some examples of expressions which conveyed an attitude or disposition were statements made, such as 'all to pot', 'get in and get out', 'imagining the possibilities', 'I make a list and stick to what is on that list', 'love to cook, love to shop', 'awful' etc. (Appendix 15). From this first stage, narratives began to emerge, more specifically, the attitudes and/or dispositions towards shopping, cooking and embodiment began to emerge.

The second stage involved creating a 'flow diagram', specifically this was helpful in order to apply retroduction (i.e. creative thought process, see section 2.1.1.4.2 on retroduction). The flow diagram contains some of the modules from the interview question set, with the participant's answer (i.e. expression/attitude) linked to that module. As an example, 'diet' was a module; if a participant stated that her/his diet was 'all to pot', a line was drawn to connect this statement to that module 'Diet' (Appendix 16).

Stage 3 involved itemising or listing each statement under a narrative, also a process of abduction and retroduction, in order to draw a visual picture or representation of the individual (i.e. to get a feel or a sense of that participant's overall pervading attitude/disposition) (Appendix 17). The three narratives which emerged were 'Instrumental', 'Disciplined' and 'Aesthetic', and will be referred to as the IDA profile from this point forward. The IDA profiles were based upon how the participants identified in function of how they related to food, or prioritised it, in their everyday practices, how they saw themselves in relation to food, socio-cultural functioning and embodiment. The model (or concept) for the IDA profile emerged from the words and expressions the participants themselves used when describing their food habits.

Each of these three narratives were overall quite different in how the individuals related to food, how they perceived themselves in relation to health and embodiment, how they felt about their diet, what might initiate an eating episode outside of hunger, (i.e. emotions or boredom, etc.) and to some extent, socio-cultural functioning. Table 3.2 contains a list of the participants'

anonymised names, sex, age, IDA profile identity, a biographical detail (i.e. employment or student status), and their own words on, whether or not, this status effected their eating or diet.

Table 3.2 SSi participants' details: Anonymised name, sex, age (years) and IDA profile identification.
I: instrumental; D: disciplined; A: aesthetic. A biographical detail (employment or student status) with subjective information about how this affects how they eat. F: female; M: male, age in years.

Name	Sex	Age	IDA	Biographical detail
Iona	F	21	I	FT desk job, sitting a lot; influences the way I eat; I just eat when I eat
Isla	F	58	I	FT desk job, do not sit all the time; eat at canteens on campus, but the food can bloat me
Beth	F	31	I	FT PhD student; does not influence how I eat
Grace	F	66	D	Retired, affects eating timeframes
William	M	41	D	FT desk job, mostly sitting, go for walks on my breaks instead of eating
Mary	F	49	D	FT professional desk job, with bouts of sitting; allows for good eating
Alicia	F	27	I	FT PhD student, standing and sitting, affects what I eat; sometimes I eat because I have to
Chloe	F	34	D	FT professional; Part-time student, affects the way I eat in a positive way
Abbey	F	63	D	PT desk job; tend not to eat when at work
Fiona	F	27	D	FT PhD student, mainly sitting; affects how I eat, bring my own food to university
Ingrid	F	27	D	FT PhD student, mainly sitting; does not affect how I eat, mainly pack my lunch
Alan	M	66	A	PT professional desk job, allows for good eating, buy my lunch at work
Tom	M	49	A	FT labourer, walking 3-5 hours a day, bring my own lunch, sometimes miss lunch
Mike	M	57	A	FT professional desk job, does not affect what or when I eat
Tate	F	26	A	FT PhD student, sitting and standing, affects what I eat, prefer eating in evening when the stress is behind me
Dave	M	59	A	FT professional desk job, does not influence how I eat
Andrew	M	69	D	Retired, affects how I eat, often miss lunch, but it does not bother me

Ten (59%) participants who took part in the SSi were in employment where the majority were working full-time and only 2 (12%) participants were in part-time employment. Five (29%) were full-time students, and 2 (12%) were retired.

The IDA analysis identified 4 instrumental, 8 disciplined, and 5 aesthetic eaters. Table 3.3 summarises the main motifs from the IDA analysis, and lists examples of some of the main differences found among these three attitudinal/dispositional approaches towards food and eating. The instrumental eater did not express experiencing food in a rich, aesthetic and pleasurable way; in the way the aesthetic eater expressed experiencing food and anticipating eating pleasure. For the disciplined eater, his/her main priority was for either restricting or having a heightened awareness of food intake. However, the disciplined eater had either an underlying instrumental or aesthetic attitude to food. Which explains why, in the Table 3.3, disciplined eaters may appear to be in between the instrumental or the aesthetic profiles. Additionally, aesthetic eaters generally paid attention to food labelling; but more to sugar than fat. They largely did not eat due to emotions or boredom and lost their appetite when stressed. Because food was important to these individuals, food had a high priority in their life. In contrast, instrumental

eaters gave food a lower priority and saw it as a much less important part of life. Both the disciplined and aesthetic eaters felt that diet and food were important because of health and to some extent wellbeing, whereas, the instrumental eaters felt food was important because if they did not eat, they would pass out.

Table 3.3 The three narratives/themes comprising the IDA profiles.
Examples of repeated expressions or the dominant expression for each eating profile as identified through IDA analysis. *Note that 'diet' refers to a way of eating and not dieting per se.

INSTRUMENTAL	AESTHETIC	DISCIPLINED
Mostly eat to live	Mostly live to eat	Eat to live and live to eat
Food is not important	Food is very important	Food is functional
Food does not rule my life	Food is part of the enjoyment of life	Food is nutritional fuel
Will pass out if I do not eat	Everything in moderation	May or may not eat in moderation
*Diet and/or food is not important	Diet and/or food is important	Diet and/or food is/is not important
Do not (typically) eat breakfast	Eat breakfast	May or may not eat breakfast
Do not enjoy food shopping, Get in and get out	Enjoy food shopping (imagining possibilities)	May or may not enjoying food shopping; Usually always shop with a list
Finical eater; will eat the same kinds of foods; food neophobic (lacks variety)	Explorer of foods / will go out of my way to find new foods; food neophilia (seeks variety)	Conscious of nutritional value of food (may or may not seek variety)
Texture and look are important	Can wait to eat something I really enjoy	May or may not snack; or if do, only once or twice a week
Cut fat off of everything	Like fat on meats (the particular fat that comes with the type of meat)	Aware of the amount of fat
Food labelling not important	Food labelling; pay attention to the amount of sugar	Food labelling; pay attention to sugar and fat
Convenience is important	Freshness and taste are important	Convenience is important
Do not know if full or not after a meal	Will go back for a second helping if the food is particularly tasty	No going back for second helpings
Diet not balanced	Diet balanced	Diet balanced
Do not eat 5-a-day	Generally eat 5-a-day	Generally eat 5-a-day
Need to eat more fruit and vegetables	Love vegetables	Enjoy fruit and vegetables
Eat when stressed, bored or watching TV, Mindless eating	No emotional eating; no mindless eating, Lose appetite under stress	May or may not eat when stressed or bored; May or may not mindlessly eat
Eat main meal in front of TV	Eat main meal at the table	Eat main meal at the table / or TV
Do not usually eat dessert	Dessert can be a glass of wine, cheese and/or fruit	May or may not eat dessert

Not all participants fitted neatly into one profile, indeed, some participants' characteristics overlapped with another eating profile. However, the iterative process and the use of critical realism's modes of inference, in particular abductive and retroductive analysis, allowed the researcher to reach conclusions as to which eating profile was dominant in each participant. For example, if a participant stated *I enjoy having a glass of wine with my evening meal, but only on the weekends*, this would be classified first as disciplined and then aesthetic. It is classified as disciplined first because this individual placed a limit on how often s/he has a glass of wine, and classified as aesthetic second because the individual is deriving pleasure with having a glass of wine with her/his meal. If a participant said *I must have dessert after my evening meal because this is how I was raised*, or *because I find that I need it to round off my meal*, this would be classified as instrumental because his/her desire for the dessert is an impulse, based on what has always been or by a need to round off his/her meal; it is a 'hedonic eating impulse' and a 'visceral eating pleasure' and is often beyond the eaters' volitional control (Loewenstein 1996; Dube & Le Bel 2003). However, if s/he were to state *I have a dessert occasionally, and in moderation because it enhances the enjoyment of the meal*, then this is classified as aesthetic; because this individual is not allowing the experience to dominate them (i.e. s/he has volitional control), but instead s/he limits her/himself in a fashion of 'in moderation', and the experience of having the dessert relates to the enjoyment of her/his meal. Most of the participants could identify with what moderation meant and a majority of instrumental and surprisingly, disciplined eaters, stated that they could not 'do moderation' that once a packet of crisps or candy or whatever was opened, they felt they had to finish it. Thus, the researcher sought to identify the underlying attitude which caused or led a person to eat whatever it was they either deliberately ate, or subconsciously, (in the case of mindless eating) chose to eat.

3.3.1 Findings from interviews

The following sections 3.3.1.1 to 3.3.1.5 report some of the answers that the participants provided reflecting best their classification in one of the IDA groups.

'Shopping for a variety of foods' emerged when participants were asked what influenced the foods they purchased (Section 3.3.1.1). It is an interesting concept because in this case it means the opposite of buying a lot of the same kinds of foods. One of the differences between an instrumental and aesthetic eater was variety. This study highlighted that instrumental eaters, because they had a neophobic approach to food, tended to eat a lot of the same kinds of foods. In

contrast, the aesthetic eater had a food neophiliac approach and derived pleasure from eating a broader range of foods and was open to exploring new foods. The disciplined eater may or may not have sought variety, their main priority was about the amount (or limiting) the food eaten.

'How would you describe your diet' is relevant since participants with the instrumental profile mostly described their diets unfavourably, versus the disciplined who felt it was healthy, as did the aesthetic eaters, except they admitted they might eat a bit too much (Section 3.3.1.2). How participants felt about their body shape and/or image (embodiment) and if they felt that the foods, they ate had a direct effect on their body shape was also discussed (Section 3.3.1.3). There were differences in how each of the IDA profile categories identified with their body shape. Overall, instrumental eaters expressed dissatisfaction, disciplined eaters expressed a degree of satisfaction, and the aesthetic eaters expressed contentment with their body. 'Social aspects around food' topic was also considered (Section 3.3.1.4), instrumental eaters did not describe it as something to look forward to, or as a social event; whereas, the disciplined and aesthetic eaters described it in terms of 'pleasant' and 'enjoyment'. How participants responded to the question on the importance of food, or how important food was in their life was also explored (Section 3.3.1.5). This idea developed during the course of the interviews and so not all participants were asked this question explicitly. Instrumental eaters expressed that food was not important, whereas all aesthetic eaters and overall the disciplined eaters felt that food was very important.

Following every extract (or participant response), the code L and the number after it refer to the place where the text can be found in the participant's transcript (ex. L30, line 30). Additionally, sometimes three dots/periods follow (i.e. …) a participant's answer, the dots were used to indicate that the sentence was not completed by the participant. If three dots are in the middle of a sentence, this indicates that the full answer was not relayed in this thesis: the most relevant answer is conveyed by the researcher in order for the reader to 'get' a flavour for the three attitudinal narratives.

3.3.1.1 Shopping for a variety of foods

Instrumental participants

Alicia exemplifies the instrumental narrative: she was not explicitly asked about shopping for a variety of foods, but early in the interview she stated that she was a 'pernickety' eater, and quipped, *"I would say that the food range I eat is quite limited, but what I do eat I like, I eat it in*

vast quantities, yes, so probably more than you should" (L30). Later she also commented on eating the same foods, *"I'll go through spells where I'll eat… I'll find something that I like, and I'll eat it 'til the point where eventually the smell of it will make me feel sick. And then I can no longer eat it again"* (L532-3).

Isla suggested that even to her detriment she probably ate too much of one item, she stated, *"I probably eat too much pasta, because I could eat pasta all the time. But I have noticed that, if I have too much pasta, I feel very bloated… I could eat pasta about 3 or 4 times a week"* (L250-6). Isla also expressed how she did not care for most meats because of the fats on them. She only cooked vegetables twice a week for her family, even though they did not or would not eat them. This implied that her diet was limited in variety.

For Beth, variety was about economics when shopping, she expressed, *"it largely depends on how much money I have, if I've got plenty of money, I'll be more focused on like taste and variety and nutrition, but if I haven't got much money, it's more like what's really cheap"* (L92-4). Beth's answer when asked to describe what was in her shopping basket, revealed a lack of variety, she replied, "*I would have a bottle or two of grape juice, in case my blood sugars get low, um and then a couple of premium sandwiches, and then depending on how I'm feeling, I would, there would be somewhere between zero and 3 kinds of sweets*". She also explained, "*I'm not in the habit here yet of actually doing cooking, so for now I'm basically just getting prepared salads and like, prepared sandwiches and so I'll just get those and eat them…*" (L40-1).

Iona stated simply 'no' to the question if she shops for a variety of foods, and added, *"I do buy like different stuff and that, when we go shopping, we normally try and get meat, veg that we like with the meat, like tatties or whatever, but then sometimes we're like 'no', we're just going to have that, but normally we do try and have a proper meal like meat, veg and tatties, it just depends on what there is"* (L89-91).

Disciplined participants

Chloe explained that although she had found food to be cheaper in ALDI and ASDA, she was unwilling to compromise on the quality or the variety of vegetables, which is why she continued to do her food shopping in Morrisons. Later she described when cooking her (food) ingredients, she expressed the importance of flavour and nutrition in what she was eating and how she prepared it so as "*to get the goodness out of what you are buying"* (L343).

Ingrid, not explicitly discussing variety, explained that balanced meals and nutrition were important points to consider when she shopped, she stated, *"Sometimes I only have meat and a salad, but I do try and have... always have some vegetables. I'm not a big massive fan of pasta… I do try and have two days a week when I don't eat meat"* (L76-80). Ingrid also explained how she has pasta only 3 to 5 times a month and if time permits, she will make her pasta from scratch.

Grace, when describing what she might put together as a meal, explained, *"I've got a few basic things that I do, I mainly do protein and vegetables, like a stir fry, or protein and salad, and a few potatoes on the side"* (L42-3). Grace also discussed throughout the interview how she was gluten intolerant and how her husband could not eat seeds or nuts (L110-12) and so avoided all products with these ingredients. In this sense she was quite limited in her range of food products that she could purchase.

Aesthetic participants

Mike used vivid language in describing his food purchases as *"spices or exotic rices or specialty food"* (L13). Moreover, he described the food bases from which he and his wife use to cook from, such as tinned fish, tomatoes and pulses, he explained that they do not buy frozen anything, except for salmon.

Dave was also very descriptive in his conveying the food types he purchased, using terminology such as "*fresh Indian vegetables*" (L160) and he described in particular how the smaller sized aubergines purchased at the speciality store, are richer in flavour (L164).

Tate explained her frustration in the lack of variety of vegetables available in Aberdeen compared to her home country where she had access to 'fresh and proper looking vegetables' (L160-1) and to some extent meats, she stated, *"sometimes of course you have to restrict your choices regarding to what is available"* implying here in Aberdeen (L163). She did describe her shopping trolley contents as having a variety of meats, always some fish and a variety of vegetables and fruits (L101-9).

Alan, in a very matter of fact manner quipped, "*a little bit of everything does ya good, and too much of one thing does ya harm, so a varied diet*" (L399-400).

Summary of 'Shopping for a variety of foods'

Although eating a wide variety of foods was not explicitly discussed or described in detail, the aesthetic and disciplined eaters' examples indicated quite a contrast from the instrumental

eaters. It appeared that variety, for the aesthetic eater was equated with a high regard for the description, flavour, and taste of food. In contrast, the instrumental eaters expressed food choice in terms of their finical attitude towards food types so that the foods they purchased were consistently a lot of the same types of foods. The disciplined eaters communicated that the nutritional aspect of food was important for them when considering what foods to buy.

3.3.1.2 How would you describe your diet

Instrumental participants

When instrumental eaters were asked how they would describe their diet, their descriptions were not favourable. Alicia stated twice that she would describe her diet as *"absolutely shocking"* (L543, 721). She declared that she was never going to have the perfect diet, "…*it's far from perfect; but I'm never going to have a perfect diet, I don't like food. I actually don't like… if I didn't have to eat, I wouldn't eat ever*" (L546-7).

Isla also intimated that her diet was far from ideal, "*It's definitely not balanced. A lot of that is because I have so many eating idiosyncrasies, let's say*" (L290).

And although Beth felt that she did eat healthily, she also alluded to eating a lot of the wrong foods, "*fairly healthy with a lot of extra junk added on*" (L338). She explained about her meals "*I eat fairly healthy, but I also tend to buy foods to binge on, so I'll be like, 'oh those!... Oh, that ice-cream or whatever looks really good' and I just really, really want a chocolate malt*" (L97-99).

Iona, with laughter, summed up her diet in three words, it was "*all to pot"* (L411).

Disciplined participants

In contrast, a disciplined eater when asked how s/he would describe her/his diet, for the most part expressed it in a positive light. William described it somewhat contentedly, "*I don't think perfect, but I don't think it's bad"* (L329).

Mary explained, "*I think it's a balanced diet. And there's a consequence, probably healthy, but I eat a bit of everything, and I think that's what I associate balanced with, healthy*" (L281-2).

Ingrid appeared pleased as she exclaimed, "*Balanced! Healthy balance, I definitely would say that… with little sweet and savoury snack…*" (L382).

Both Abbey and Andrew were a little more hesitant, but remained contented, as Abbey stated, "*Probably not as good as it should be, but I think it's reasonably healthy, I would say*" (L453). And Andrew specified, "*I like to think that it's reasonably healthy, I don't eat a lot junk food, I don't eat a lot of fats or a lot sugars*" (L300).

Aesthetic participants

The attitude of the aesthetic eaters as to how s/he would describe her/his diet was quite similar to the disciplined profile, that is, although they felt some adjustments may be needed, they were, overall, happy about their diet. Dave expressed it this way, "*I can improve it, but I'm reasonably happy that it's healthy. Well, let's put it the other way, it's not unhealthy*" (L500).

Tate alluded to her ability to eat healthily, and her feelings about her diet was not in terms of the foods she ate but the meal times, "*I think it's a healthy diet, and the only thing that I should change is the time and the gaps during the day. I should eat something, but I don't do that, and it's something that I know, so if I would change something, it would not be the food that I'm cooking but the timing*" (L313-15).

Tom stated that he felt his diet was varied and interesting, he described that it consisted of fresh vegetables, meat, low in sugar and carbohydrates and high in protein (L220-4).

Mike expressed that he would like to improve his diet, but intimated that it was balanced, he articulated, "*I think I could probably improve it a bit, I'm sure it's healthy, I probably over eat a little bit, I have a good balance of my major nutrients, but I probably eat more calories than I actually need. So, I would like to be a bit lighter than I am, so at the moment I'm just going back to fruit... cuz eating fruit takes longer and it's less energy dense and it's actually good for your digestion and it ticks a lot of boxes*" (L317-21).

Summary of 'How would you describe your diet'

Both the disciplined and the aesthetic narratives exhibited similar feelings about the way individuals were eating and how they felt about their diet: although they felt that they could make changes to improve it, overall, they were content with it and expressed it in a favourable light. In contrast, the instrumental eaters conveyed a dis-favourable attitude because of either eating too many of the same foods, or too much of the wrong foods.

3.3.1.3 Body image

Instrumental participants

The way instrumental eaters saw themselves in terms of body shape, image and foods affecting their weight was overall, discontent. Iona expressed succinctly, "*Not good, I don't like it"* (L522), furthermore she felt that she did not have a healthy body shape and stated she would like to lose weight, she felt this could be accomplished by "*Walking more, and not eating snacks, watching what I'm actually eating"* (L536). Additionally, she felt that "*probably, yeah*" the foods she ate influenced her body shape (L543).

Alicia expressed complete discontent with her body shape, but also an unwillingness to make any changes, she exclaimed, "*Absolutely not great, I've never been a fan of the way I look, but I wouldn't say it doesn't prevent me from eating",* (L591-3). When asked if she felt she had a healthy body shape, she emphasised, "*Me looking at my body shape, I would say no, but I think other people would look at my body shape and say it's fine. People who are perhaps not experts… do you know what I mean?*" (L595-6). However, she expressed no interest in altering her food habits or exercise even though it might have a positive effect on her body, she stated, "*I'd imagine that it probably would, but that's not something that I would do… No. I think that if I was willing to do that, it would change my body shape and I'd be healthier for it, but it isn't something that I would do right now*" (L620-3). Even though Alicia had expressed that she could possibly change her body shape by changing her food habits, she also believed that the foods she ate did not affect her body shape, "*no, I don't actually, strangely*" (L605).

Beth stated that if she lost a large amount of weight she would feel *"great"* about her body shape, she explained that before she put on all the weight that she had, she had a Marilyn Monroe figure. For her, a healthy body shape was idealised in terms of the Hollywood icon, Marilyn Monroe, Beth described as follows, "*well for me, I mean it would probably be if I were about 160 pounds and ahhh. I mean, my body, before I gained weight was very like, Marilyn Monroe sort of rrraaahh*" (L405-6).

Isla was pragmatic in expressing how she felt about her body, *"Umm… alright sometimes … I know I'm overweight, but first thing in the morning, I feel absolutely ok; and then as soon as I eat anything, I just feel fat"* (L407-8). However, when asked if she thought she had a healthy body shape, she answered saying, "*In a way I think I do. I'm in proportion"* (L415). She did express a desire to lose weight, but when it came down to practicality, she explained, "*you sit and say, I*

haven't got time to do this, I haven't got time to do that… and then I think about, you sit for a couple of hours in the evening and you watch telly, or you're on the computer or stuff, and I think, well you should be doing something else there. But then, to be quite honest, at (my age)*, at that time of night, I'm absolutely buggered, and I don't have time …you know, it's a catch 22!"* (L425-9).

Disciplined participants

Disciplined eaters expressed a certain level of satisfaction with their body, although most were not completely satisfied, the majority of them expressed they would like a smaller stomach. For example: Fiona intimated a shortcoming in her body because it was not perfect, "*Umm… it's ok, but I go to the gym, so I know I should be working on it, you know, it's not like I look in the mirror and I'm like 'you look gross today'… but I know it's not perfect*" (L422-3). Although she professed to feeling comfortable in her body, she was dismayed because her "*tummy is too big*" (L427). Additionally, she felt that the foods she ate had an effect on the shape of her body, and that she "*should probably skip some of the chocolate*" she eats (L434).

Mary hinted a somewhat practical attitude and yet a conscious effort at maintaining what she has, she stated, "*At my age? I feel, in general I feel ok, I know I'm conscious about my body, but I'm ok, I'm doing the right thing from an eating point of view, so what I put into it is good. A kind of how to use the energy from an exercise point of view I'm not very good at that, and so my slight dissatisfaction from my body comes from the not exercising, so I would like to have a more firm body, body parts, but I'm ok with my weight, I have no issues with my weight or its distribution, or fat, maybe yes, but I do know that if I were to try to lose weight, I will never lose it where I'd like to; and so the solution to that would be to exercise and shape it that way*" (L329-36). Mary also felt that her body shape was affected more by her exercise (or lack of it), than the foods she ate, as she indicated, "*in my case it would be exercise, for others it might be to reduce the treats or reduce the chocolates or a combination of both"* (L352-3).

Andy expressed overall satisfaction, except for his stomach, he commented, "*I'm pretty good about my body. I'd like to see my stomach a bit thinner, but generally speaking, I'm pretty happy with my body, yeah"* (L346-51). When asked if he felt he had a healthy body shape he replied, "*Yeah, I think so, my belly is probably a little bit bigger than it should be at the moment*" (L353-55). In addition, he felt that he could stand with losing a few kilos but that he felt he would have no trouble with losing it via diet and exercise, he specified, "*It'll be both, it will be exercise and I'll*

cut down on what I'm eating. I hope to get back to the gym, but as I said, I've been sick for the last five or six weeks, and it's stopped me from going to the gym" (L356-62).

Aesthetic participants

Overall, Aesthetic eaters expressed a more positive level of satisfaction or contentment with their body's, compared to the disciplined eaters, as the following excerpts reveal.

When Tate was asked how she felt about her body shape, she explained enthusiastically, "*Yeah. I think I feel quite happy"* (L400). When asked if she felt that she had a healthy body shape, she explained, "*Umm… I have already tested this in the past, yes, because for example I know that probably, I don't know that you will agree, I can see the weight on my body is not in specific areas... but it's all over* (evenly distributed the researcher asked), "*Exactly, so considering that, yes, I think I'm ok*" (L417-20).

Furthermore, Tate felt that foods did have an effect on her body shape, she articulated, "*Of course, yes, I mean, as I told you it was something that I was able to see in the last two years, since I changed the way that I was cooking and the way that I was choosing what I'm going to eat, and by having more exercise in my daily life, so yes, it's obvious, and of course there is an affect*" (L423-5). When asked if she would like to lose weight, she explained in an upbeat manner, "*actually, it's something that is always good when it happens, it's not a target for me, so I wouldn't say that 'oh my god I want to lose for example 5 kilos, until the summer' for example, before I go for swimming with my bikini, no, it's something that of course it's good when it happens, for example especially when you have more weight than you should, but I wouldn't say that it is a main target, but if it happens then it isn't bad at all*" (L427-32).

Dave expressed his feelings about his body in terms of its vulnerability in health and/or its weaknesses, he was pragmatic in his stating, *"I suppose I'm getting more conscious of its fragility. Maybe because at my age I'm thinking more about mortality"* (L545-6). …*"you discover weaknesses in your body, but that's just, for example, bad posture that causes back pain and muscle ache and so on"* (L560-1). And although he felt neither happy or unhappy about his body, he agreed that he felt comfortable in it. Additionally, he felt that the foods he ate had a direct effect on the shape of his body. When asked if he had a healthy body shape, he felt that this concept had more to do with his body's ability to perform tasks or physical fitness than anything cosmetic, he clarified, *"there is always that ideal that I must shape up my body and shape up myself to be able to do this, because that's my notion to being healthy … I never thought of it as a shape thing, it's more to do with its ability to do things… fitness*" (L564-68).

Tom expressed that he was *"content"* with his body shape and although he felt that he did not have a healthy body shape and needed to lose 4 to 8 kilograms, he felt that he had no need to improve it, he emphatically stated, "*no, I don't think I need to find that time in the day* (to exercise), *because I am happy with who I am*" (L279).

Summary of 'Body image'

The aesthetic eaters appeared to have a more pragmatic and relaxed attitude towards their bodies, and their attitude towards body shape was related more to physical fitness than an ideal shape. The disciplined eaters fared similarly to the aesthetic profiles, although perhaps not as comfortable. In contrast, the instrumental eaters expressed dismay and dissatisfaction overall, and body shape was related to an image ideal or thinness.

3.3.1.4 Social aspects around food

Instrumental participants

With regards to the social practices around food, when instrumental eaters were asked about meeting up with friends or going out to eat, they did not express much enthusiasm. Alicia exclaimed, "*Oh no, I would be perfectly happy just eating it* (a meal) *on my own. I'm comfortable, I'm fine with eating with people if I know them, I'm not comfortable with eating with people I don't know. …but you know what I mean, if you're just getting to know someone, you don't want to eat in front of them, like for some reason you have to get past that barrier to get comfortable with them, it's kind of a strange, kinda… I don't know what the fear is, whether you're gonna like end up with it* (discussing spaghetti) *everywhere, or spill it, I don't know, but there's some sort thing preventing…*" (L515-24).

Although Beth was not asked explicitly if she ate out in restaurants with friends, at a point during her interview she had expressed that if she felt more confident in herself she would perhaps eat better, she expressed, "*I mean, if I had more confidence in myself, and I think that if I had a better social support network as well, I would probably being doing a lot better, I'd be eating better and that sort of thing, but and sometimes it's like 'yeah, I know I should be eating healthily, but eeeaahh, why bother, it's not like anybody's gonna notice or care"* (L621-4). She had explained earlier during the interview how she lacked confidence in her social abilities (L565).

Iona expressed her experience of meeting up with friends rather plainly, she professed "*Not really, no. I sometimes go around to my neighbours for like tea and that, but I don't really go out much"* (L376). When asked if she would like to go out more with friends, she replied, "*I suppose yeah, I would. But it's good that I don't because then I save money. But yeah, I suppose it would be good to go out more often*" (L389-90). She also stated, in reference to going out to eat that, "*Yeah, it's nice there* (discussing a pub) *and you get a nice meal as well… Sometimes I get bored of eating out because I think it's just the same frozen stuff, depending on where you go*" (L209-10).

Isla was the one instrumental eater who expressed pleasure in the social aspect around food, she exclaimed, "*Oh, I enjoy the whole social thing around food, I enjoy… You know, we don't go out to eat a lot, but we will have people over for a meal, because we both love cooking, we both love sitting down and having a few drinks, having a few laughs… Yeah, I enjoy the whole social aspect of it"* (L398-402).

Disciplined participants

Disciplined eaters conveyed enjoyment around the whole social practice around food as something pleasurable. Mary described her experience around food and either having friends over for dinner or meeting up with friends as something that was done as a social thing, when explaining that when she catches up with friends, she expressed it as, "*Like a social thing, like a quick catch up then we can meet in town for something to eat, and it's more lunch time than dinner*" (L277-8). In addition, she stated during the interview *"Yeah food is one of my main interests, but as a social aspect, as a social encounter I am really interested in finding out how different people eat, what their different cultures are, when we go abroad we look at the scenery and we look at the culture and also the culture of food, that's very important for me*" (L317-20).

Chloe derived enjoyment in how once a month her friends would come over and either she would cook a dish, or her friends would bring food, she stated, "*I enjoy cooking for my friends. My friend will make something and bring it… I really like cooking from scratch and feeling that you know, this is good quality dinner, it's you know, it's with the ingredients themselves rather than you know a package*" (L335-42).

Andy described the importance of food in terms of a social 'thing', he exclaimed, "*I enjoy food. Sure, I enjoy cooking it, I enjoy eating it, umm… but I think we probably enjoy the social interaction with having people for dinner or going out with people for dinner, as much as we enjoy the food… so it's not right at the top of the list, the most crucial part of the evening, it's just a means to an end, we fuel the tank up; it's the social interaction that's probably more important*" (L337-42).

Aesthetic participants

Aesthetic eaters, described their social practices around food with enthusiasm; Tate explained that often she has friends coming around to her place for dinner, she pronounced food and friends as such, "*I think this is the best way, apart from the fact that I don't have much free time, eating is a really nice opportunity to see someone about things and enjoy the food as well*" (L294-5). She also specified that friends would come over to her place to enjoy a movie and takeaway food, as well as enjoying going out to a variety of restaurants (Turkish, Italian, Chinese, Mediterranean) with family and friends about once a week, mainly during the weekend (L141-6).

Alan described his social experience in meeting up with friends in several ways, "*we probably meet more often with friends than once a month… I mean for example, we are out for a meal on Friday night, out for a wine tasting with friends one Saturday night, umm... we went out last week with friends, yeah, so it's once a week that we probably go out*" (L384-8). He articulated that when meeting up with friends they tend to have them over, or will go to their home, "*we tend not to go out to restaurants, we go to their homes, they cook from scratch, they're the same age as we are, brought up in exactly the same way, …they always cook from scratch*" (L390-2). Additionally, he commented on how bumping into friends or neighbours while shopping added pleasure to the journey because that conversation could very well end up with them going into a café and continuing the conversation there (L83-4).

Dave also expressed enjoyment from the social experience revolving around food, "…*even like a Sunday lunch, inviting family around, anticipating and conversation and a variety of stuff on the table… and it doesn't matter if it's indoors or outdoors, I think I enjoy it equally. I think it's the company that makes it, more than the socialisation*" (L481-5). Dave emphasised that his family will invite friends or family over and have a carry out about once a month (L494-7). Dave also made very clear about the important role food plays in a social context and as a cultural identity, "*the role of food is highly important, it is the main deal*", food is a part of the celebration on special occasions, family occasions, birthdays, weddings and that you cannot *"dissociate"* the food from the social celebration. He explained that because of these celebrations around food and social events it was part of his identity, that he had a lot of memories attached to these events around food, and for that reason, food was also important from that perspective. (L757-74).

Summary of 'Social aspects around food'

Both the disciplined and aesthetic eaters clearly displayed enjoyment and enthusiasm about getting together with friends and cooking a meal or ordering a takeaway. In contrast, instrumental eaters, overall, expressed more reluctance around the social interaction and enjoyment of food and eating.

3.3.1.5 Importance of food

Instrumental participants

Iona alluded to an attitude of indifference about the importance of food, she stated, *"Not too important, like obviously you need to eat, like keep my energy up and that, but it's not the main importance in my life"* (L516-7).

Additionally, both Beth and Alicia, simply expressed that food was not that important to them. Isla conveyed confliction when asked about the importance of food in her life, she intimated an indecision by stating, *"I know I like food and I know I couldn't do without it, but because I'm so picky with food… aaaahhhmmm…"* (L396).

Disciplined participants

Disciplined eaters felt food was an important aspect in their lives, however, not all agreed that it was just for sustenance, some felt that it was for their health and others felt that it was important for social interaction.

Mary emphasised foods importance by exclaiming, *"A very big one"* and she went on to explain it in terms of social encounters.

Ingrid was emphatic by stating, "V*ery important, I love eating, especially the social aspect of it, if you have friends over, and I just… if food tastes nice, I really just enjoy it so much. For me, food is pleasure. … I'd rather spend money on a nice dinner in a restaurant than on a dress. So, for me it's just, it's something special. It's definitely a luxury as well. But just if that pays off and you eat something that's… just tastes so nice, you just go ooohhh*…" (L428).

Fiona specified, "*it's pretty important, I like eating. I like, yeah, I love eating even, I'm not, as I said, I still try to eat healthy, but I still don't want to skip dinner, because I just* (ate something that is not healthy), *Yeah"* (L386-9).

Both Grace and Abbey, agreed that the importance of food was for sustenance or energy. Abbey stated, *"it's because I have to have food because otherwise, I'd faint, apart from that I don't, I'm not sitting thinking, 'gosh, when's my next meal going to be', that doesn't, you know… I mean, I have a vague idea, but it's not, you know, it's … I'm not planning on great things"* (L360-2). Grace guessed food was important (L367) and agreed that she eats to live and does not necessarily enjoy food (L373).

Throughout Chloe's interview, it was apparent that she thought a great deal about food, and when asked the question, expressed, "*from the sounds of it, a lot. I make time for food. I wouldn't compromise food for you know... unless there was an emergency, I make time for food and because I exercise more than before, I cannot NOT eat, at the time that I feel hungry… it sounds stupid"* (L396-8).

Aesthetic participants

All aesthetic eaters felt food was an important part of life. The importance Tate placed on food in her life was discussed as her making homemade meals, so that whether she was working or not working, food played an important role and cooking from scratch was important. Though not explicitly stated, another way that Tate expressed the importance of food was that no matter how busy she was, she would not eat lunch at her desk, she explained, "*I prefer to go for ten minutes into the kitchen have the lunch and then go back"* (to her desk) (L282-3) intimating that she wanted to enjoy her meal and not just eat for the sake of suppressing her hunger.

Additionally, Mike was not asked explicitly how important food was, but he expressed *"we actually associate quite a lot of importance for eating together as a family and exchanging conversation during the meal, I would… call me old-fashioned, but I think that is actually really important, we need to spend time with the children in a variety of contexts and eating is one of them"* (L219-22).

Both Dave and Tom agreed that food was quite important, Tom quipped, "*It is quite important, it's what keeps you going and so you have to put effort into it"* (L250).

Summary of the 'Importance of food'

Overall, both the disciplined and aesthetic eaters felt that food was an important aspect in life, either in terms of social, health and/or sustenance/energy. In contrast, the instrumental eaters did not think food was an important part of their life, overall, they expressed that they 'eat to live', whereas the aesthetic eaters overall, and several of the disciplined eaters expressed they 'live to eat'.

3.3.1.6 Semi-structured interview Discussion

Overall, the aesthetic eaters conveyed a relaxed approach and comfortable relationship with food and their bodies, they viewed food as an important part of life, either in terms of it being part of a social aspect or cultural identity. The instrumental eaters, instead, did not appear to have as comfortable a relationship with food and their bodies. They did not consider food to be an important part of their life and saw it more as a necessity, 'so as not to pass out'. The disciplined eaters' attitude and comfort levels were somewhere between the aesthetic and instrumental eaters' profiles; most felt that food was an important part of their life, some saw it as nutritional fuel, whilst others felt it was important from a social perspective.

An interesting and unexpected finding from this study was that each of the identified eating behaviours related to the accepted (albeit problematic) classifications of weight based on body mass index, where the instrumental profile was generally represented by the obese category and the disciplined, by the normal weight category, see Table 3.4. A significant difference (p = 0.04) was found in BMI among the instrumental eaters, who had a significantly larger BMI (39.4 kg/m^2), compared to disciplined eaters (24.1 kg/m^2). However, there was no significant difference in BMI between the instrumental and aesthetic (26.8 kg/m^2) eaters, nor the disciplined and aesthetic eaters.

Table 3.4 IDA participants' age and anthropometric measurements.
Values reported as mean ±SD.

Descriptive characteristics (n = 17)	**Age** years & Range	**Stature** (cm)	**Weight** (kg)	**[t]BMI** (kg/m^2)	**SAD$_1$** (cm)	**Waist** (cm)	**Hips** (cm)	**[#]WHR** ratio	**WSR** ratio
Instrumental (4F, 0M)	34.3 ±16.4 21-58	1.64 ±0.03	107.2 ±52.9	39.4 ±18.1	33.0 ±11.8	111.3 ±32.0	124.7 ±34.4	0.89 ±0.09	0.68 ±0.18
Disciplined (6F, 2M)	47.0 ±17.4 27-69	1.71 ±0.08	70.8 ±13.6	24.1 ±4.0	23.8 ±6.4	83.0 ±14.5	104.7 ±12.7	0.79 ±0.10	0.48 ±0.08
Aesthetic (1F, 4M)	51.4 ±15.4 26-66	1.73 ±0.06	80.2 ±6.8	26.8 ±2.0	24.7 ±1.0	95.5 ±6.0	100.5 ±4.2	0.95 ±0.04	0.55 ±0.04

[t]Significant difference found in BMI between the Inst and Disc groups ($F = 4.03$, $p = 0.043$). [#]Significant difference found in WHR between Disc and Aest groups ($F = 5.03$, $p = 0.029$). WSR did not quite reach significance between the Disc and Inst groups ($U = 5.50$, $z = -1.79$, $p = 0.074$).
No significant difference in age was found among the IDA groups ($F = 1.26$, $p = 0.313$).

Overall, individuals in the aesthetic profile were older (51.4 years) than the disciplined or instrumental (47.0 and 34.3 years, respectively) groups, but this was not significant ($p = 0.31$). The instrumental group had a larger WSR ratio (0.68) compared to the disciplined (0.48) and aesthetic (0.55) groups, but it was not significant. The aesthetic group had a significantly larger WHR (0.95) ($p = 0.04$) compared to the disciplined (0.79), but not the instrumental (0.89) group.

These examples showed that for those individuals who had an aesthetic or disciplined approach towards food, did not experience extreme body weights, and appeared to have a better relationship with food and body image. Because the instrumental eaters mapped onto the OB category of the body mass index, it is perhaps not surprising that instrumental eaters were dissatisfied with their bodies. However, what is interesting is that the aesthetic, and therefore overweight participants were more comfortable with their bodies, than were the participants with the disciplined profile.

However, a limitation in these findings is that this study has an unequal distribution of women and men representing each of the IDA groups. Moreover, they are not age-matched. Therefore, these are two caveats to bear in mind when interpreting the differences in anthropometric measurements. That is, where differences have been observed, may be more related to the differences between men and women.

One possible explanation for why instrumental eaters are associated to a higher BMI, may be explained by the circumstance (and although not highlighted in the examples above), that, when under stress or feeling sad or negative emotions, they would eat in response to these factors; and yet they also expressed that food was not an important part of their life. It is as if the instrumental

eater experiences a dissonant relationship with food: eating under stress/emotions and feeling that food is not important are examples of demi-regularities.

The aesthetic eaters, on the other hand, stated that they did not eat when stressed or feeling down (also a demi-regularity). The aesthetic eaters also expressed eating in terms of 'all things in moderation' (another demi-regularity). However, they stated that they would go back for a second helping of food during mealtime: '*if the food is particularly tasty'* s/he would go back for a second helping. In the case of the aesthetic eaters, there is an example of two demi-regularities counteracting each other to some degree: their response to stress or negative emotions is to lose their appetite; but they will have a second helping at mealtimes if the food is aesthetically pleasing; moreover, they express eating 'all things in moderation' as their motto. One can theorise that aesthetic eaters would have a larger BMI if they did not eat in moderation, or also if they ate in response to stress or emotions (but then by definition they would not be an aesthetic eater). In other words, the demi-regularity to not eat during times of stress helps to counteract the demi-regularity of when an aesthetic eater goes back for a second helping.

The disciplined eaters were more varied, some ate in response to stress and emotions, and some lost their appetites under these conditions. Additionally, some disciplined eaters also made statements about eating in moderation, but others made clear that they could not 'do' moderation, that once a packet of crisps, candy, etc. was opened they had to finish it, (see Table 3.3). The demi-regularity for this group is that they have an awareness about how much they are eating, and this demi-regularity counteracts the demi-regularity of eating under stress or when not able to eat in moderation.

The above discussions are only some of the examples of the possible demi-regularities that may occur among the different IDA narratives. Additionally, the pervasive need to eat the same foods consistently, the feelings of a lower body image, the lack of desire for social interaction, can all be described as demi-regularities the instrumental eater experiences, and the pervading demi-regularity is the negative embodied salience the instrumental eater feels overall about most aspects which were explored during the interviews and overall in this study.

In contrast, another demi-regularity for the aesthetic eaters is their food neophilia, the desire to seek variety in the foods they eat; finding food to be an important aspect of life and a part of social interaction, experiencing a more positive body image. The demi-regularity among this group is a pervasive feeling of a positive embodied salience towards all aspects explored during the interview.

The disciplined group varied in their approach to food, but their pervasive demi-regularity is their overall awareness of the amount or the type/quality of food they were eating in addition to paying attention to food labelling and restricting fats. However, some of the disciplined eaters were more similar in their disposition towards food and their embodied self as the instrumental, than they were the aesthetic.

Cornil & Chandon (2016) developed a questionnaire to ascertain eating attitude, and identified two attitudinal approaches to food: participants in their study had either an 'Epicurean eating pleasure' approach, or a 'visceral eating pleasure' approach to food. The Epicurean approach was described as "*the enduring pleasure derived from the aesthetic appreciation of the sensory and symbolic value of food*" (p. 52). In contrast, the visceral approach was described as "*the short-lived hedonic relief created by the satisfaction of eating impulses, triggered by hunger, emotional, and/or external cues*" (p. 53). All data for this study were gathered online (*via* Amazon Mechanical Turk), and included self-reported information. Cornil & Chandon (2016) stated that Epicurean eating tendencies were found among all age groups and BMI levels. Nevertheless, they found that visceral eating tendencies increased with BMI, in addition to, external and emotional eating also increasing with BMI. Their results suggested that these two attitudinal approaches to food could be distinguished by external and emotional eating (higher scores for these two constructs), and that the Epicurean attitude was associated with a preference for smaller food portions and wellbeing (p. 56).

In contrast to Cornil & Chandon (2016) study, which identified two distinct approaches towards food, this study identified three: instrumental, disciplined and aesthetic. The instrumental and aesthetic eaters in our study may equate to the visceral and epicurean eaters respectively. Whereas, individuals who had a disciplined approach towards food, although they may comprise some underlying instrumental or aesthetic characteristics, were distinct as they had a conscious awareness of the nutritional value of food and acted on this awareness. They were also more likely to pay attention to food labelling and were more likely to restrict fat. Interestingly, although the aesthetic eaters also had nutritional awareness, they were more likely to have a preference for fat but limited their sugar intake. In contrast, the instrumental eaters actually stated that they did not like fat and would cut fat off of everything or try to avoid it. Moreover, food labelling was not a concept they expressed interest in.

The IDA narratives that emerged from this study were the result of the highest level of abstraction and represent the most dominant, underlying attitude or disposition, which appeared to be involved in motivating food choice decisions, in the participants. More specifically, instrumental

eaters' attitude or disposition towards food was one of dissonance, on one hand food was considered as not being an important part of their life, but on the other hand, food served as comfort in times of boredom and/or negative emotions. Additionally, stress could cause an eating episode, it was viewed as fuel (so as not to pass out) and a response to eliminating hunger. All of these are examples of demi-regularities. Food is used as an instrument and a means to an end, is a demi-regularity, because the use of food is a semi-predictable pattern which can lead to the choices that an instrumental eater makes, such as, the lack of variety, eating a lot of the same types of food, being food neophobic, in addition to emotional and stress eating. This is similar to Cornil & Chandon's (2016) concept of 'visceral eating pleasure'. In contrast, disciplined eaters viewed food as functional fuel (a demi-regularity) and they had an awareness (another demi-regularity) of the nutritional value of food, and they acted on this awareness (demi-regularity). They paid attention to food labelling and generally did not give in to eating out of boredom, or their emotions (demi-regularities). However, stress caused some disciplined eaters to eat, and yet, others to lose their appetite (both stress eating and non-stress eating are demi-regularities). Aesthetic eaters viewed food as being important and as part of the enjoyment of life. They sought out new foods (demi-regularity), displayed an interest in trying new foods and sought variety, and generally enjoyed shopping and cooking (all demi-regularities), which may be equated to Cornil & Chandon's (2016) concept of the 'epicurean eating pleasure'.

3.4 Questionnaire Results and Discussion

All twenty-nine participants completed the 7 validated questionnaires, with the aim of understanding how volunteers' obtained answers would contribute to the aim of the project, and complement the semi-structured interviews. Specifically, we investigated the possibility of the questionnaires supporting findings from the interviews. It was hoped that answers to the questionnaires would support findings from the interviews and possibly identify new additional traits/behaviours.

Results from each questionnaire are firstly presented in function of BMI categories and then discussed in function of the participants' classification according to the IDA profile.

3.4.1 Multidimensional Body-Self Relations questionnaire-Appearance Scales (MBSRQ-AS)

The MBSRQ-AS questionnaire explored subjective aspects of body image through using 5 different scales: an individual's appraisal of her/his appearance, body checking (i.e. looking in the mirror to check one's self), discrete aspects of body area satisfaction, overweight preoccupation and self-classified weight categorisation. Obtained answers showed a normal distribution, and results for each scale are reported as mean and standard deviation (M ±SD) and shown in a radar diagram (Figure 3.2) for each BMI category.

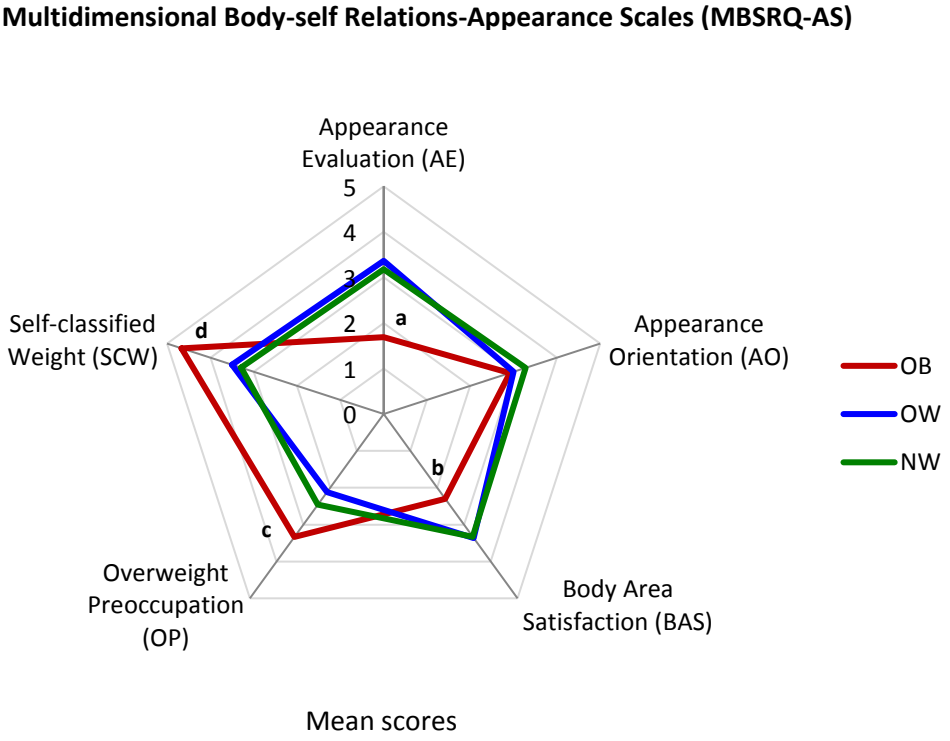

Figure 3.2 MBSRQ-AS mean scores, radar diagram, for each BMI category.
a: significant difference between NW and OB, and OW and OB ($F = 14.30$, $p \leq 0.0001$).
b: significant difference between NW and OB, and OW and OB ($F = 10.67$, $p = 0.001$).
c: significant difference between OW and OB ($F = 5.84$, $p = 0.007$); between OW and OB ($p = 0.06$).
d: significant difference between NW and OB ($F = 12.13$, $p < 0.0001$); and between OW and OB ($p = 0.001$).
Neutral scores for the following scales AE, AO, BAS (between 2.6 and 3.4) are indicative of neither agreeing or disagreeing with the questions pertaining to that scale.
Cronbach alpha for each scale was as follows: AE $\alpha = 0.54$, AO $\alpha = 0.72$, BAS $\alpha = 0.84$, OP $\alpha = 0.64$ and SCW $\alpha = 0.91$.

Appearance Evaluation scale (AE)

For the AE scale, the OB group had the lowest score (1.69 ±0.70) compared to OW and NW groups (3.36 ±0.69 and 3.18 ±0.58, respectively). There were statistically significant differences between the NW and OB ($p < 0.0001$), and the OW and OB ($p < 0.0001$) groups. Scores of 3.5 and above are indicative of positive feelings and satisfaction with one's appearance. Scores of 2.5 and below indicates a general unhappiness with physical appearance. Scores > 2.5 and < 3.5 are indicative of neutrality about a particular body image aspect for all scales, (i.e. neither agree nor disagree), excluding the overweight preoccupation and self-classified weight scale.

Appearance Orientation scale (AO)

The OB group scored the lowest (2.92 ±0.90) on the AO scale compared to the OW and NW groups (3.00 ±0.63, 3.28 ±0.85, respectively). No significant differences were found among the scores for the 3 BMI groups. Scores of 3.5 and above indicate placing importance in one's looks, engaging in grooming behaviours and paying more attention to appearance, by fixing and checking oneself in a mirror. Scores of 2.5 and below are representative of individuals who feel indifferent about their appearance, and would not find their appearance especially important, therefore would not spend much time and energy into checking their appearances. However, because all groups scored within the neutral range, and had approximately the same score (Figure 3.2), this is suggestive that the participants each had neutral feelings about themselves when it came to assessing how they looked in a mirror, or 'fixing' themselves before going out or being seen by other people, independently of their BMI.

Body Area Satisfaction scale (BAS)

The OB group scored 2.30 (±0.63) which was significantly lower compared to the OW score of 3.36 (±0.50) ($p = 0.001$) and NW score 3.33 (±0.42) ($p = 0.001$). Scores of 3.5 and above indicate being generally pleased with most discrete aspects of the body. Scores of 2.5 and below indicate feelings of unhappiness and discontent with appearance and size. No significant differences were observed between the NW and OW participants.

Overweight Pre-occupation scale (OP)

The OW group scored significantly lower (2.11 ±0.53) ($p = 0.007$) on this scale compared to the OB (3.33 ±0.80) group, but did not score significantly lower than the NW (2.46 ±0.80) ($p = 0.06$) group. A score of 3.0 is indicative that the individual may 'sometimes' experience fear and/or anxiety of

being fat or gaining weight. Scores above 3.5 indicate experiencing 'sometimes to often', fear and anxiety of being fat or gaining weight, or attempts at weight loss, eating and dietary restraint. A score of 2.5 or below is indicative of 'sometimes to rarely' having a concern with dieting or weight loss and gaining weight or fear of becoming fat. The OW score of 2.11 is suggestive that they rarely experienced fear and/or anxiety over weight issues compared to the OB group's score, 3.33.

Self-Classified Weight scale (SCW)

The OB group scored 4.67 (±0.52) indicating that they see themselves as being very overweight and they believe that other people see them as being very overweight. The OW group scored 3.50 (±0.45), hence, they see themselves as being overweight and feel other people see them this way as well. The NW group scored 3.29 (±0.69), which suggests they see themselves as being normal weight or perhaps a little overweight. Scores below 2.5 indicate awareness of being either underweight or very underweight and the perception that other people see them that way. There was a significant difference in scores between the OW and OB ($p = 0.001$), and the NW and OB ($p < 0.001$) groups, but no significant difference was found between the OW and NW groups.

Overall, in a US study, American participants had higher scores compared to the 29 participants in this study. The higher scores in the US adults suggests that they experienced better body image feelings compared to the 29 individuals in this study. Whereas, the 29 participants in this study, experience neutral feelings around body image issues, as their scores lay in the neutral range area of body image (Table 3.5).

Table 3.5 MBSRQ-AS scales in US norms (adapted from Cash 2000).
US population, age range 15-74 years, values reported as mean ±SD.

MBSRQ-AS scale	Male	Female	Current Study all 29 Participants
AE	3.49 ±0.83	3.36 ±0.87	2.94 ±0.91
AO	3.60 ±0.68	3.91 ±0.60	3.10 ±0.77
BAS	3.50 ±0.63	3.23 ±0.74	3.13 ±0.65
OP	2.47 ±0.92	3.03 ±0.96	2.51 ±0.82
SCW	2.96 ±0.62	3.57 ±0.73	3.66 ±0.77

A study by Miller et al. (2000), explored body image differences in African, Latino and European Americans, and how each race viewed, judged and felt about their bodies. When considering the European American group (n = 40), because the background of the participants to our study, European Americans scored (4.51 ±0.63) much higher on the AO scale than all 29 participants (3.10 ±0.77), which suggests that the European Americans engaged in more body checking, from

'often to very often', 'fixing and looking at themselves in a mirror' (Table 3.6). In relation to the other scales, most of the scores in both studies were between 2.6 and 3.4 which are considered neutral feelings about body image and satisfaction with personal appearance.

Table 3.6 MBSRQ-AS scales, body image in European.
Americans (Miller et al. 2000). Scores reported as mean ±SD.

MBSRQ-AS scales	European American n = 40	Current study n = 29
AE	3.46 ±0.76	2.94 ±0.91
AO	4.51 ±0.63	3.10 ±0.77
BAS	3.42 ±0.70	3.13 ±0.65
OP	2.24 ±1.00	2.51 ±0.82
SCW	3.27 ±0.51	3.66 ±0.77

The MBSRQ-AS questionnaire has been used by Hrabosky et al. (2009), to investigate body image functioning in men (n =17) and women (n = 39) who suffered from body dysmorphic disorder (BDD, n = 56), and eating disorders, such as anorexia nervosa (AN, n = 35), and bulimia nervosa (BN, n = 26). BDD is characterised as a distressing or a preoccupation with a slight defect or an imagined defect with physical appearance (APA 1994, cited by Hrabosky et al. 2009).

When the scores obtained in the OB group in our study were compared to Hrabosky's findings, it was noticed that the OB group scored lower for the AE scale (1.69 ±0.70) than the BDD (2.23 ±0.85) and the BN (2.22 ±0.81) participants, suggesting that the OB group experienced a lower body image and more body dissatisfaction compared to individuals who suffered from body dysmorphia disorder or bulimia nervosa. However, for the BAS scale, the OB group scored similarly (2.30 ±0.63) to the BDD (2.05 ±0.1.09) and the BN (2.31 ±0.93) participants, which suggests that the OB group experience similar body dissatisfaction with discrete aspects of their body in a similar manner as those who suffered from BDD or BN disorders. Regarding the OP scale, the OB group scored higher (3.33 ±0.80) than the BDD (2.81 ±1.09) group, but not as high as the BN group (4.13 ±0.67). This suggests that the OB group may have sometimes experienced fear around issues of weight, weight gain and/or fat anxiety more than the BDD participants; the OB group did not experience it to the same extent as those participants who have a BN disorder; the BN group experienced often to very often issues around fat anxiety and/or weight gain, (Table 3.7).

Low scores in the BAS scale (i.e. below 2.6), regardless of sex, indicate a poorer body-image quality of life, greater body-image disturbances, greater body-image dissatisfaction, more investment in body-image self-evaluative salience, greater physical self-ideal discrepancies, a

lower self-esteem and more dysfunctional eating attitudes (Giovannelli et al. 2008). The 29 participants, along with the OW and NW groups experienced neutral to good feelings about their body image with both discrete aspects and overall physical appearance, and rarely to sometimes experienced fear of gaining weight and/or fat anxiety in a similar manner as the control group in Hrabosky et al.'s (2009) study. In contrast, the OB group experienced similar body dissatisfaction and issues of weight gain and/or fat anxiety as the individuals who suffered from BDD or BN in Hrabosky et al.'s study (Table 3.7).

Table 3.7 MBSRQ-AS body image in eating and body dysmorphia disorders.
Scales AE, BAS and OP in Hrabosky et al. (2009) control group, bulimia nervosa (BN) and body dysmorphia disorder (BDD). Values reported as mean ±SD. F: female, M: male.

Participants	**Control Group** F: n = 34 M: n = 36	**BDD** n = 56	**Bulimia N**. n = 26	**Current Study** n = 29	**OB** n = 6	**OW** n = 11	**NW** n = 12
Age (years) **30.7 ±11.1**	F: 33.0±12.0 M: 37.5±11.8	29.8 ±10.0	26.7 ±8.7	41.4 ±14.7	44.6 ±18.6	46.5 ±14.8	35.4 ±11.5
BMI (kg/m^2)	F: 24.7±5.0 M: 26.1±6.0	22.4 ±3.2	22.4 ±3.0	27.7 ±8.7	43.3 ±14.7	26.7 ±1.4	22.6 ±1.6
AE scale	F: 3.17±0.88 M: 3.18±0.87	2.23 ±0.85	2.22 ±0.81	2.94 ±0.91	1.69 ±0.70	3.36 ±0.69	3.18 ±0.58
BAS scale	F: 3.50±0.90 M: 3.31±0.98	2.05 ±1.09	2.31 ±0.93	3.13 ±0.65	2.30 ±0.63	3.36 ±0.50	3.33 ±0.42
OP scale	F: 2.69±0.91 M: 2.33±0.97	2.81 ±1.09	4.13 ±0.67	2.51 ±0.82	3.33 ±0.80	2.11 ±0.53	2.46 ±0.80

Overall, the scores obtained for the OB participants on body image were not surprising, suggesting they have a negative evaluation of their body image. However, it was surprising that they scored lower on the appearance evaluation (AE) scale than did those who suffer with bulimia nervosa, or those who suffer from body dysmorphic disorder. It is worth noting that in the Hrabosky et al. (2009) study, the control group's largest BMI for the men was 26.1 kg/m^2 (±6.0), and women, 24.7 kg/m^2 (±5.0). This may, in part, explain why the obese participants (BMI = 43.3 ±14.7) in this study scored as they did on body image, suggesting they have a negative evaluation of their body image. Higher BMI levels have been found to have an adverse impact on body image, and in women in particular (Cash & Fleming 2002).

More surprising was the scores obtained for the OW group. OW participants in this study had nearly the same scores or better than the control group in the Hrabosky study and Cash's US norms' study, and they fared better against the normal weight group in this study. Based on the literature, overweight individuals would be expected to score as poorly as individuals who suffer from being obese, because of how the overweight group is often combined with obese groups in

the majority of studies in the literature (Sturgeon & McColl 2010; Schafer & Ferraro 2011; Public Health England 2017). However, this study has not found that to be true.

IDA groups and Multidimensional Body-Self Relations-Appearance Scale

Given that the OB group scored lower on this questionnaire, we can hypothesise that participants classified as instrumental according to the IDA profile would also score lower, compared to the disciplined and aesthetic groups. We found that for the AE scale the instrumental had the lowest median score (1.57 ±0.96), and the disciplined and aesthetic groups scored similarly (3.21 ±0.61 and 3.29 ±0.86, respectively). Both the disciplined and aesthetic groups experienced more positive body satisfaction compared to the instrumental group. There was a significant difference observed between the instrumental and disciplined (p = 0.006), and instrumental and aesthetic (p = 0.01) groups. As previously described, scores below 2.5 are indicative of negative feelings about body satisfaction, whereas scores between 2.5 – 3.5 are indicative of neutral feelings towards body satisfaction.

The instrumental group had a lower median (2.83 ±1.35) score on the AO scale, compared to the disciplined group (3.63 ±0.98), but scored similarly to the aesthetic group (2.75 ±0.96). The disciplined group had a significantly (p = 0.05) higher score than the aesthetic group, but did not reach significance (p = 0.06) with the instrumental group. Based on the disciplined group's score, these participants engaged in more body checking, placed more importance in how they looked and engaged in more grooming behaviours. Both the instrumental and aesthetic groups experienced more neutral feelings in their overall appearance orientation.

On the BAS scale, the instrumental group had the lowest median score (2.33 ±1.06), the aesthetic group had the highest (3.56 ±1.00), and the disciplined group scored (3.22 ±0.75) slightly lower than the aesthetic group. There was a significant difference between the instrumental and aesthetic (p = 0.05), and between the instrumental and disciplined (p = 0.006) scores. This scoring suggests that the instrumental group experienced overall more body dissatisfaction with discrete aspects of their body. In contrast, the aesthetic group experienced overall body satisfaction with discrete aspects of their body. The disciplined group had a score in the neutral range, thus they experienced neither satisfaction or dissatisfaction with discrete aspects of their body.

The disciplined group had a higher median score (2.50 ±1.25) on the OP scale compared to the aesthetic group who scored the lowest (2.00 ±0.38), and the instrumental scored (2.38 ±1.88) just

below the disciplined group. There was a significant difference (p = 0.006) found between only the aesthetic and disciplined groups. The disciplined group experienced slightly more concern around feelings of fat anxiety compared to the aesthetic group. A score of 2.5 is suggestive that individuals experienced 'sometimes to rarely' concerns around the fear of becoming fat, gaining weight, weight-loss, or dieting. A score of 2.0 is more closely related to rarely experiencing any of these fears or concerns.

Regarding the SCW scale, the instrumental group had the highest median score (4.50 ±1.38), followed by the aesthetic group (4.00 ±0.75), and the disciplined group had the lowest score (3.00 ±1.25). However, the difference in scores between the instrumental and disciplined groups did not reach significance (p = 0.06). These scores suggest that the instrumental group sees themselves as being very overweight and believes that others see them as very overweight as well. The aesthetic group see themselves as being overweight and feel others see them this way as well. The disciplined group see themselves as being normal weight and feel others see them as normal weight.

Overall, these findings suggest that, the instrumental group experienced more body dissatisfaction and more body image disturbances. In contrast, the aesthetic group experienced a higher level of overall body satisfaction. Interestingly, the disciplined group were more pre-occupied with their appearances and experienced a higher degree of fat anxiety compared to the aesthetic group.

3.4.2 Body Image Quality of Life Inventory (BIQLI)

This questionnaire assessed individuals' subjective feelings about their body image and how it impacted certain aspects of their quality of life, related to grooming, exercising, eating and sexuality to emotional wellbeing, social functioning and sense of self. The data obtained showed a normal distribution and the results for each BMI category are shown in Figure 3.3. Values are reported as mean and standard deviation.

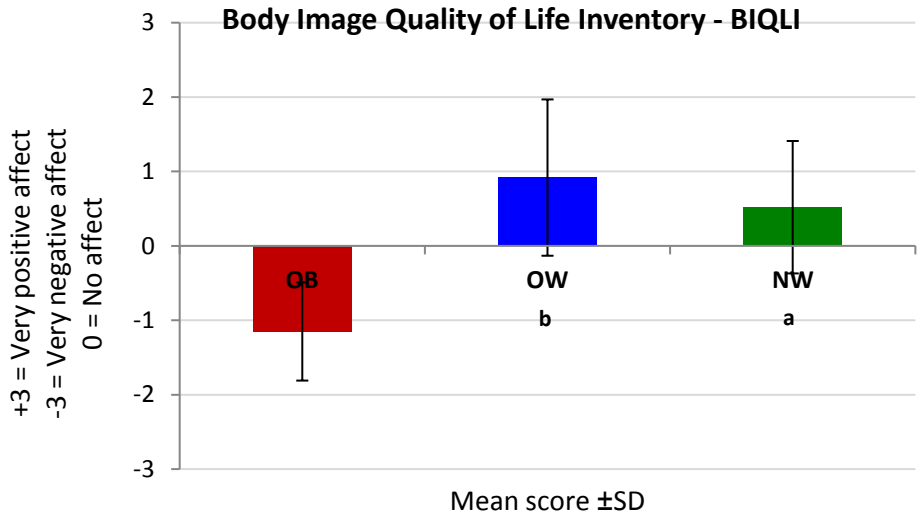

Figure 3.3 BIQLI bar chart for each BMI category.
a: significant difference between NW and OB (F = 10.35, p = 0.004);
b: significant difference between OW and OB (F = 10.35, p < 0.0001).
Cronbach α = 0.96.

The OW group scored the highest mean score (0.92 ±1.05) which suggests that the way they perceived their body image, had a positive impact on their psychosocial wellbeing and everyday quality of life. The NW group had a lower mean score (0.52 ±0.89), suggesting that their body image perception had only a slight positive impact on their psychosocial wellbeing and everyday quality of life. In contrast, the OB group scored the lowest mean score (-1.15 ±0.66), suggesting that their perceived body image had a negative impact on their psychosocial wellbeing and everyday quality of life. The differences in scores were significant, specifically, the OW group scored significantly higher than the OB group (p < 0.0001), and the NW group also scored significantly higher than the OB group (p = 0.004). However, there was no significant difference between the OW and NW groups' mean scores.

Lower negative scores suggest that perceived body image has a negative impact on psychosocial functioning, wellbeing and everyday quality of life with everyday life including self-esteem, emotions, social interests and/or avoidance, relationship with themselves, grooming habits, sexuality, exercise and eating behaviour, and general overall body image satisfaction (Cash, Jakatdar & Williams 2004). Body mass has been found to influence body image evaluation (Friedman et al. 2002), and indeed, this study showed that there was a trend towards a moderate, negative association between BMI and BIQLI scores, (Spearman's correlation test r_s = -0.29, p = 0.13). The small sample size may be responsible for the non-significant difference. Nevertheless, this negative relationship between BMI and BIQLI scores suggests that as BMI increases, quality of

life related to body image perception may possibly decrease. However, Brownell et al. (2005) had previously reported that not all individuals with obesity suffer from body image disturbances and that society may project this image onto the obese individual. The OB group's score range (-1.81 to -0.49) may suggest that the participants with obesity in this study felt a negative impact, about their perceived body image and psychosocial functioning and wellbeing and everyday quality of life. Whether this is their perception based on their own self-perceived image, or society projecting this image on them is not known.

However, having a smaller BMI does not necessarily mean that an individual experiences a positive body image. In this study, the NW group score ranged from 1.41 to -0.37, suggesting that not all NW participants experienced a positive impact in their quality of life based on their body image perception: 2 individuals (16.7%) scored negatively and experienced a slight negative impact in their everyday quality of life. The OW group had a score that ranged from 1.97 to -0.13; similarly, two participants (18%) felt that their perceived body image had a very slight negative impact on their life and psychosocial wellbeing.

When comparing overall findings from this study with a study carried out by Cash & Grasso (2005) among an American student population, all 29 participants' mean score (0.33 ±1.19) was lower than the female (0.97 ±1.12) and male (1.10 ±1.05) US students' mean scores. This suggests that the US students experienced a slightly higher positive impact on their psychosocial wellbeing and everyday quality of life. It is not possible to draw further conclusions as Cash & Grasso did not report BMI and age for their participants.

Body image attitudes using the BIQLI construct were explored in a sample of individuals with eating disorder BN and BDD (Hrabosky et al. 2009). The BN group had identical scores to the OB group (-1.15 ±0.66), whereas the individuals in the BDD group (-1.81 ±0.68) had lower scores. These results suggest that the subjective feelings about their body, of the OB group, had a negative impact in aspects related to psychosocial functioning, quality of life and wellbeing in a similar manner as the individuals with the eating disorder BN, but not to the extent that individuals who suffer from body dysmorphia disorder experience (Table 3.8).

Table 3.8 BIQLI scores in, BDD and BN (Hrabosky et al. 2009).
BDD: body dysmorphia disorder; BN: bulimia nervosa. Values: mean ±SD.

Participants	**BDD** n = 70	**BN** n = 26	**Current study** n = 29	**OB** n = 6	**OW** n = 11	**NW** n = 12
BIQLI scores	-1.81 ±0.68	-1.15 ±1.07	0.33 ±1.19	-1.15 ±0.66	0.92 ±1.05	0.52 ±0.89

It has been suggested that individuals who score low on the BAS scale (of the MBSRQ-AS questionnaire) may also score low on the BIQLI (Giovannelli et al. 2008). The findings from our study are consistent with Giovannelli et al.'s proposal. Specifically, OW and NW participants had the highest scores for the BAS scale (3.36 and 3.33 respectively) and the BIQLI construct (0.92, 0.52 respectively). The OB participants' BAS score was the lowest (2.30), as was their BIQLI score (-1.15). This indicates that OW and NW participants had higher levels of satisfaction with discrete aspects of their body which had a positive effect on their quality of life, psychosocial functioning and wellbeing. Whereas the OB participants had higher levels of dissatisfaction with discrete aspects of their body which affected their quality of life, psychosocial functioning and wellbeing. Moreover, there was a significant correlation found between BIQLI scores and the BAS scale, (Pearson correlation: $r = 0.82$, $p < 0.001$). Furthermore, there was a strong, significant association found between the BIQLI scores and the AE scale, (Pearson correlation: $r = 0.75$, $p < 0.001$). This suggests that individuals who are satisfied with their looks also feel attractive (i.e. the AE scale measures feelings of physical attractiveness), and this has a positive impact on their psychosocial functioning and wellbeing and a positive impact on their everyday quality of life.

IDA groups and Body Image Quality of Life Inventory

Given that the OB group scored lower on this body image construct, we can theorise that participants classified as instrumental according to the IDA profile would also score lower, compared to the disciplined and aesthetic groups. We found that, the instrumental group had the lowest mean score (-1.51 ±0.42) suggesting that these participants perceived body image had a negative impact on their psychosocial wellbeing and everyday quality of life. In contrast, the aesthetic group had the highest score (0.92 ±1.08) suggesting that they experienced a positive psychosocial wellbeing and everyday quality of life. The disciplined group scored higher than the instrumental, but not as high as the aesthetic group (0.73 ±0.89). There was a significant difference in scores between both the instrumental and aesthetic, and disciplined ($p = 0.003$) groups. The results from these two body image constructs (MBSRQ-AS and BIQLI) help support the findings from the interviews where the instrumental group expressed overall body dissatisfaction and the aesthetic group expressed overall satisfaction with their bodies and body image, whereas the disciplined group were more varied in how they expressed body satisfaction/dissatisfaction, as this group did not express being as comfortable with their bodies compared to the aesthetic group.

3.4.3 Sense of Coherence-13 (SOC-13)

This questionnaire assessed individual's salutogenic approach towards life; specifically, it explored aspects of comprehensibility, manageability and meaningfulness of life which are reported in one total score. The data showed a non-normal distribution, median scores and interquartile range (IQR) for each BMI group are reported in Figure 3.4.

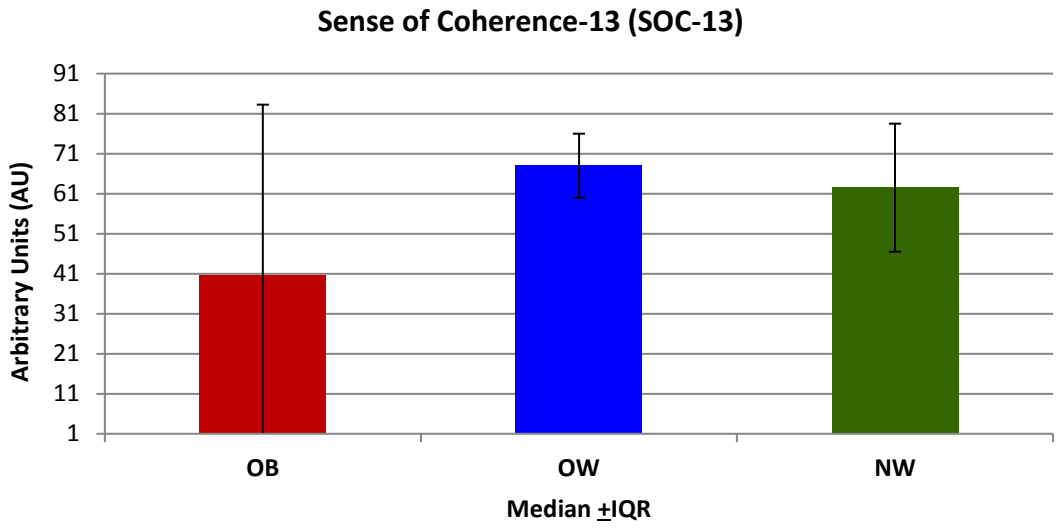

Figure 3.4 SOC-13 median scores for each BMI group.
No significant difference found between scores. Score range is from 13 to 91, high scores indicate strong salutogenic outlook. Cronbach alpha for meaningfulness: $\alpha = 0.70$, comprehensibility: $\alpha = 0.75$, manageability $\alpha = 0.77$.

The OW group had a higher median score (68.0 ±8.0), followed by the NW group (62.5 ±16.0), compared to, the OB group, which scored the lowest median score, but they also had the greatest interquartile range (40.50 ±42.75). However, no significant differences were observed between the three groups.

The score range is from 13 to 91: the higher the score an individual obtains, the stronger her/his salutogenic outlook is on life. S/he is in a stronger position to deal with life's stressors, views life as more manageable, meaningful and is better able to comprehend her/his life. S/he is able to find solutions to any given situation and resolve conflicts that might arise through having the ability to adapt (Antonovsky 1993). Additionally, stressful situations are less likely to be perceived as threatening or provoke anxiety, instead they are challenges, seen as part of life's experiences and can be coped with. Negative situations will still happen to individuals with a strong

salutogenic outlook, but they are able to make sense out of bad events when they do occur (Antonovsky 1988).

OB participants had the lowest SOC-13 score, which is suggestive of individuals experiencing a lower salutogenesis: these individuals may have more difficulty in finding the resources within themselves to face challenging life situations. They may experience more difficulty in dealing with or managing stress. Additionally, their lower score is suggestive that they may find life to be less meaningful, things may not work out and be less manageable. Their lower score is suggestive that they may have less resources within themselves, to call upon in times of need; and that life may be less comprehensible. Specifically, it is possible that perceived stimuli from both the internal and external environment may make less cognitive sense: their world may feel more disordered, chaotic, accidental, random and/or inexplicable (Antonovsky 1988). However, because this group has the widest interquartile range, not all participants with obesity necessarily suffered from a low sense of coherence. Indeed, the IQR suggests that some of the participants do have a high SOC, indeed their score range was from 28 to 76, and upon further inspection there were 2 OB individuals (33%) who had scored above 68, (which corresponds to the highest median score in this study). The score range for the OW group was 26 to 80, and 6 individuals (54.5%) scored 68 or higher. The score range for the NW group was 44 to 75, where only 3 (25%) participants scored above 68. A very weak negative association between BMI and SOC-13 scores was observed (Spearman test, r_s = -0.04, p = 0.84), suggesting that BMI may not necessarily be related to salutogenesis, or the size of the study was too small to detect a relationship between salutogenesis and BMI.

Body image construct, BIQLI and SOC may be related, and a moderate, significant association was observed between these two constructs (Spearman test, r_s = 0.41, p = 0.03), suggesting that a strong salutogenesis may be associated with positive feelings about body image, emotional wellbeing and psychosocial functioning, or vice-versa.

As Antonovsky hypothesised that individual's SOC increases with age; a borderline significant difference between the NW and OW groups' age (p = 0.055) was observed, a Spearman's correlation test was carried out. Unfortunately, a weak, non-significant relationship was observed between age and SOC (r_s = 0.23, p = 0.25), possibly due to the small sample size of the study.

A Swedish study comprising over 43,000 participants, aged 18 to 85 years, (Nilsson et al. 2010) found that SOC increased with age. There was nearly a ten-point difference between the youngest age group [18 to 24 years, SOC-13 score (mean ±SD) 62.23 ±13.71] and the oldest age group [80 to

85 years, SOC-13 score, 72.20 ±13.02] which was significant ($p < 0.001$). Our 29 participants whose mean age was 41.4 (±14.7 years) and had a median SOC-13 score of 65.00 (±22.50) which was a similar score (66.65 ±12.62) as the Swedish age group, 40 to 44 years (Table 3.9).

Table 3.9 SOC-13 in Swedish study norms (Nilsson et al. 2010).
Scores reported as mean ±SD, compared with this study all 29 participants' median score ±IQR (age range was 21-69 years).

Age group years	**SOC-13 score** Mean ±SD	**Current study** Mdn ±IQR
18-24	62.23 ±13.71	SOC-13 score 65.00 ±22.50 (41.4 ±14.7 years)
25-29	63.70 ±13.25	
30-34	66.32 ±12.51	
35-39	66.38 ±12.83	
40-44	66.65 ±12.62	
45-49	67.33 ±12.58	
50-54	68.62 ±12.11	
55-59	69.70 ±11.89	
60-64	70.48 ±11.43	
65-69	71.78 ±11.61	

The SOC-13 score for the participants in our study was also similar to the scores reported in a study that explored sex differences in sense of coherence in a non-clinical Australian community sample (Pallant & Lae 2002) (Table 3.10). The NW and OW groups scored (62.50 ±16.00 and 68.00 ±8.00, respectively) similarly to the Australian men and women. Whereas, the OB group scored nearly 20 points lower (40.50 ±42.75), but had a very large IQR. These scores suggest that the NW and OW participants in this study experienced a similar salutogenesis as the men and women in the Australian study. However, the OB participants in this study experienced a lower salutogenesis in comparison to the Australian men and women.

Table 3.10 SOC-13 in Australian male and female participants (Pallant & Lae 2002).
Score values reported as mean ±SD, compared with this study's participants' score values median ±IQR.

Participants	**Men** n = 184	**Women** n = 255	**Current study** n = 29	**OB** n = 6	**OW** n = 11	**NW** n = 12
SOC-13	61.37 ±11.23	60.40 ±12.05	65.00 ±22.50	40.50 ±42.75	68.00 ±8.00	62.50 ±16.00

Similar scores to the one obtained in our study were also observed in a study by Adams et al. (2000) which aimed to explore sense of coherence in a male and female Texas student convenience sample (age range was from 16 to 58 years, mean 23.2 ±5.5 years), with a SOC-13 mean score (62.4 ±10.89).

In relation to studies which measured SOC in obese individuals, the study by Karlsen, Søhagen & Hjelmesæth (2013) aimed to investigate the levels of SOC as possible predictors for weight loss in individuals seeking treatment for their obesity. The SOC-13 mean score for morbidly obese

females 59.9 (±13.5) and for males 60.5 (±10.6), were higher than the OB group's score of 40.5 (±42.8) in this study. However, their scores were not too dissimilar from the 29 participants' median score of 65.0 (±22.5). Karlsen, Søhagen & Hjelmesæth (2013) remarked that their participants may differ from other individuals with morbid obesity as their participants were seeking treatment, and may justify their higher SOC-13 score. Karlsen, Søhagen & Hjelmesæth identified that age, mental health related quality of life and employment may affect motivational weight loss. Moreover, Antonovsky (1988) suggested that an individual's sense of coherence was closely linked to her/his health. Salutogenesis works prospectively in a manner of how one can improve her/his health, so that a person who has a higher SOC, will seek out ways to promote or obtain better health (Becker, Glascoff & Felts 2010). A systematic review of empirical studies from 1992-2003, found that SOC was strongly associated to health, especially mental health (Eriksson & Lindström 2005).

IDA groups and Sense of Coherence-13

The instrumental group had the lowest mean score (39.25 ±11.35) while the aesthetic group had the highest score (71.20 ±6.06). The disciplined group scored lower (63.00 ±10.62) than the aesthetic group, but not as low as the instrumental group. There was a significant difference in scores between the instrumental and aesthetic (p = 0.001), and disciplined (p = 0.004) groups.

These scores are in support of the findings from the interviews where the instrumental group had expressed having low self-esteem and confidence levels, whereas the aesthetic group expressed having a high self-esteem and confidence levels. Again, the disciplined group were more mixed in their levels of confidence and self-esteem. It can be theorised that having a higher self-esteem or confidence also results in having a higher salutogenesis, or vice versa. An individual who has the conviction of high self-confidence/esteem, is more likely to have higher general resistance resources and, as Antonovsky theorised, these individuals have the feeling or belief that things will work out (Eriksson & Lindström 2005). Alternatively, lower feelings of self-confidence and/or esteem may result in having fewer general resistance resources, thus finding life situations more stressful and challenging. Having a low SOC has also been found to be associated with having a low self-esteem and low optimism (Eriksson & Lindström 2005), which was consistent with the outcomes from the semi-structured interviews.

3.4.4 Dutch Eating Behaviour Questionnaire (DEBQ)

This questionnaire assessed individuals eating traits, specifically it identified the psychological eating behaviours related to restrained, external and emotional eating. The data showed a non-normal distribution and a visual representation of each BMI groups' median scores for each DEBQ trait is shown in Figure 3.5.

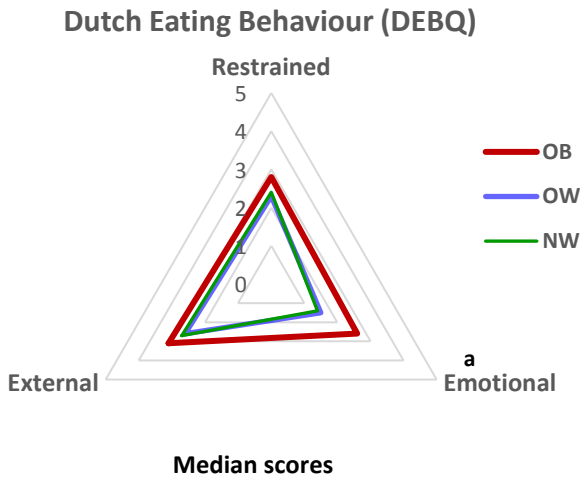

Figure 3.5 DEBQ eating trait for each BMI group.
a: significant difference between NW and OB (U = 14.50, z = -2.02, p = 0.04); and between OW and OB (U = 12.00, z = -2.13, p = 0.03).
Cronbach alpha: restrained α = 0.89, emotional α = 0.97, external α = 0.77.

Regarding the restrained eating scale, the NW and OW groups scored similarly (2.40 ±1.93 and 2.30 ±1.10, respectively), while the OB group had a slightly higher score (2.80 ±1.03). However, no significant differences were found between scores, which suggests that all BMI groups were equally likely to employ the same degree of restraint in their eating. Specifically, a score between 2 and 3 is interpreted between 'rarely' to 'sometimes' showing restraint in eating foods which helps in maintaining weight, and/or not eating certain foods that might cause weight gain, or are deliberately slimming.

Regarding the external eating scale, a similar pattern in scores was observed: the NW and OW groups had similar scores (2.65 ±0.98 and 2.60 ±0.50, respectively), and the OB group was characterised by a higher score (3.05 ±0.83), but no significant differences were found between scores. This suggests that all BMI groups were equally likely to eat in response to external food

stimuli, such as the smell, taste and sight of food which can provoke a response 'seldom or sometimes' to eat, regardless of hunger state.

Regarding the emotional eating scale, the NW and OW groups had lower scores (1.35 ±0.98 and 1.54 ±1.15, respectively), compared to the OB group, which had the highest score (2.58 ±2.61) but also a large IQR range. Score values between 1 and 2 for the emotional eating scale are interpreted as eating 'never' or 'rarely' due to either boredom, or negative emotions (i.e. sadness, disappointment), or emotions related to irritation or anxiety. Score values between 2 and 3 suggest that an individual will eat 'rarely' or 'sometimes' in response to boredom or negative emotions, or emotions related to irritation or anxiety. There was no significant difference found between the NW and OW group scores, however, there was a significant difference found in scores between the NW and OB groups (p = 0.04) and between the OW and OB groups (p = 0.03).

Overall, the 29 participants' scores in each of the eating traits were similar to the scores observed in studies carried out by van Strien et al. (1986) over the years in a Dutch population to validate the questionnaire. Specifically, for the restrained eating scale Dutch individuals scored 2.21 (±0.92) compared to 2.50 (±1.40) in this study. This suggests that both studies' participants employed similar restraint (i.e. 'rarely' or 'sometimes') in their eating in an attempt to control their weight through restricting calories and food intake (Table 3.11).

Table 3.11 DEBQ in Dutch norms (van Strien et al. 1986).
Compared to the 29 participants from this study.

DEBQ scales	**Dutch Participants**		**Current study** n = 29
	n	Mean ±SD	Median ±IQR
Restrained	1169	2.21 ±0.92	2.50 ±1.40
Emotional	1051	1.92 ±0.68	1.62 ±1.35
External	1163	2.66 ±0.54	2.70 ±0.75

Regarding the emotional scale, the Dutch population scored similarly to the participants in this study (1.92 ±0.68 vs 1.62 ±1.35, respectively). Overall, suggesting that the participants in this study ate in response to their emotions (i.e. 'never' or 'rarely') in a similar fashion as the Dutch participants.

Lastly, regarding the external scale, Dutch participants' scores were very similar to this study (2.66 ±0.54 vs 2.70 ±0.75, respectively), which suggests that both groups ate food that looked or smelled good 'sometimes' to 'often' regardless of state of hunger. Van Strien et al. (1985) in an earlier study had reported finding a moderate, significant association between BMI and external

eating (Pearson's correlation, $r = 0.38$, $p < 0.01$, p. 337), however, this was not replicated in our study (Spearman's correlation, $r_s = 0.21$, $p = 0.28$), possibly due to the small number of participants in this study.

In comparison to a British study by Wardle (1987), the 29 participants scored (2.50 ±1.40) similarly to the female group (2.75 ±0.79), but higher than the male group (1.88 ±0.77) in the restrained scale, suggesting that a similar amount of restraint was applied, (i.e. rarely to sometimes) in eating foods that would help to control weight, however, the male group employed less restraint (i.e. never to rarely).

Regarding the emotional and external scales, the participants in our study scored lower on both scales (1.62 ±1.35 and 2.70 ±0.75, respectively) than both female (2.65 ±0.72 and 3.12 ±0.51, respectively) and male groups (2.24 ±0.77 and 3.16 ±0.55, respectively), suggesting that overall, the 29 participants ate less in response to their emotions (i.e. never to rarely), and to external food cues (i.e. the sight and smell of food) regardless of state of hunger, compared to the British groups, who ate rarely to sometimes in response to their emotions, and ate sometimes to often due to external food cues.

The correlations between these eating traits in the British male and female groups was investigated by Wardle (1987) and, for comparison with this study's 29 participants' correlation results are also shown in Table 3.12.

Table 3.12 DEBQ correlations between eating traits in a British male and female.
(Adapted from Wardle 1987), compared with this study's 29 participants.
NS: non-significant, value not reported.

DEBQ Traits	Women n = 102	Men n = 86	Current study n = 29
Restrained w/ Emotional	$r = 0.15$ NS	$r = 0.48$, $p < 0.001$	$r_s = 0.43$, $p = 0.02$
Restrained w/ External	$r = -0.05$ NS	$r = 0.08$ NS	$r_s = 0.28$, $p = 0.14$
Emotional w/ External	$r = 0.45$, $p < 0.001$	$r = 0.32$, $p < 0.005$	$r_s = 0.46$, $p = 0.01$

In the British study, a weak, non-significant relationship between the traits restrained and emotional eating ($r = 0.15$) was found in the female group, however, the male group: a strong, significant association was found ($r = 0.48$, $p < 0.001$), which was similar to this study ($r_s = 0.43$, $p = 0.02$). This is compatible with the Restraint theory by Stunkard & Messick (1985) which suggests that the women were successful restrained eaters, and the men employed restraint but then gave in to emotional eating (as discussed in section 1.6.2, p. 18).

Regarding the association between restrained and external eating traits, both female and male groups in the Wardle study showed very weak associations (female, r = -0.05 and male, r = 0.08) which were not significant. This study found a moderate, but non-significant association (r_s = 0.28, p = 0.14). However, this agrees with Wardle's explanation that, it is unlikely to find scores high in both restrained and external eating traits.

The most striking similarity is the correlation between emotional and external eating traits where both Wardle and this current study found significant associations. Specifically, for the female group there was a strong association, (r = 0.45, p < 0.001), and the male group there was a moderate association, (r = 0.32, p < 0.005). Our study observed a strong, significant association, (r_s = 0.46, p = 0.01). These findings agree with the 'Externality theory' that an individual who eats in response to her/his emotions, can precipitate an external eating event (regardless of state of hunger). These individuals are also classified as disinhibited eaters according to Stunkard & Messick (1985), specifically because these individuals are less likely to be able to employ restraint due to 'external' (food) or 'internal' (emotional) cues and give in to eating.

Overall, the similarities between the participants from this study and the Dutch study suggest that both groups experienced a similar approach to food and eating in terms of eating traits: restrained, external and emotional eating. Additionally, the participants were similar to the British female group in employing similar levels of eating restraint, which was slightly more restraint than the British male group. The participants from this study, overall, appeared to be less susceptible to eating because of their emotions compared to the female and male groups in the British study. Additionally, overall the 29 participants from this study were less prone to eating due to external food stimuli compared to the female and male British groups.

IDA groups and Dutch Eating Behaviour Questionnaire

Regarding the restrained eating scale, the disciplined group had a similar median score (2.75 ±1.25), to the instrumental group (2.55 ±1.53), suggesting that both these groups eat 'rarely' to 'sometimes' foods that will help to maintain weight, or that will not cause weight gain. The aesthetic group had the lowest score (1.90 ±0.85) which suggests that these individuals ate foods 'never' to 'rarely' that would maintain their weight. In other words, the aesthetic group were less concerned about eating foods related to weight gain or loss or maintenance. There was a

significant difference observed between the disciplined and aesthetic groups (p = 0.04), but not between the aesthetic and instrumental group scores.

Regarding the external eating scale, the instrumental group had the highest median score (3.10 ±0.98), and the disciplined and aesthetic groups had similar scores (2.75 ±0.81 and 2.60 ±0.45, respectively) which were lower. No significant differences were observed between scores. Scores 3 and above equate to eating food due to their smell, taste or sight 'sometimes' to 'often'. Scores between 2 and 3 suggest eating food 'rarely' to 'sometimes' due to external food stimulus.

A similar pattern was observed in the emotional eating scale, where the instrumental group had the highest median score (2.81 ±3.58) but also the largest interquartile range, and the disciplined and aesthetic groups had similar scores (1.50 ±0.96 and 1.00 ±1.27, respectively). Although there was no difference observed in scores, it is not surprising that the instrumental group scored higher on this scale as these results correlate with some of the interview statements: the instrumental participants expressed that their response to stress or negative emotions was to eat. Moreover, the aesthetic group scored the lowest in emotional eating which corresponds with the interviews where they expressed that stress and negative emotions caused them to lose their appetite (scores between 1 and 2 equate with eating never to rarely in response to negative emotions), which is considered to be the 'normal' response according to Gold & Chrousos (2002).

Overall, the aesthetic group had the lowest scores for the three eating traits, which suggests perhaps having a more comfortable relationship with food than either the disciplined or instrumental groups. This observation is supported by the interviews where the aesthetic group expressed that food was an important part of their life and part of the enjoyment of life. Findings were mixed among the disciplined group where some expressed that food was important and others did not, and these findings were supported by the scores obtained for this group in the different eating traits. This suggests that there are some disciplined participants who do not experience the same level of being comfortable with food, as the aesthetic group experiences. Interestingly, the instrumental participants described food as not important, and not an important part of their life, and yet they find comfort in eating when sad or stressed. This finding suggests that the instrumental group experiences a dissonance, or dichotomous relationship with food. On the one hand food is not important to them and yet they rely on it for comfort in times of stress or when experiencing negative emotions. This might suggest that this group experiences a more challenging relationship with food. Thus, it is possible to hypothesise that if this is true, then the instrumental group will have higher scores in food dependency and/or possible (suggested) food addiction, as measured by the mYFAS questionnaire (next section).

3.4.5 Modified Yale Food Addiction scale (mYFAS) (version 1)

This questionnaire explored individuals who may suffer from possible food addiction (i.e. loss of control over food intake), especially with foods high in sugar, fat, salt and/or starches, most preferred by individuals who binge eat and have eating problems (Kales 1990; Drewnoswki et al. 1992; Drewnoswki 1995; Allison & Timmerman 2007). The data obtained from submitting this questionnaire showed a non-normal distribution and median scores and interquartile range for each BMI group are reported in Table 3.13.

Table 3.13 mYFAS: BMI groups' scores.
Median ±IQR and score ranges.

mYFAS: **Symptom Count score (SCS)**	**OB** **n = 6**	**OW** **n = 11**	**NW** **n = 12**
Median ±IQR	1.5 ±2.5	0 ±1	0 ±1
Range	0 - 4	0 - 2	0 - 2
Food Addiction Diagnostic score (FAD) **Median ±IQR**	1.5 ±3.0	0 ±1	0 ±1
Range	0 - 6	0 - 1	0 - 3

SCS possible score range is 0 to 7, a median score of 1 meets criteria for 'food dependence'.
Significant difference between NW and OB (U = 15.00, z = -2.10, p = 0.04); and between OW and OB: (U = 11.50, z = -2.36, p = 0.02)
FAD possible score range is 0 to 9, a score of 4 or greater meets the threshold for food addiction.
Significant difference between the OW and OB (U = 10.00, z = -2.54, p = 0.01).
SCS Cronbach α = 0.71; FAD Cronbach α = 0.82.

The symptom-count (SCS) median and interquartile scores for the NW and OW were identical (0 +1.0) with score ranges from 0 to 2. In contrast, the OB group's median score was higher (1.5 ±2.5), as well as their score range (0 to 4). A score equal to 1 meets the criteria for food dependence, and Gearhardt et al. (2011) expressed that SCS higher scores are indicative of "*patterns of neural activation implicated in other addictive disorders*". Specifically, this SCS is a measure of the severity of addictive-like eating symptoms, the higher the score, the stronger the food dependence is.

Significant differences were observed between scores for the NW and OB groups (p = 0.04), and between the OW and OB groups (p = 0.02). This suggests that the OB group had a stronger food dependence compared to their NW and OW counterparts.

Five participants in the NW (42%) and OB (83%) groups scored at least 1 or higher for the symptom count score, whereas, only 3 (27%) in the OW group: Spearman's correlation showed a weak, non-significant association between BMI and symptom count scores, (r_s = 0.19, p = 0.33).

Regarding the food addiction diagnosis (FAD) scores, NW and OW groups had identical scores (0 +1.0). However, the score range for the NW group was greater (0 to 3) than it was for the OW group (0 to 1). The OB group also scored higher on this scale, (1.5 ±3.0), and their score range was also greater (0 to 6). A score of 4 or higher is suggestive of experiencing problems with suggested food addiction. Lower scores, between 2 and 3 are suggestive of mild symptoms for food impairment and/or distress (Schulte & Gearhardt 2017). Upon further inspection of each BMI group, only 1 NW participant (8%) scored as high as 3, and no participants in the OW category scored more than 1. The OB group had 1 participant (17%) who scored 3, and 1 participant (17%) scored a value of 6. Scores between 4 and 5 are suggestive of moderate symptoms and scores 6 or greater suggests severe food impairment or distress.

No significant difference was observed in scores between the NW and OW groups, or between the NW and OB groups. There was a significant difference observed between the OW and OB groups (p = 0.01), Spearman's correlation showed a weak, non-significant association between BMI and food addiction scores (r_s = 0.14, p = 0.46).

In comparison to a study by Gearhardt, Corbin & Brownell (2009) that found 11.4% of their participants meeting the criteria for food dependence, our study found that 45% (13/29) of participants scored a median value of at least 1 for the SCS, suggesting a greater propensity for food dependence.

A large US study by Flint et al. (2014) identified in 2 cohort samples from NHS I and II (Nurses' Health Study) that the prevalence of food addiction decreased with increasing age, and it increased with increasing BMI. Specifically, in women aged 45 to 49 years and with a BMI $\geq$ 35.0 kg/m^2, FAD prevalence was 25.5%. In contrast, in women aged 70 to 74 years and with a BMI from 18.5 to 23.0 kg/m^2, prevalence was 0.3%. Additionally, in participants with a BMI between 23.0 to 24.9 kg/m^2, the FAD prevalence ratio (PR) was 2.01 (95% CI: 1.65 to 2.44). In contrast for women with BMIs $\geq$ 35.0 kg/m^2, the PR was 15.83 (95% CI: 12.58 to 19.91). In comparison our study showed a prevalence of 3.4% suggested food addiction diagnosis which agrees with the NHS I study (2.7%). Additionally, there was a moderate, negative association found between age and suggested food addiction, which was borderline significant (r_s = -0.37, p = 0.056), partially agreeing with Flint et al.'s findings that with age, food addiction prevalence declines. However, our study found no correlation between BMI and food addiction (r_s = 0.14, p = 0.46).

IDA groups and modified Yale Food Addiction Scale

The SCS median score and IQR was higher in the instrumental group (2.5 ±1.8) with a score range from 2 to 4. The disciplined group had a lower score (0 +1.0) and lower range (0 to 1), and the aesthetic group scored similarly (0 +1.5) but with a slightly larger range (0 to 2). There was a significant difference in scores observed between the instrumental and disciplined (p = 0.004) and aesthetic (p = 0.02) groups. The instrumental group had no participants with a score equal to 0 or 1, instead, 2 participants (50%) had a score of 2, 1 participant (25%) had a score of 3, and 1 participant had a score equal to 4. In contrast, 5 disciplined participants (62.5%) scored 0, and 3 (37.5%) scored 1. The aesthetic group had 3 participants (60%) who scored 0, 1 participant (20%) scored 1, and 1 participant scored 2. Recall that the SCS is a measure of the severity of addictive-like eating symptoms, where a score of 1 meets the criteria for food dependence and the higher the score the stronger the food dependence is.

Regarding the FAD scores both the aesthetic and disciplined groups scored identically (0 +1.0), although the score range for the disciplined was higher (0 to 2) than it was for the aesthetic group (0 to 1). The instrumental group had the highest FAD score (3.0 ±3.0) and score range (2 to 6). There was a significant difference observed in scores between the instrumental and disciplined (p = 0.006) and aesthetic (p = 0.01) groups. Previously described, scores between 2 and 3 suggest mild symptoms for food impairment and/or distress. A score of 4 or higher suggests experiencing problems with suggested food addiction, specifically, scores between 4 and 5 suggest moderate symptoms, where scores of 6 or greater suggest severe food impairment or distress. Upon further inspection of each IDA group, 1 instrumental participant (25%) scored 2, 2 participants (50%) scored 3, and 1 participant scored as high as 6. In contrast, 5 disciplined (62.5%) and 3 aesthetic (60%) participants scored 0. Two disciplined (25%) and 2 aesthetic (40%) participants scored 1. However, 1 disciplined (12.5%) and no aesthetic participants scored 2.

These SCS and FAD scores support the interview findings where the instrumental participants expressed dismay at eating too much of the wrong food types and a lot of the same type of food (see section 3.3.1.2). In addition, both the aesthetic and to some extent, the disciplined groups, although they felt that they could probably make some changes to improve the foods they were eating, they expressed that they enjoyed all ranges of food ‘in moderation’.

3.4.6 Food Choice Value questionnaire (FCV)

This questionnaire was used to investigate what factors might have an effect on individuals' food choices when shopping. These factors included food safety concern, convenience, health and weight concern, comfort food, sensory appeal, organic, accessibility and tradition. The data obtained showed a non-normal distribution and each BMI groups' median scores for each scale are reported in a radar diagram (Figure 3.6).

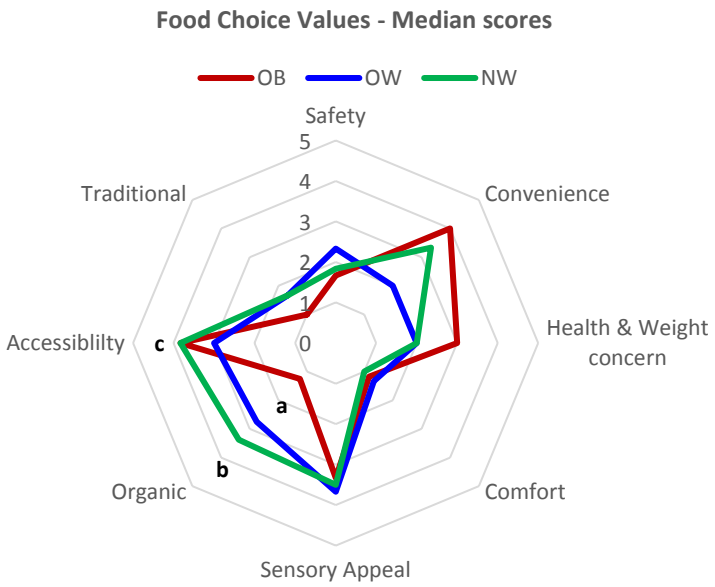

Figure 3.6 FCV BMI groups' median scores.
a: significant difference between NW and OB (U = 12.50, z = 2.22, p = 0.02);
b: significant difference OW and OB (U = 12.50, z = -2.08, p = 0.04);
c: significant difference between NW and OW (U = 32.00, z = -2.11, p = 0.04).
A score of 1: 'not at all important'; 2: 'a little bit important'; 3: 'moderately important'; 4: 'quite a bit important'; 5: 'very important' (Lyerly & Reeve 2015). Cronbach α: safety = 0.75, convenience = 0.92, health & weight concern = 0.93, comfort = 0.66, sensory appeal = 0.58, organic = 0.88, accessibility = 0.62, traditional = 0.72.

On the organic scale, the NW group had the highest score, 3.38 (±2.69), followed by the OW group who scored 2.75 (±1.25), and the OB group scored the lowest, 1.25 (±1.88). Significant difference in scores between the NW and OB (p = 0.02) and between the OW and OB (p = 0.04) groups were observed. A score of 3 or higher suggests that buying foods that contain minerals, vitamins, natural ingredients and that have minimal impact on the environment is 'moderately' to 'quite a bit' important. In contrast, a score between 1 and 2 is indicative that choosing these food types is 'not at all' to 'a little bit' important.

On the accessibility scale, the OW group scored 3.00 (±1.67) whereas, the NW and OB groups had higher similar scores, (3.83 ±1.00 and 3.83 ±1.79, respectively). There was a significant difference in scores only between the NW and OW groups (p = 0.04). Scores between 3 and 4 suggest that food accessibility (i.e. how physically accessible food is in terms of stores in proximity to home, and food cost) was 'somewhat' important to the OW group but was 'quite a bit' important to the NW and OB groups.

Regarding the convenience scale, no significant differences were observed. The OW group scored the lowest, 2.00 (±1.00), the NW group scored higher, 3.33 (±2.5), while the OB group scored the highest, 4.00 (±3.42). How easily food can be prepared was 'a little bit important' for the OW group, while it was 'moderately important' for the NW group, but 'quite a bit important for the OB group.

Regarding the health and weight concern scale, both the NW and OW groups scored similarly, (2.00 ±2.58 and 2.00 ±1.33, respectively), while the OB group scored higher, (3.00 ±2.08). The NW and OW groups' scores suggest that when they shopped for food, foods that helped in either maintaining or losing weight were 'a little bit' important. Whereas the OB group's score is suggestive that they put 'moderate' importance into purchasing and/or eating these food types. To investigate if this scale was associated with the DEBQ scale, restrained eating, a Spearman's correlation test was carried out and a very strong, significant association was observed (r_s = 0.76, p < 0.0001). This finding supports the health and weight concern scores that the participants engaged in purchasing foods that would help either to maintain or lose weight. Alternatively, they may have engaged restraint in purchasing/eating foods that would not put weight on. Furthermore, this finding is supported by the fact that a Spearman's correlation test also showed that the health and weight concern scale was strongly and significantly associated with the OP scale (i.e. overweight preoccupation scale from the MBSRQ-AS), (r_s = 0.53, p = 0.003).

Regarding the safety scale, the OB group scored the lowest, (1.67 ±1.75), with the NW group scoring similarly, 1.83 (±2.83), and the OW group had the highest score, (2.33 ±2.00). Overall, the OB and NW groups' scores suggest that food safety, (i.e. food that has been prepared or processed properly to the extent that it will not cause illness) was 'not at all' to 'a little bit important' for these groups. For the OW group, food safety was 'a little bit' to 'moderately' important.

Regarding the traditional scale, the OB group scored the lowest, (1.00 ±1.00), while the scores between the NW (1.67 ±1.25) and OW (1.67 ±2.33) groups were similar. Scores between 1 and 2

suggest that foods that are familiar or recognisable as food from one's heritage or background was 'not at all', to 'a little bit important'.

Regarding the comfort scale, all groups scored very similar, specifically, the NW group scored 1.00 (±0.33), the OW group scored 1.33 (±1.00), and the OB group scored 1.17 (±1.08). Scores suggest that the degree that food elicits positive emotions or alleviates negative emotions was 'not at all', or 'a little bit' important to each of these groups. It is interesting that all groups scored similarly for this scale, especially because for the DEBQ emotional eating trait we observed a significant difference in scores between the NW and OB, and the OW and OB groups (p = 0.04 in both cases) where the OB group scored significantly higher compared to the NW and OW groups. It would have been expected that the OB group would have scored high on this comfort scale as well. In order to investigate if the FCV comfort scale was associated with the DEBQ emotional scale, a Spearman's correlation test was carried out and showed only a weak, non-significant association between these two scales (r_s = 0.14, p = 0.46). This finding can perhaps be explained by the fact that overall, all 29 participant's DEBQ emotional median score was low (i.e. 1.62 ±1.35), additionally, all 29 participant's FCV comfort median score was also low (i.e. 1.00 ±0.83), suggesting that there were perhaps too few participants (especially in the OB group) to detect high scores for each scale.

Lastly, for the sensory appeal scale, all groups, scored similarly. Specifically, the NW group scored 3.50 (±1.00), the OW group scored 3.67 (±1.33), and the OB group scored 3.33 (±2.08). These scores suggest that overall, these groups felt that the appearance of food that is pleasing to the senses in taste and smell was 'moderately' to 'quite a bit important'. To investigate if there was a relationship between this scale and either of the two YFAS scales (i.e. SCS or FAD), a Spearman's correlation test was carried out. A very weak, negative association was observed between the sensory appeal scale and the YFAS SCS (r_s = -0.08, p = 0.70) and FAD (r_s = -0.12, p = 0.52). These findings may suggest that foods that are pleasing to the senses in taste and smell are not necessarily the same foods which cause dependency or food addiction. Specifically, because both NW and OW groups scored the highest for this sensory appeal scale, but scored very low on both the SCS and FAD on the mYFAS questionnaire. Additionally, the OB group had a lower score (for sensory appeal), but the largest IQR, and the highest scores for the YFAS scales, which may explain the negative correlation.

This study's 29 participants' scores were compared with scores obtained from a US sample by Lyerly & Reeve (2015) who were updating an older version of the 'Food Choice Questionnaire'

designed by Steptoe, Pollard & Wardle (1995). Table 3.14 lists Lyerly & Reeve's US norms means (±SD), and this study's 29 participants' median scores (±IQR).

Table 3.14 FCV scores in a US population (Adapted from Lyerly & Reeve 2015).
US population, mean ±SD, compared with this study's, median ±IQR.

Food Choice Values scales	**US sample** n = 235	**Current study** n = 29
Safety	3.63 ±1.06	2.33 ±2.50
Convenience	3.50 ±0.97	2.67 ±2.17
Health and weight concern	2.81 ±1.12	2.00 ±2.17
Comfort	1.98 ±0.95	1.00 ±0.83
Sensory appeal	4.04 ±0.71	3.33 ±1.33
Organic	3.13 ±1.14	2.75 ±2.00
Accessibility	3.62 ±0.95	3.33 ±1.67
Tradition	2.00 ±0.92	2.67 ±1.50

Overall, the US participants scored slightly higher for most of the FCV scales. In the food safety scale, the US participants had a much higher score (3.63 ±1.06) compared to this study's participants (2.33 ±2.50). Overall, food safety was moderately to quite a bit important to the US participants, (i.e. how food has been prepared and/or processed properly to the extent that it will not cause illness) compared to this study's participants whose score suggests that they felt food safety was a little bit to moderately important.

Regarding the convenience scale, the US participants had a higher score (3.50 ±0.97), whereas the participants from this study had a lower score (2.67 ±2.17), which suggests that how easily food is prepared and/or can be eaten played a more important role (i.e. moderately to quite a bit) for the US participants than for the participants in this study, where food convenience was a little bit to moderately important.

Regarding the health and weight concern scale, the US participants scored slightly higher (2.81 ±1.12) than the participants in this study (2.00 ±2.17). Overall, for both studies' participants, eating foods that would help to maintain weight and/or to lose weight, or that were deliberately slimming, was a little bit to moderately important.

Regarding the comfort scale, the US participants scored slightly higher (1.98 ±0.95) than the participants in this study (1.00 ±0.83). This suggests that overall the US participants were 'a little bit' more likely to eat foods that offered some degree of comfort in alleviating negative emotions, or that would elicit positive emotions, whereas the participants in this study were overall less likely (i.e. 'not at all') to eat these foods.

Regarding the sensory appeal scale, the US participants scored 4.04 (±0.71) which was higher than the participants in this study, who scored 3.33 (±1.33). Overall, the higher score by the US participants suggests that the appearance of food that is pleasing to the senses in taste and smell was 'quite a bit' important, compared to the participants in this study whose score suggests that overall it was 'moderately' important.

The organic scale, the US participants scored higher 3.13 (±1.14) than the participants in this study who scored 2.75 (±2.00) but had a larger IQR. Overall, the US participants' score suggests that they were moderately concerned with eating foods, which had minimal impact on the environment, contained vitamins, minerals and natural ingredients. Whereas the participants in this study overall felt that eating these foods was a little bit important.

The accessibility scale, both the US participants and this study's participants scored similarly, (3.62 ±0.95 and 3.33 ±1.67, respectively), this suggests that physical accessibility to food in terms of proximity to stores from one's home and the cost of food are moderately to quite a bit important, for the individuals in both studies.

For the tradition scale, this study's participants scored slightly higher than the US participants (2.67 ±1.50 vs 2.00 ±0.92, respectively). The differences between scores was not very large, such that both studies' participants felt that eating foods that are recognisable and/or familiar from one's background or heritage, was 'a little bit' to 'moderately important'.

Lyerly & Reeve (2015, p. 54) commented that it would be useful to examine health and weight concern in relation to body mass index, and to date, no study has carried out this research with this questionnaire until our study, and even though the sample sizes are small it is possible that our study may provide a starting point for future studies. Moreover, to date, no other studies have used this updated questionnaire to explore food choice in other populations. This may be explained by the fact that it is still a relatively new instrument and researchers may not be aware of its existence. Indeed, at least 5 other studies (Markovina et al. 2015; Miedema et al. 2016; Baudry et al. 2017; Hoang et al. 2017; Cunha et al. 2018) and at least one study each in Spain, Malaysia, Turkey, Brazil and Africa (Canales Ronda & Hernández Fernández 2015; Ooi et al. 2015; Dikmen et al. 2016; Heitor et al. 2016; Cabral, Vaz de Almeida & Cunha 2017, respectively) have used the older Food Choice questionnaire by Steptoe, Pollard & Wardle (1995) since 2015 to date. This suggests that food choice is still being explored as a relevant topic in research studies.

IDA groups and Food Choice Value questionnaire

The disciplined group had the highest score on the food safety scale (3.33 ±3.25) suggesting that food safety was moderately to quite a bit important, whereas the aesthetic and instrumental groups had similar scores (2.33 ±1.83 and 2.17 ±1.33, respectively), suggesting that food safety was 'a little bit important'. However, no significant differences were observed among scores. This was not a topic that was discussed, nor did food safety emerge during the interviews.

For the convenience scale (i.e. how easily food can be prepared), the instrumental group had the highest score (4.33 ±3.17) which suggests that food convenience was 'quite a bit' important. In contrast the aesthetic group had the lowest score (2.00 ±1.50), suggesting that how easily food was to prepare was a little bit important. Whereas, the disciplined group scored slightly higher than the aesthetic group (2.83 ±2.08), suggesting food convenience was somewhat moderately important for them. There was no significant difference observed between scores. These findings are supported by the interviews where overall, the aesthetic group were more likely to prepare home-cooked meals. One can theorise that preparing a home-cooked meal is not considered very convenient because the perception is that home-cooked meals take longer to prepare and cook.

Regarding the health and weight concern scale, although the disciplined group had the highest score (2.83 ±2.17) it was not dissimilar from the aesthetic or instrumental groups (2.00 ±1.33 and 2.33 ±1.92, respectively). These scores suggest that foods that helped in either maintaining or losing weight, were 'a little bit to moderately' important to all participants, as no significant differences were observed between scores. The fact however that the disciplined group had the highest score is supported by the fact that all these participants expressed their awareness of the amount of sugar and fat in foods, and that when purchasing foods, this was a consideration.

For the comfort scale, the instrumental group scored significantly higher (2.17 ±1.83) than both the disciplined group (1.00 ±0.0) (p = 0.006), and aesthetic groups who also scored significantly lower (1.00 ±0.50) (p = 0.03). A score of 2 is interpreted as eating foods that either alleviate negative emotions or elicit feelings of positive emotions is 'a little bit' important. In contrast, both the disciplined and aesthetic score is interpreted as these foods being not at all important. The interesting finding is that it may further support the concept of the instrumental group experiencing a dissonance in their relationship with food. On one hand, they have expressed that food is not important and yet on the other hand they find comfort in it. It is possible however, that these individuals are not cognisant of this dissonance.

Regarding the sensory appeal scale, all IDA groups scored similarly, in particular, the aesthetic and disciplined groups had identical scores (3.0 ±1.17) and the instrumental group had a slightly larger IQR (3.0 ±1.92), suggesting that all participants felt that food appearance and food that is pleasing to the senses in taste and smell was 'moderately' important. This is supported by the interviews where overall, participants expressed that part of what compelled them to purchase the foods they purchased was if the food looked nice.

Regarding the organic scale, the disciplined group had a much higher score (3.50 ±2.13) compared to the instrumental who scored significantly lower (1.38 ±1.38) (p = 0.02). The aesthetic group had a higher score compared to the instrumental group, but it did not reach significance (2.75 ±1.75) (p = 0.065). The disciplined group's score suggests they place 'moderate to quite a bit' importance on foods that have minimal impact on the environment, and that are natural and contain vitamins and minerals. Whereas, the aesthetic group places 'a little bit to moderate' importance on these food types, and in contrast, the instrumental group's score suggests they feel that purchasing these food types is 'not at all to a little bit' important. There were no significant differences observed in scores between the aesthetic and disciplined groups. The topic of purchasing organic foods did not emerge during the interviews, however, because the disciplined group scored significantly higher does agree with their higher score on the food safety scale. Both these findings also agree with the interview findings of the overall awareness about food that the disciplined expressed.

On the accessibility scale, all participants scored similarly. The disciplined group had a slightly higher score (3.50 ±1.50), followed by the instrumental (3.33 ±1.83) then the aesthetic (3.0 ±1.67). No significant differences were observed between scores. Overall, participants felt that the cost of food and how close stores were (i.e. proximity to home) was 'moderately to quite a bit' important to them. This is supported from the interviews, where overall, most participants explained that where they shopped was close to either where they lived or worked, or on their route home from work, or school (university).

Regarding the traditional scale, the aesthetic group had the highest score (2.67 ±2.67), whereas the disciplined and instrumental groups scored similarly (1.33 ±1.25 and 1.67 ±1.50, respectively). There was no significant difference observed between scores. However, the aesthetic group's score suggests that they felt foods that were familiar with their heritage or background was more important compared to the disciplined and instrumental groups who felt less important about eating these food types. The finding that the aesthetic group feels these food types are more important may be supported by the interview findings when they expressed that food was

important in terms of social get-togethers with friends and family members, and indeed Dave felt that food played an important role in terms of his cultural identity (section 3.3.1.4).

3.4.7 Scottish Physical Activity questionnaire (SPAQ)

This questionnaire measured physical activity, as leisure time and work-time, and the two forms of activity were added together to obtain total time spent in physical activity over a 7-day period. The data obtained showed a non-normal distribution. Each BMI groups' median (±IQR) scores for total time (in minutes per week) spent in total physical activity (PA) are reported in a bar chart below (Figure 3.7).

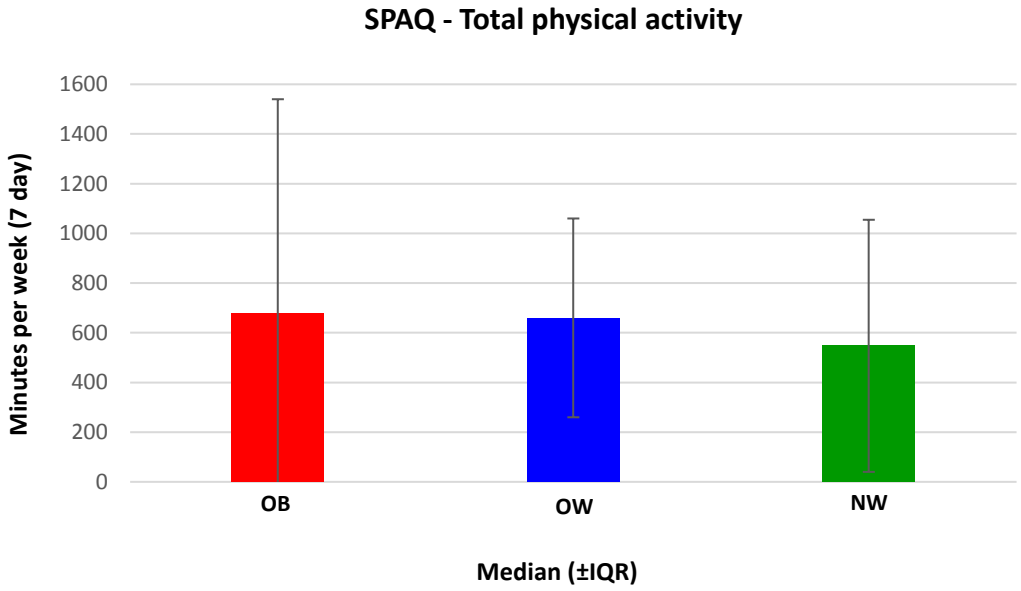

Figure 3.7 SPAQ Total time spent in physical activity among BMI groups.
No significant difference in scores.

The NW group spent the least amount of time in total PA per week, (547.5 ±507.3 mins/wk), approximately 78 min/day. The OW group spent more time (660.0 ±425.0 min/wk), approximately 94 min/day, and the OB group spent the most time in total PA (677.5 ± 862.5 min/wk), approx.-imately 97 min/day, but also had the largest interquartile range. No significant differences were observed in total time spent in PA between the different groups. Additionally, the observation that the OB group spent the most time in total PA may be explained by the amount of time they spent in WTPA, discussed in the second paragraph below.

Regarding leisure time physical activity (LTPA), 2 participants were omitted from the calculations as one reported that s/he was 'just starting up' with exercise and another participant reported doubling her/his physical activity during the time of completing the questionnaire. To avoid biased results, these 2 participants were not included, therefore, each BMI group consists of the following, OB n = 6, OW n = 9, and NW n = 12. The OW group spent the most time in LTPA, (650.0 ±247.5 min/wk), approximately 93 min/day. In contrast, the OB group spent the least amount of time in LTPA, (410.0 ±525.0 min/wk), approximately 59 min/day, but also had the greatest IQR. The NW group spent a similar amount of time in LTPA compared to the OB group, (445.0 ±454.0 min/wk), approximately 64 min/day. No significant differences in time spent in LTPA were observed (Figure 3.8).

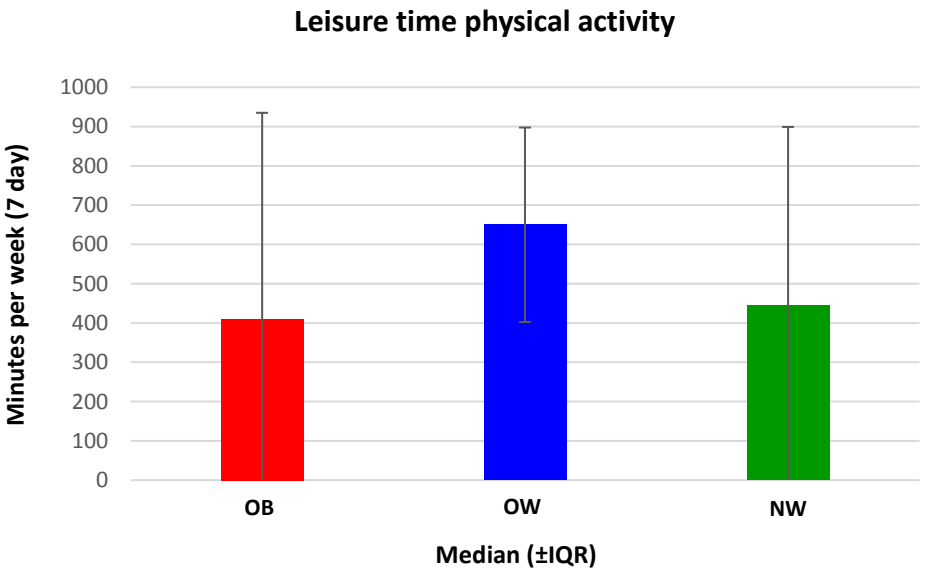

Figure 3.8 LTPA among BMI groups.
No significant difference observed among BMI groups.

Regarding the work time physical activity (WTPA), two participants were retired and therefore no longer employed, because of this, WTPA was calculated for 27 participants (OB n = 5, OW n = 10, NW n = 12). The OW group spent the least amount of time in WTPA (62.5 ±183.8 min/wk), approximately 12.5 minutes per day (5 days per week). In contrast, the OB group spent 4 times that amount (250.0 ±382.5 min/wk), or approximately 50 minutes per day. Whereas, the NW group spent approximately double time (compared to the OW group) in WTPA (105.0 ±93.8 min/wk), equivalent to spending 21 minutes per day being physically active at work. There was a significant difference observed between the NW and OB (p = 0.02), and between OW and OB (p = 0.02) groups (Figure 3.9).

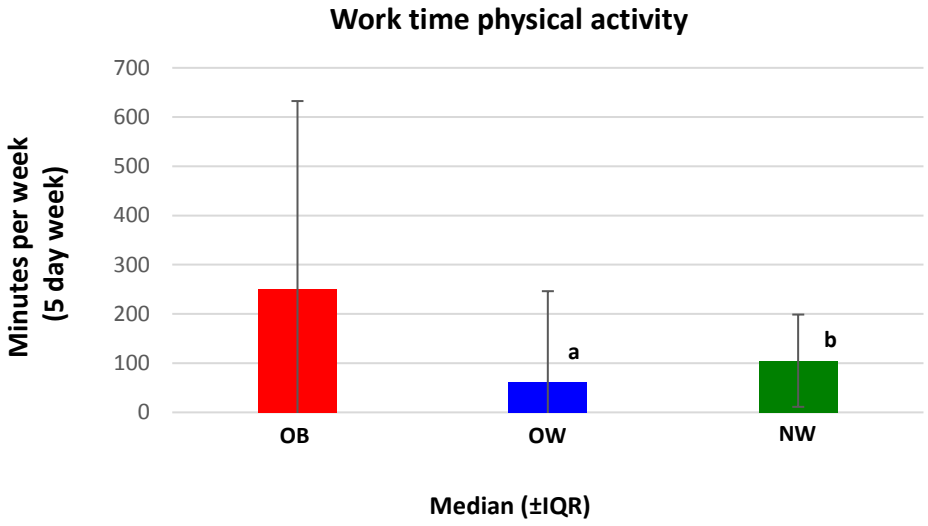

Figure 3.9 WTPA among BMI groups.
a: Significant difference between OW and OB (U = 6.50, z = -2.28, p = 0.02);
b: Significant difference between NW and OB (U = 7.00, z = -2.44, p = 0.02).

In comparison to a Scottish study with a similar sample size as our study, Lowther et al (1999) validated the questionnaire in individuals who were physically active with a gym membership, and members of the public who volunteered for an exercise project with Lowther et al. (1999). Values are reported as mean ±SD, and values from both studies are shown in Table 3.15.

Table 3.15 Scottish study total physical activity.
(Adapted from Lowther et al. 1999).

Participants	**Scottish study** (n=34)	**Current study** (n = 29)
Mean (±SD) (mins/wk)	587.5 (464.6) (=83.9 mins/day)	648.0 (426.8) (=92.6 mins/day)
Minimum	45.0	0
Maximum	1950.0	1765

The participants from our study spent more time in total PA (648 ±426.8 min/wk) compared to the Scottish study (587.5 ±464.6), which was approximately 60 minutes more per week, or about 8 ½ minutes more per day. However, the Scottish study had a slightly larger minimum-maximum range (45 to 1950 mins/wk, or approximately 6 to 279 min/day), which was not too dissimilar compared to the participants from this study (0 to 1765 mins/wk, or approximately 0 to 252 mins/day).

Lowther et al. (1999) reported that their repeatability finding for total PA was 53 minutes, which they deemed to be a large variation (or a large degree of error). When the researchers analysed the SPAQ in its component parts, (LTPA and WTPA), the repeatability for LTPA was 29.3 minutes, and for WTPA was 54.6 minutes (a very large variability). Upon further investigation, Lowther et al. discovered that the WTPA section which asked about 'walking while at work' had the largest variability and confirmed their suspicions in a second study. Lowther et al. discovered that for this section (walking while at work) participants were including bouts of standing while at work. This may explain the significant findings between our BMI groups in WTPA (Figure 3.9), and it may also explain why the OB group had reported spending the largest amount of time in total physical activity (compared to the NW and OW groups above).

Based on Lowther et al.'s (1999) findings, we re-examined the 'walking while at work' on the WTPA section, among the BMI groups and observed that the OB group had the highest median value of 150 (±375) min/wk, equal to 30 min/day. In contrast, the OW group had spent the least amount of time, 65.0 (±195) min/wk, equal to 13 min/day. Whereas the NW group reported spending 105 (±93.75) min/wk: equal to 21 min/day. Although these values may appear realistic, they have however, very large IQRs. These values still resulted in a significant difference between the NW and OB (p = 0.02), and between the OW and OB (p = 0.04) groups. Another interpretation of these findings can include the fact that OB participants are carrying more weight, and for them moving while at work, or walking may cause them to perspire. Moreover, because only moderate and vigorous activity are supposed to be reported by the volunteer, and not light activity, such as walking, it is possible that OB participants feel that walking is moderate (or vigorous) activity. Interestingly, the OW group reported the least amount of time spent in PA at work. If we use the same argument as we did for the OB participants then we would expect that OW participants would report spending more time in PA at work, especially compared to the NW participants. However, the OW participants also reported spending the most amount of time in LTPA. As a result of this, they may feel more physically fit and any walking they do while at work is interpreted as simply a light physical activity.

A study in west Scotland by Hasler et al. (2000) exploring LTPA levels in a smaller sample size (n = 11) of outpatients with type 1 diabetes (with the aim of an exercise intervention), but similar age range to our study, found these individuals spent 420 (±64 mins/wk) (mean ±SE), equivalent to 60 mins/day. Remarkably similar, the participants in our study spent 537 (±63 min/wk) (mean ±SE), equivalent to 76.7 mins/day, or approximately 13 ½ minutes more per day.

There are very few studies that have used this questionnaire, this may be for the reason that, for individuals to try to answer this questionnaire with the best accuracy, it is advisable they sit with the researcher to fill it in. It was used in study 1 but not study 2, as the design and layout of it caused confusion to both the participant and the researcher (Appendix 11). It was decided that questions regarding physical activity would be asked during the interview instead. Since the objective in asking about physical activity was to explore which participants were active in exercise and how often, and what type of activity was performed.

In summary, it is possible that the OB group felt that their level of being overweight prevented them from spending more time in LTPA. The more interesting finding, however, is that the OW group spent the most time in LTPA. This is counterintuitive as individuals with obesity are less likely to engage in physical activity (Stewart 2012), and individuals who are overweight are believed to be on the trajectory to becoming obese, and would therefore spend less time in physical activity.

IDA groups and Scottish Physical Activity Questionnaire

For total PA, the aesthetic group spent the most time (660.0 ±695.0 min/wk), equivalent to 94.3 min/day; followed by the instrumental group (597.5 ±1312.5 min/wk), equivalent to 85.4 min/day. The disciplined group spent the least amount of time in total PA (517.5 ±381.3 min/wk), equivalent to 73.9 min/day. No significant differences were observed between groups in total time spent in PA.

For LTPA, the aesthetic group spent significantly more time in LTPA (720.0 ±468.8 min/wk), approximately 103 min/day, compared to the disciplined group (445.0 ±266.3 min/wk) (p = 0.02), approximately 64 min/day. Although the instrumental group spent the least amount of time in LTPA (417.5 ±828.8 min/wk), approximately 60 min/day, it was not significantly different from the aesthetic group. This finding however, agrees with our earlier finding where the OW group spent the most amount of time in LTPA and the OB group spent the least amount of time in leisure activity.

Regarding WTPA, however, the instrumental group spent more time in WTPA (180.0 ±483.8 min/wk), 36 min/day followed by the disciplined group who spent a little less time in it (105.0 ±131.3 min/wk), approximately 21 min/day. In contrast, the aesthetic group spent the least amount of time in WTPA (7.5 ±33.8 min/wk), approximately 1 ½ min/day. There was a significant

difference observed between the aesthetic and instrumental (p = 0.01) and disciplined (p = 0.006), but not between the instrumental and disciplined groups. That the instrumental group reported the largest amount of time spent in WTPA can probably best be explained by the findings from Lowther et al.'s study (above) where their participants had included bouts of standing while at work. Additionally, our finding that the instrumental group spent the most time in WTPA agrees with a similar finding where the OB group spent the largest amount of time in WTPA.

3.5 Summary of BMI and IDA groups

This study aimed to investigate how individuals of all sizes respond to, or behave in their environment. In order to not make an assumption or judgement on body size and behaviour, different anthropometric measurements were taken to classify participants in different groups. However, allocating individuals according to BMI categories resolved as the best approach for the most balanced distribution of participants and, after analysis of SSis, the identified IDA profile was also utilised.

The results from the analysis of the questionnaires in function of both the BMI categories and IDA profiles show that there are distinct demi-regularities (some activated and some counteracting each other) and differences among our participants. The questionnaire results in function of BMI showed that overall, the OW group had better scores in body image salience, salutogenesis, with no food dissonance (i.e. low scores in restrained, external and emotional eating, with little or no food dependency), and engaged in more leisure time physical activity. The SSi results also support this concept that OW individuals were comfortable in their own bodies, they expressed having a high amount of confidence in themselves, and they also expressed pleasure in seeking and trying new foods, and their motto, overall, was 'all things in moderation', as a result they felt they did not need to restrict any food types. The main food ingredient that they had an awareness to not overconsume, was sugar.

In contrast, the OB participants overall had worse scores in body image salience, lower salutogenesis, higher scores in emotional eating and food dependency, and engaged in less leisure time physical activity. Moreover, the findings from the interviews support the questionnaire findings, where OB participants expressed discomfort with their body image and shape. Additionally, they expressed feeling low levels of confidence and/or self-esteem. They also stated that trying new foods was not something that interested them, they were more comfortable with eating the same familiar foods. Additionally, food labelling was not generally something they were

interested in paying attention to, ironically however, they stated that they would cut fat off of everything.

The NW participants had better scores overall, compared to the OB participants, but not as high as the OW participants; additionally, the NW participants also engaged in less leisure time physical activity compared to the OW participants. This finding was unexpected because researchers might expect that OW participants would be more similar to the OB participants however, we found the opposite. Moreover, the interview results from the NW participants support the questionnaire findings where some NW participants expressed feeling ok about their body image/shape, and yet others did not have the same degree of comfort. Additionally, some NW participants expressed feeling confident in themselves with a healthy self-esteem, and others did not. Moreover, some NW participants expressed interest in trying new foods, and yet others expressed no interest in experiencing new foods. Overall, the NW participants felt that it was important to pay attention to food labelling, in particular sugar and fat.

Moreover, when the questionnaires were analysed in function of the IDA profiles, their results support the findings from the interviews. In particular, participants designated as aesthetic eaters and to some degree, disciplined, have a distinct, more positive embodied salience to food, themselves, and outlook on life. In contrast the participants with an instrumental approach to food, experienced a more negative embodied salience to food, themselves, and outlook on life.

The implication of these findings in function of BMI suggests that individuals with obesity may need more support and understanding from health management, which is what Skär, Juuso & Söderberg (2014) concluded from their obesity research which explored salutogenesis and quality of life. In function of IDA analysis, this research did not identify the demi-regularities of how or why instrumental eaters, (therefore, more likely to be obese) experience food dissonance, and an overall negative embodied salience; which is why individuals with obesity may need more support in terms of understanding from public health officials (i.e. doctors, nurses, etc) about the overall negative embodiment these individuals personify. Particularly because this negative embodiment appears to be more related with being obese than it does with being overweight or normal weight.

Chapter 4 Study 2

4.1 Study aims and design

The second part of this study (study 2), aimed to evaluate if the similar attitudes and behaviours/dispositions towards the obesogenic environment, as identified in a group of participants of different ages and identified BMI categories, could be identified in a group of volunteers with a targeted age range between 20–40 years of age. This age group was chosen because of the potential for intervention on them, to reduce the risk of developing obese associated diseases later in life: younger individuals have a better chance at making lifestyle changes since they are less established in their lifestyle habits, whereas, older adults, are more likely to be established in their life habits/regime, thus making intervention more difficult. With increasing age, the risk of age-related diseases, such as, insulin resistance, type-2-diabetes, coronary heart disease and cancer is increased (Boss & Seegmiller 1981; Weissberg 2012; WHO 2018) and the scope for prevention strategies is reduced.

Recruitment began in mid-February through mid-September 2017. Advertisements were placed in the RGU Bulletin, broadcasted in an email every Friday to staff and students. Additionally, advertisements were placed on Gumtree approximately twice a week, under the heading of 'other charity and volunteer work', (Appendix 18). In addition, power-point posters were hung on employee boards in RGU's departments (e.g. sports centre, Pharmacy and Life Sciences (PALS) and library) and at IKEA's collection point on Wellington Circle; Sainsbury's and ASDA on Garthdee Road, the local Garthdee post office on Holburn Street, and Bannatynes gym in Danestone (Appendix 19).

Participants were required to be 20-40 years old, living in Aberdeen city or shire, and no awareness of having an eating disorder (e.g. anorexia or bulimia). Potential volunteers emailed the researcher expressing their interest, and they would receive back an information sheet about the study (Appendix 2), as well as an example of the consent form (Appendix 3) so that the volunteer would see what s/he would be signing should s/he decide to take part. However, the consent form was signed by both parties on the day of the appointment. An appointment was scheduled and lasted, on average 2 hours. During which time, anthropometric measurements (Appendix 20), a full body scan, body adiposity measures, blood pressure, a blood sample and the semi-structured interview took place, in the order described. Participants were able to answer the questionnaires (the questionnaire pack included 7 questionnaires and a demographic form) at their leisure and either mail (envelope and postage supplied) or return the pack to the front desk

(in a sealed envelope provided) of the Sir Ian Wood building, where the researcher would collect it. As an expression of gratitude and appreciation for their time and contribution, participants were given a £15 ASDA gift voucher upon completion of the study.

The navigator tool below (Figure 4.1) highlights all 4 generative mechanisms this second study focuses on where the 'socio-cultural' mechanism still uses semi-structured interviews; 'behavioural/psychological', the questionnaires and interview; anthropometric measurements and body scans explore the 'phenotype/somatotype' mechanism and blood biomarkers explore the 'biological' mechanism.

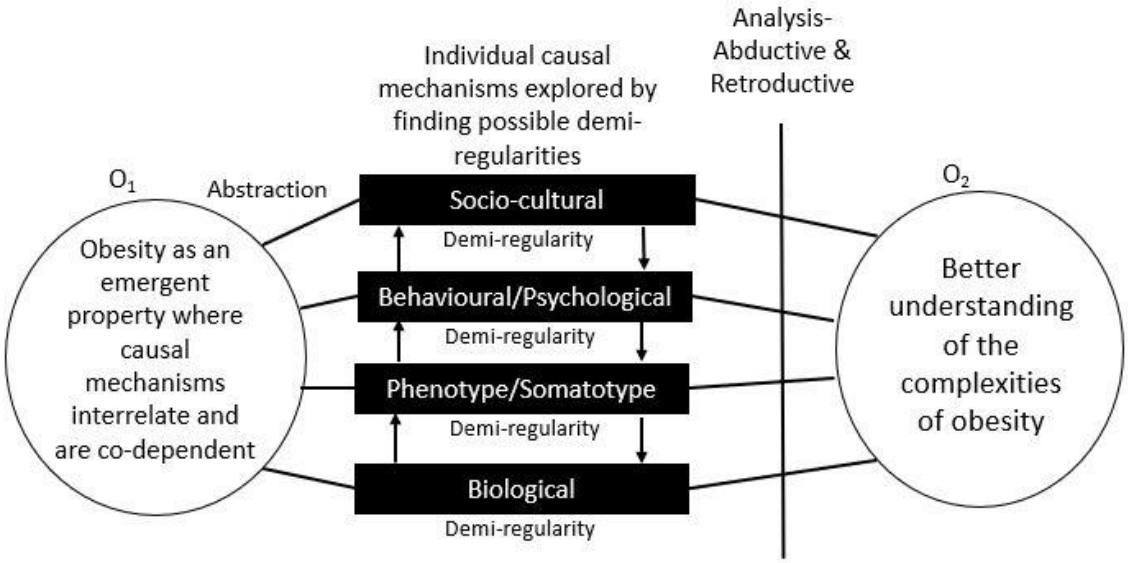

Figure 4.1 All mechanisms explored in the second study.
Socio-cultural mechanism explored using semi-structured interviews; Behavioural/Psychological mechanism explored using questionnaires and to some extent, the semi-structured interviews; Phenotype/Somatotype explored *via* anthropometric measurements and body scans; Biological mechanism explored through the blood biomarkers.

In Chapter 3 we discussed findings according to both the classifications based on BMI categories and the IDA profiles. In this chapter we will only explore questionnaire findings related to the IDA groups, however detailed analysis of the BMI groups can be found in Appendix 22 (pg. 366-411).

4.2 Anthropometric measurements and Demographics

Thirty-five participants were recruited from North East Scotland with an age range of 20 to 41 years and different BMI ranges. (The 41-year old participant was recruited while still 40 years of age, but had to reschedule, meanwhile a birthday occurred interim.) Mean age of the participants was 27.4 (±5.8 years). Fourteen participants were classified as NW, according to BMI classification, eleven were OW, and 10 were OB. Participants within each BMI category did not differ by age. Anthropometric measurements were collected for all participants and included height, weight, waist, hips, sagittal abdominal diameter (SAD_1), and ratios waist-to-hip (WHR), and waist-to-stature (WSR) were calculated. In addition, body fat was assessed using air displacement plethysmography (BOD POD) and bioelectrical impedance (Tanita). Descriptive characteristics for all 35 participants and each BMI category are reported in Table 4.1.

OB participants had the largest BMI (39.3 ±4.2 kg/m^2) compared to the OW (27.4 ±1.8 kg/m^2) and NW (22.3 ±1.5 kg/m^2) participants. There were significant differences observed between the 3 groups ($p < 0.001$).

OB participants had the greater waist circumference (WC) (110.4 ±7.3 cm) compared to OW (88.3 ±10.6 cm) and NW (71.8 ±5.9 cm) participants. There were significant differences observed between the 3 groups ($p < 0.001$).

Regarding WHR, the OB and OW participants had the same ratio (0.84 ±0.06, and 0.84 ±0.11, respectively), whereas, NW participants had a lower WHR (0.75 ±0.05). There was a significant difference between the OB and NW groups ($p = 0.001$), whereas, only a marginal difference was observed between the OW and NW groups ($p = 0.06$).

WSR was higher in the OB group (0.64 ±0.05) compared to the OW (0.51 ±0.05) ($p < 0.001$) and the NW (0.43 ±0.02) groups. There were significant differences observed in all BMI groups ($p < 0.001$).

The OB group had the largest SAD_1 value (35.5 ±5.0 cm) compared to the OW and NW groups (24.7 ±3.1 cm and 19.9 ±2.3 cm, respectively). Differences were significant between OB and OW ($p < 0.001$), between OB and NW ($p < 0.001$), and between OW and NW groups ($p = 0.005$).

Table 4.1 Participants descriptive characteristics and anthropometric measurements.
Results reported as mean ±SD.

Characteristics/ Measurements	**Age** (yrs) ±SD (Range)	**Height** (cm)	**Weight** (kg)	**BMI** (kg/m^2)	**SAD_1** (cm)	**Waist** (cm)	**Hips** (cm)	**WHR** ratio	**WSR** ratio	**BodPod** (% BF)	**Tanita** (% BF)	***Systolic BP** (mm/Hg)	***Diastolic BP** (mm/Hg)
Participants n=35 (24F, 11M)	27.4 ±5.8 20 - 41	169.8 ±9.4	83.6 ±24.9	28.8 ±7.5	25.9 ±7.3	80.0 ±17.8	108.9 ±16.4	0.80 ±0.09	0.52 ±0.09	32.5 ±12.9	29.2 ±12.2	125.2 ±15.4	73.8 ±10.9
OB (7F, 3M)	30.6 ±6.3 22 - 41	172.3 ±7.4	116.3 ±112.0	39.3 ±4.2	35.5 ±5.0	110.4 ±7.3	131.2 ±11.0	0.84 ±0.06	0.64 ±0.05	47.1 ±10.0	42.1 ±10.8	129.8 ±13.5	80.6 ±9.4
OW (6F, 5M)	28.1 ±5.5 20 - 38	173.0 ±9.5	82.3 ±10.0	27.4 ±1.8	24.7 ±3.1	88.3 ±10.6	105.8 ±5.5	0.84 ±0.11	0.51 ±0.05	29.6 ±9.4	27.4 ±9.9	135.0 ±15.8	76.1 ±10.2
NW (11F, 3M)	24.6 ±4.7 20 - 33	165.4 ±9.5	61.3 ±8.4	22.3 ±1.5	19.9 ±2.3	71.8 ±5.9	95.6 ±4.2	0.75 ±0.05	0.43 ±0.02	24.4 ±7.7	21.4 ±6.1	114.5 ±9.1	67.6 ±9.3

*****n = 34. F: female; M: male; WC: Waist circumference; SAD_1: Sagittal abdominal diameter; WHR: Waist-to-hip ratio; WSR: Waist-to-Stature ratio; BP: Blood pressure; BF: Body fat. Significant differences in BMI in all 3 BMI groups ($F = 125.74$, $p < 0.001$); WC between all BMI groups ($F = 67.86$, $p < 0.001$); WHR between OB and NW ($U = 13.00$, $z = -3.34$, $p = 0.001$) and marginal between NW and OW ($U = 43.00$, $z = -1.86$, $p = 0.06$); WSR between all BMI groups ($F = 80.54$, $p < 0.001$); SAD_1 between OB and NW, and OW ($F = 59.33$ $p < 0.001$); BOD POD %BF between OB and NW ($U = 10.00$, $z = -3.51$, $p < 0.001$) and between OB and OW ($U = 11.00$, z -3.10, $p = 0.002$); Tanita %BF between OB and NW ($U = 12.00$, $z = -3.40$, $p = 0.001$) and between OB and OW ($U = 16.00$, $z = -2.75$, $p = 0.006$); Systolic BP between OB and NW (F= 8.79, $p = 0.03$), and between OW and NW (F= 8.79, $p = 0.001$); Diastolic BP between OB and NW (F 5.45, $p = 0.01$).

The OB group had a significantly larger percent bodyfat measured by the BOD POD (47.1 ±10.0%) compared to OW group (29.6 ±9.4%) (p = 0.002) and to NW (24.4 ± 7.7%) (p < 0.001). No difference was observed between the NW and OW groups. The percent of bodyfat measured by bio-impedance (Tanita) followed a similar pattern: the OB group had a significantly larger percent bodyfat (42.1 ±10.8%), compared to OW (27.4 ±9.9%) (p = 0.006) and NW (21.4 ±6.1%) (p = 0.001). Similarly, no differences were noted between the NW and OW groups.

Systolic and diastolic blood pressure (BP) was measured in 34 participants. OW participants had a significantly higher systolic BP (135.0 ±15.8 mmHg) compared to the NW (114.5 ±9.1 mmHg) (p = 0.001), but not the OB (129.8 ±13.5 mmHg). Additionally, a significant difference was observed between the OB and NW participants (p = 0.003). Diastolic BP was significantly higher in the OB group (80.6 ±9.4 mmHg) compared to the NW (67.6 ±9.3 mmHg) (p = 0.01), but not the OW group (76.1 ±10.2). No difference was observed between the OW and NW participants.

This analysis, among the BMI groups, where statistical significance was observed, should be interpreted with caution specifically because, these differences could be attributed to the differences between women and men, as there was an unequal distribution of men and women in both the OB and NW groups.

All 35 participants were Caucasian, either British, European or American. Twenty-three (65.7%) participants held a bachelor's degree or higher, 1 (2.9%) participant had other professional qualification, 3 (8.6%) were educated up to HNC/HND/SQ4/L4 or equivalent level, 5 (14.3%) had GSVQ foundation or advanced, 1 (2.9%) had a Highers or A level education, and 2 (5.7%) had other schooling or standard grade education.

Eight (22.9%) participants were in full-time employment, 10 (28.6%) were in part-time employment, 1 (2.8%) reported being a full-time stay at home mother. Twenty (57%) participants were in full-time university education, and 1 (2.8%) participant was a part-time student. Additionally, 6 (17%) were in either full or part-time education and part-time employment.

Twenty-three (65.7%) participants reported an income level between £0 to £16,000 per year, 9 (25.7%) reported having an income level between £17,000 to £30,000 per year, and 3 (8.6%) reported having an income of £31,000 or more per year.

Ten (28.6%) participants lived in a region of Aberdeen that was 5 or below the Scottish index multiple deprivation (SIMD 2012), and 25 (71.4%) lived in a SIMD region that was 6 or above.

4.3 Semi-structured interviews analysis

The outcomes of the first study informed the process of analysis for the second study semi-structured interviews (SSi). Specifically, the researcher scrutinised and used the same modes of analysis to examining for the themes and motifs that helped to develop the narratives in the first study and to assist with the coding for the second study. The analysis of the second study was simplified in the number of stages as participant's statements/responses were directly itemised under the narratives: Instrumental, Disciplined, Aesthetic (Appendix 21).

4.3.1 Findings from the interviews

Table 4.2 contains a list of the participants' anonymised names, sex, age, IDA profile identity, a biographical detail (i.e. employment or student status), and a statement related to their status affecting their eating or diet.

Using the IDA analysis and iterative process, 18 instrumental (51%), 14 disciplined (40%), and 3 aesthetic (9%) eaters were identified. Compared to the first study, aesthetic eaters were on average older (54.3 years), and perhaps more established in their life, which may have allowed them more opportunity of seeking out the aesthetic experience of food. In the second study, participants comprised mostly of students attending university either full- or part-time (n = 20, n = 1, respectively, 60%). Additionally, among the student participants, 6 were working part-time as well. This study also comprised young professionals working either full- or part-time (n = 10, n = 4, respectively, 40%). Only one participant was unemployed who was a full-time, stay-at-home mum. Moreover, this second study comprised more participants who reported an income level between £0 to £16,000 compared to the first study (65.7% vs 29.6%, respectively), which may have had a bearing on participants' attitude/disposition to food, and other aspects explored in this study.

Table 4.2 SSi participants' details: Anonymised name, sex, age (years) and IDA profile identification.
I: instrumental; D: disciplined; A: aesthetic. A biographical detail (FT: full time; PT: part-time, employment or student status) with subjective information about how this affects how they eat. F: female; M: male.

Name	Sex	Age	IDA	Biographical detail
Ada	F	31	I	FT employment, definitely effects my eating, I graze a lot
Amelia	F	38	D	PT employment, does not influence what I eat
Dehlia	F	21	D	FT student, does not affect how I eat, always bring my own lunch to university
Zoe	F	21	I	FT student, do not think it effects how I eat, generally pack my own lunches
Nora	F	20	D	FT student, affects what I can buy, would rather buy better quality, organic food
Natalie	F	20	D	FT student, does not affect what I eat, you can have good eating habits
Annita	F	20	A	FT student + PT employment, allows for healthy eating, pack my own lunch
Cait	F	21	I	PT employment, does not allow for structure, end up eating when not hungry
Zada	F	23	A	FT student, does not allow for structure therefore does not allow for good eating
Hazel	F	33	D	FT student, does not affect what I eat, limited funds and still buy organic & healthy
Juliette	F	25	D	FT student + PT employment, affects what I eat especially when bored
Blair	F	29	I	FT student + PT employment, affects what I eat, I get tempted to eat out
Adelina	F	23	I	FT student, influences how I eat, there's less structure, try to pack my own lunch
Shauna	F	26	I	FT Mum, definitely influences how I eat, tend to pick/graze all day
Logan	M	28	D	FT student, doesn't affect how I eat, pack my own lunches
Grayson	M	33	D	FT employment affects how much I eat, my work is manual, so need to eat a lot
Ellie	F	28	D	FT employment doesn't affect what I eat, tend to bring my own lunches
Katrina	F	32	I	PT student + PT employment affects what I eat, but do try to pack my lunches
Jake	M	30	D	FT employment does not normally affect how I eat, but sometimes does, not good
Emma	F	28	I	FT student, does affect how I eat, sometimes eat late or ready meals
Odin	M	37	D	FT employment keeps me active so eat more, but usually go home for lunch
Ivan	M	22	I	FT student + PT employment allows me to eat healthy and have healthy habits
Theo	M	28	D	FT employment does not affect how I eat, I've got my routine, pack my lunch
Lindsay	F	20	I	FT student influences how I eat, have more free time, not interested in eating healthy
Lucas	M	30	A	FT employment, definitely allows for good eating habits
Mason	M	22	D	FT student affects my eating, forget to eat, will pack my lunches
Max	M	21	D	FT student affects what I can afford to buy, come home for lunch
Andy	M	34	I	FT student does not affect how or what I eat, will pack my own lunches
Sirena	F	41	I	PT employment affects what I eat, lots of sitting, generally try to bring my own lunch
Camila	F	25	I	FT student sometimes affects what I eat, try to bring lunch or wait to get home to eat
Elizabeth	F	30	I	PT employment lots of sitting, will try to bring my own food b/c can affect what I eat
Dylan	M	28	I	FT employment, not sure if it affects how I eat, try to have my meals at home
Deidra	F	27	I	FT student definitely affects how I eat, not making meals, buying at university cafes
Abigail	F	26	I	FT employment, lots of walking, does not affect what or how I eat
Flora	F	38	I	FT student + PT employment affects how much I eat, eat less at work

Table 4.3 lists the most predominant themes found among the 35 participants. The majority of the themes identified in study 1 were also identified in study 2. However, the differences are listed in a separate table, Table 4.4. For example, in the first study, the instrumental participants expressed their diet in terms of needing to eat more fruits and vegetables; whereas, in the second study, they stated that they needed to eat less fatty and sugary foods in addition to more fruit and veg. Furthermore, in the first study, the instrumental eaters expressed that texture and the 'look' of food was important, whereas, in this second study it was not expressed or did not emerge. For aesthetic eaters, in the first study, food labelling was important only in terms of the amount of sugar, in the second study both sugar and fat were expressed as being important when paying attention to food labelling. Additionally, one aesthetic eater (in the second study) expressed that s/he could not 'do' moderation and so instead would go without. This same participant also expressed foods' importance in terms of being a reward, where this person would wait to savour a 'wee treat' for later. We can argue that this is still an aesthetic approach to food because this person is not dependent on food 'in the moment' but rather anticipating the later 'reward'. In other words, food choice is within this individual's volitional control as was previously described by Cornil & Chandon (2016). Nothing new emerged from the disciplined profile narrative.

Not all participants fitted precisely into one eating profile: a number of the participants' characteristics overlapped with another eating profile. However, using the same high level of abstraction and iterative process of scrutinising the interviews and using critical realism's modes of inference allowed the researcher to ascertain what the dominant eating profile was for each participant.

Table 4.3 The three narrative: themes comprising the IDA profiles.
Examples of repeating themes for each profile.

INSTRUMENTAL	AESTHETIC	DISCIPLINED
Mostly eat to live	Mostly live to eat	Eat to live and live to eat
Food is not important	Food is very important	Food is functional
Food has low priority	Food is part of the enjoyment of life	Food is nutritional fuel
Symbolic- (ideal) upscale, name brand, Bread home-made in store	Symbolic – Top brand, bread home-made in store, specialty shops, no plastic	Symbolic – organic, name brand, produce must be wrapped in plastic
Will pass out if I do not eat	Eating in moderation	May or may not eat in moderation
Diet and/or food is not important	Diet and/or food is important	Diet and/or food is/is not important
Do not typically eat breakfast	Eat breakfast	May or may not eat breakfast
Do not enjoy food shopping, Shopping is a chore	Enjoy food shopping (imagining possibilities)	May or may not enjoying food shopping; Usually always shop with a list
Finical eater; will eat the same kinds of foods, food neophobia	Explorer of foods / will go out of my way to find new foods, food neophilia (likes variety)	May or may not enjoy new foods
May or may not snack	Can wait to eat something I really enjoy,	May or may not snack; or if do, only once or twice a week
Need to eat less fatty/sugary foods	Aim to eat healthy fats	Aware of the amount of fat
Food labelling not important	Food labelling: pay attention to sugar and fat	Food labelling: pay attention to sugar and fat
Convenience and quality are important	Freshness and quality are important	Convenience and quality are important
Do not know if full or not after a meal	Overeat a little	No going back for second helpings
Diet not balanced	Diet balanced	Diet balanced
Day lacks structure	Structure helpful	Structure helpful
Do not eat 5-a-day	Generally eat 5-a-day	Generally eat 5-a-day
Need to eat more fruit and vegetables	Eats fruit and vegetables	Eats fruit and vegetables
Eat when stressed, bored or watching TV, Mindless eating	No emotional eating; no mindless eating, stress might affect by having a reward later in the day	May or may not eat when stressed or bored; May or may not mindlessly eat
Eat main meal in front of TV	Eat main meal at the table	Eat main meal at the table / or TV
Will eat a dessert	No dessert if full; may have something very small	May or may not eat dessert

Table 4.4 The differences between study 1 and study 2 in themes that either emerged or did not emerge.

Study 1	Study 2
INSTRUMENTAL	
Food texture and look was important	Did not emerge
Did not emerge	Need to eat less fatty/sugary foods
Symbolic was not discussed	(ideal) upscale, name brand, bread homemade/ or home-made in store
AESTHETIC	
Enjoy all foods in moderation	Enjoy food in moderation, except 1 participant expressed cannot do moderation so will go without, Expressed that food is a reward, (anticipating a wee treat for later)
Food labelling: pay attention to sugar	Pay attention to sugar and fat
Symbolic was not discussed	Top brand, bread home-made in store, specialty shops, no plastic
DISCIPLINED	
Symbolic was not discussed	Organic, name brand, produce must be wrapped in plastic

The same topics from study 1 were explored during the interviews and, the following sections (4.3.1.1 through 4.3.1.6) summarise each IDA groups' overall responses to the topics explored. For detailed analysis and participants' individual responses, see Appendix 23 (pp. 412-436). One new motif that emerged, however, was the concept of 'structure'; mentioned by a number of participants as 'a structured day' that allowed them to eat more healthily, whereas a number of other participants felt that lack of structure did not allow for healthy eating habits. Structure is discussed as part of 'How would you describe your diet (4.3.1.2). Additionally, the concept of symbolism of food was explored as this was a concept described by Cornil & Chandon (2016), where the 'Epicurean eater' held a symbolic attitude towards food (4.3.1.5). Symbolic is described as the value judgement the participant holds towards a food or a food product. In addition, the concept of why, or why not, food was important, and the effect of stress, boredom and emotions, on appetite and eating patterns was explored.

4.3.1.1 Shopping for a variety of foods

Some of the participants in the instrumental profile bought a lot of the same foods as they expressed discomfort in buying new foods, because 'you do not always know if you are going to like it'. However, a couple of participants did not share this attitude, but commented that, because of their family's dislike of new foods, they did not have the freedom to purchase different

or unusual foods. Overall, for the instrumental eaters, the common theme was eating much of the same foods, eating foods they know and are familiar with and can trust. Whereas, for the disciplined and aesthetic profiles, variety was expressed in terms of eating a little bit of everything. Eating a variety of foods to have a balanced diet was also a recurring theme between these two eating attitude profiles.

4.3.1.2 How would you describe your diet / structure

Instrumental eaters consistently defined their diet in very unfavourable terms, whereas the disciplined eaters intimated a positive satisfaction with how they were eating and how they felt about their diets. The aesthetic eaters intimated overall, contentment with their diets, but two of them felt that they needed to cut down on the quantity. Similar to the first study, both the disciplined and aesthetic eaters expressed their food habits and eating in an overall, positive light. Most of them felt they were eating the right foods, fruits and vegetables, and that a structured day allowed for this. In contrast, and similar to the first study, the instrumental eaters conveyed disappointment and dissatisfaction in eating the wrong foods, not enough fruits and vegetables, and conveyed frustration by the lack of structure in their days. A few of the instrumental eaters felt that if their day had more structure that would allow for better eating habits. However, others communicated an unwillingness in trying to eat better, either because of food distrust or because of being a self-professed food addict.

4.3.1.3 Body image

Findings from these participants were very similar to the ones from the first study, specifically, the aesthetic eaters had a more pragmatic, relaxed attitude about their body shape. The disciplined eaters expressed mixed feelings: some were comfortable, and others were a bit more cautious, but not in a negative way. Whereas, nearly all instrumental eaters expressed their body shape and image in a very negative light. There was only one instrumental participant who expressed their body image in a positive light, in terms of its strength: strong and powerful. Overall, however, nearly all participants felt that the foods they ate had a direct effect on their shape; some also expressed foods' effects on the body in terms of mental health.

4.3.1.4 Social aspects around food

Each of the IDA profiles in this study expressed enjoyment and pleasure in the socialisation of meals and eating together. This contrasts with the first study where instrumental eaters, overall, expressed more reservation in social meals, or going out to eat, but here it was expressed quite clearly that most participants enjoyed the social aspect around food.

4.3.1.5 Importance of food / symbolic

The disciplined eaters had varied responses on why food was important. Some viewed its importance in terms of functional fuel, and for wellbeing, which was very similar to how the disciplined eaters in the first study saw it. Additionally, others thought of it as being important because it was a way to connect socially with family and friends, or as a cultural identity. In a similar manner, the aesthetic eaters also viewed foods importance in terms of connecting with people. Additionally, the aesthetic individuals also expressed foods importance through it being a highlight of their day, something to look forward to, similarly to the aesthetic eaters in the first study, where their description was 'I live to eat'.

In stark contrast, the participants with an instrumental profile, made quite clear that food held a low priority, it was something you had to do for energy and to function, or to satisfy the stomach. Among the instrumental eaters who expressed that food was important, they intimated a negative caveat: food becomes a bad habit; or it's a guilty pleasure; it has ruled my life, my relationship with food has been detrimental to my health; if I'm stressed, I'm going to eat more; it's the middle ground, if you're sad you're eating, if you're happy you're eating, if you're celebrating you're eating. All of these direct statements were made by participants with an instrumental profile and they were similar to the ones made by the instrumental eaters in the first study, who expressed that food had no importance and that they 'eat to live'.

Interestingly, symbolic attitudes about food were very similar between the instrumental and disciplined profiles. Generally speaking, both expressed a preference in wanting to buy organic food and to avoid pesticides, although the disciplined profile voiced stronger views about organic and actually purchasing it, the instrumental eaters, mostly saw it as an ideal, something they were not yet doing but would like to do. Additionally, the disciplined eaters appeared to have taken more action on their belief in organic, because some of them have become vegetarian because of their conviction that it will help the animals and the environment. Both instrumental and

aesthetic eaters expressed trying to buy the best brand for their money, intimating that the better brand was associated with higher quality. A similar attitude towards the use of plastics was noticed among participants classified as having a disciplined and aesthetic profile: one disciplined eater trusted food that was wrapped in plastic, and one aesthetic eater was mortified that food should be wrapped in plastic because it was detrimental to the environment.

4.3.1.6 The effect of stress and other emotions on eating

Overall, among the instrumental eaters a common theme was to eat in response to stress. In addition, the majority of instrumental eaters also agreed that there were times when they ate mindlessly, or when bored or feeling down. Whereas, among the disciplined eaters, a common theme was that they tended to lose their appetite in response to stress. Although, interestingly, a majority of them admitted to engaging in mindless eating or when bored. Only a few disciplined eaters expressed that they did not engage in mindlessly eating or eating out of boredom. For the aesthetic eaters, stress did not induce eating, but responses varied from eating less to forgetting to eat, to having a treat later. Two aesthetic eaters expressed that sometimes when watching TV, they would eat some crisps, whereas the other aesthetic eater stated that she would not engage in mindless eating. Furthermore, one aesthetic eater explained that, when feeling sad, eating food made her feel happy, but that she would not eat 'junk' food to feel better, only her 'normal food'.

Overall, the disciplined and aesthetic eaters were more similar in how stress affected them, where they would either lose their appetite, forget to eat, or eat more readymade, convenience-based foods. In contrast, the instrumental eaters would eat in response to stress and more 'junk' food based. Overall, all three IDA profiles, engaged in some form of mindless eating, although the instrumental profile engaged in more comfort and/or emotional eating, in addition to eating out of boredom. Whereas, very few of the disciplined eaters expressed that they would comfort eat, but several stated that they would eat out of boredom. However, a number of disciplined eaters also expressed that they deliberately would not have snack food around, thus preventing them from eating it. For the aesthetic eaters, comfort eating and eating out of boredom were not concepts, which were expressed.

4.3.1.7 Semi-structured interview discussion

Overall, this study had very similar findings to the first one. Differences related to social aspects around food: in the first study, the instrumental profile participants did not express eagerness about this social interaction in the same way that the disciplined and aesthetic eaters did. Whereas, in the second study, most of the participants expressed real enthusiasm about spending time with friends and family in a food orientated situation.

Following the classification of the participants in function of the IDA profile, BMI and average age for each group was calculated (Table 4.5). The instrumental and disciplined participants were on average older (27.9 ±5.8 and 27.4 ±6.2 years, respectively) compared to the aesthetic participants (24.3 ±5.1 years). However, the instrumental group had a significantly larger BMI (32.8 ±8.3 kg/m^2) compared to the disciplined (24.2 ±3.1 kg/m^2) ($p = 0.002$), but not the aesthetic group (26.0 ±3.4 kg/m^2). No difference in BMI was observed between the disciplined and aesthetic groups.

Table 4.5 Study 2, IDA profile age and anthropometric measurements.

Values reported as mean ±SD. F: female; M: male.

Participants n=35 (24F, 11M)	**Age** (years) (Range)	**Height** (cm)	**Weight** (kg)	**BMI** (kg/m^2)	**SAD_1** (cm)	**Waist** (cm)	**Hips** (cm)	**WHR** ratio	**WSR** ratio	**BOD POD** % fat	**Tanita** % fat	***Systolic BP** mm/Hg	***Diastolic BP** mm/Hg
Instrumental (15F, 3M)	27.9 ±5.8 20-41	168.7 ±8.5	94.2 ±27.8	32.8 ±8.3	29.7 ±8.1	95.4 ±20.1	118.2 ±17.8	0.80 ±0.10	0.56 ±0.11	41.1 ±10.6	36.5 ±11.2	125.2 ±12.6	77.3 ±9.8
Disciplined (7F, 7M)	27.4 ±6.2 20-38	171.8 ±9.7	72.2 ±15.6	24.2 ±3.1	21.6 ±3.0	80.1 ±10.7	98.4 ±4.9	0.81 ±0.08	0.47 ±0.05	22.3 ±8.3	20.2 ±7.3	125.3 ±16.9	69.5 ±9.7
Aesthetic (2F, 1M)	24.3 ±5.1 20-30	166.8 ±15.4	73.5 ±18.8	26.0 ±3.4	22.2 ±3.7	80.2 ±12.4	102.9 ±11.4	0.78 ±0.08	0.48 ±0.05	29.0 ±4.2	27.7 ±8.3	124.5 ±28.2	73.3 ±18.2

*n = 34 (Inst: n = 9). SAD_1: Sagittal abdominal diameter; WHR: Waist-hip ratio; WSR: Waist-stature ratio; BP: blood pressure.

Significant difference in BMI between Inst and Disc ($F = 7.35$, $p = 0.002$); significant difference in SAD_1 between Inst and Disc ($F = 7.11$, $p = 0.003$); significant difference in WSR between Inst and Disc ($U = 59.00$, $z = -2.55$, $p = 0.011$); significant difference in BOD POD %fat between Inst and Disc ($U = 20.00$, $z = -4.03$, $p < 0.0001$), and between Aest and Inst ($U = 8.50$, $z = -1.86$, $p = 0.063$); significant difference in Tanita %fat between Inst and Disc ($U = 22.00$, $z = -3.95$, $p < 0.0001$); significant difference in Diastolic BP between Inst and Disc ($U = 56.50$, $z = -2.48$, $p = 0.013$).

The instrumental group had a significantly larger SAD_1 (29.7 ±8.1 cm) compared to the disciplined (21.6 ±3.0 cm) (p = 0.003), but not the aesthetic (22.2 ±3.7 cm) group. No difference was observed between the disciplined and aesthetic groups.

There was a similar pattern in the WSR value where the instrumental group had a significantly larger WSR (0.56 ±0.11) compared to the disciplined (0.47 ±0.05) (p = 0.01), but not the aesthetic (0.48 ±0.05) group.

No significant differences were observed in the WHR, with the aesthetic group having the lowest ratio (0.78 ±0.08) (0.81 ±0.08 for disciplined group; 0.80 ±0.10 for the instrumental group).

The instrumental group had a significantly larger percent of body fat measured by the BOD POD and bio-impedance (41.1 ±10.6% and 36.5 ±11.2%, respectively) compared to the disciplined (22.3 ±8.3% and 20.2 ±7.3%, respectively) (p < 0.0001). The aesthetic group had a lower BOD POD percent body fat (29.0 ±4.2%) which was borderline significant compared to the instrumental (p = 0.06). Although the aesthetic group also had a lower percent body fat measured by bio-impedance (27.7 ±8.3%) compared to the instrumental, it was not significantly different. No differences were observed between the disciplined and aesthetic groups.

Systolic blood pressure was similar among the IDA groups, instrumental (125.2 ±12.6 mmHg), disciplined (125.3 ±16.9 mmHg) and aesthetic (124.5 ±28.2 mmHg). However, the instrumental group had a significantly higher diastolic blood pressure (77.3 ±9.8 mmHg) compared to the disciplined (69.5 ±9.7 mmHg) (p = 0.01), but not the aesthetic (73.3 ±18.2 mmHg). No difference was observed between the disciplined and aesthetic groups.

As was the case in the first study, the differences found among IDA groups, may be more related to the differences between men and women: the unequal number of men and women in each IDA category is a limitation to the anthropometric measurements' analysis.

Compared to the first study, this study comprised more students in either full- or part-time university education (60% vs 29% in study 1), and a number of these in education were working part-time as well. Additionally, there were fewer participants (n = 3) designated as aesthetic eaters (8.5% vs 29% in study 1).

Age may affect the quality and type of eating profile an individual develops into over-time. Specifically, as an individual matures, multiple influences over the trajectory of eating profile may relate to drivers such as personal and family responsibilities, life choices and disposable income

(including new food choices that become available) and other influences such as health awareness and/or the fragility of life, exercise behaviours, food and/or health advertisements, etcetera.

These findings are in agreement with the first study which suggest that for the aesthetic profile and to some degree the disciplined profiles, their more positive embodied disposition towards food resulted in a better relationship with food, because food was seen as an important part of their day and was given a priority. Whereas, the instrumental profile has a more negative embodied disposition and dissonant relationship with food, because on one hand food is not an important aspect of their life and as a result, food is given less of a priority in their life, and yet this group is more likely to turn to food for some level of comfort in times of stress or when experiencing negative emotions. The aesthetic and disciplined profiles appeared to have a better relationship with food, or at least they appeared to have more of a balanced relationship with food. Moreover, the aesthetic and disciplined profiles appeared to have a better relationship with their body shape and image, or were at least content with their physical appearance, therefore it is possible, because of their subjective body image, they may experience a better quality of life. In contrast, the instrumental profile held a very negative view or indifference about their body shape, which may result in having lower wellbeing and quality of life. These potential explanations would be supported, or contradicted, by the results of the 7 questionnaires which explored body image, quality of life related to body image, orientation towards life, psychological eating profile, possible tendency for food addiction or food dependence, food choice, and overall quality of life in terms of physical and mental wellbeing. These questionnaire results are explained in the next section in relation to the IDA profiles. Because the findings from these questionnaires related to BMI categories, had similar trends to the first study, the results are presented in Appendix 22. Following the questionnaire in function of the IDA profiles, somatotype rating and blood biomarkers will be discussed according to BMI categories, followed by the IDA profile results.

4.4 IDA profile Questionnaire Findings and Discussion

The objective of exploring the results in function of the IDA groups was to show that some of the embodied dispositions identified in the interviews are supported by the findings from the questionnaires. Specifically, as mentioned above, the attitudinal and embodied dispositions between the IDA groups related to body image, salutogenesis, psychological eating tendency, food dependence, food choice and everyday quality of life, both physical and mental wellbeing were explored. As the aesthetic group comprises only 3 participants, it is not

possible to report an IQR, when data does not follow a normal distribution, therefore only the median score for the aesthetic group is reported. Moreover, where significant differences were observed, it is only between the instrumental and disciplined groups because of group size (18 vs 14, respectively). When data follow a normal distribution, the mean ±SD is reported for aesthetic group as well.

4.4.1 Multidimensional Body-Self Relations questionnaire-Appearance Scale (MBSRQ-AS)

The MBSRQ-AS explored subjective aspects of body image through 5 different scales: appearance evaluation, appearance orientation, body area satisfaction, overweight preoccupation and self-classified weight. (Section 2.2.3.1).

Regarding the AE scale, the instrumental group had a significantly lower median score (2.14 ±1.36) compared to the disciplined (3.43 ±1.04) (p = 0.001) but not the aesthetic (3.14) group. These scores suggest that both the disciplined and aesthetic groups overall experienced more satisfaction with physical appearance compared to the instrumental group. This follows a similar pattern as the first study (Section 3.2.2.1).

On the AO scale, the instrumental had a median score only slightly higher (3.33 ±1.35) than the disciplined (3.21 ±1.63), and the aesthetic group had the lowest score (2.92). Because no significant difference was found, these scores suggest that all participants engaged in some degree of body checking and/or fixing themselves in a mirror before going out or being seen by other people. The lower the score, the less interest or concern the individual has in body checking, or checking her/his physical appearance in a mirror. The first study found a significant difference between the instrumental and disciplined groups, and borderline significance with the aesthetic group, where the instrumental had a lower score, but the aesthetic group had the lowest score, In other words, in this second study, and therefore younger group, the participants are more concerned with their physical appearance before going outside or meeting up with others.

For the BAS scale, the instrumental group had a significantly lower median score (2.61 ±0.92) compared to the disciplined group (3.67 ±0.92) (p = 0.001), but not the aesthetic group (3.11). This suggests that the instrumental group experienced more discontent with discrete aspects of

their body, whereas the disciplined and aesthetic, to some extent, experienced overall satisfaction with discrete aspects of their body. This follows a similar pattern to the first study.

In relation to the OP scale, the disciplined and aesthetic groups had identical median scores (2.25 ±1.63 and 2.25, respectively), and the instrumental had a higher score (2.88 ±1.25) but it was not significant. The instrumental group's higher score suggests that these participants experienced slightly more anxiety around issues of weight gain. Whereas, the lower scores, because they were below 2.5 suggests that the disciplined and aesthetic participants experienced less fat anxiety, comparatively speaking. This follows a similar pattern to the first study.

The instrumental group had a significantly higher median score for the SCW scale (4.50 ±2.0) compared to the disciplined who had a lower score (3.00 ±0.50) (p = 0.002). The aesthetic group had a score of 3.50, which suggests that they see themselves as being a little overweight and feel others see them this way as well. Whereas, the instrumental participants see themselves as being very overweight and feel others see them as very overweight. The disciplined participants see themselves as being normal weight and feel others see them as being normal weight. This also follows a similar pattern to the first study.

Overall, similar patterns were found between the two studies, in terms of level of overall body satisfaction and contentment with discrete aspects of the body felt by both the aesthetic and disciplined groups. Whereas, and similar to the first study, the instrumental group experienced an overall body dissatisfaction and dissatisfaction with discrete aspects. The only difference between these two studies was the appearance orientation scale where all participants from the second study engaged in appearance checking (i.e. checking appearance in a mirror) to a similar degree. However, this 'appearance checking' finding makes sense in terms of the second study comprising of younger adults who may be generally more concerned with how they look before going out.

4.4.2 Body Image Quality of Life Inventory (BIQLI)

As previously described (Section 2.2.3.2), this questionnaire explores subjective feelings about body image and how it relates to aspects of quality of life. The instrumental group had a significantly lower mean score (-0.29 ±0.89) compared to the disciplined group (0.95 ±1.04) (p = 0.003), and although the aesthetic group had the highest mean score (1.05 ±0.82) it was not significantly different. The higher the score the more positive impact the body image related to quality of life has on psychosocial wellbeing and everyday quality of

life. Alternatively, the lower the score the more negative impact body image has on psychosocial wellbeing and everyday quality of life.

This follows a nearly identical pattern as the first study where the aesthetic group had the highest score and the instrumental the lowest. The scores from both studies help in supporting the interview findings where overall, the instrumental expressed negative feelings about their physical appearance, and the aesthetic and disciplined were more content and overall satisfied with their bodies and/or body image.

4.4.3 Sense of Coherence-13 (SOC-13)

This questionnaire assessed participants salutogenic outlook on life through aspects related to meaningfulness, comprehensibility, and manageability of life: reported as a combined total score (Section 2.2.3.3).

Both the aesthetic and disciplined groups had a higher mean score (61.8 ±3.1 and 62.3 ±10.8, respectively) compared to the instrumental group who had a significantly lower score (50.5 ±11.0) compared to the disciplined group ($p = 0.01$). This follows a similar pattern to the first study, and supports the interview findings where the aesthetic group expressed having a higher level of self-esteem and confidence in themselves. Overall, the disciplined participants expressed feeling fairly confident or quietly confident, there were only a couple of participants who felt they had a low self-esteem. Among the instrumental participants, most expressed that on a personal level their confidence levels and/or self-esteem fluctuated, some intimated that it was connected to how they felt about their body and in turn could cause them to stress eat or comfort eat. Only one instrumental participant expressed that s/he had very high confidence and self-esteem levels, s/he explained that if s/he was more self-conscious s/he would probably eat more salads.

The first study found a moderate, significant association between the BIQLI and SOC constructs. Indeed, this second study found a very strong, significant association between these two constructs ($r_s = 0.71$, $p < 0.0001$), which further supports that positive feelings about body image, emotional wellbeing and psychosocial functioning may be related to an individual's stronger salutogenic outlook on life, or vice versa.

4.4.4 Dutch Eating Behaviour Questionnaire (DEBQ)

This questionnaire assesses psychological eating behaviours related to restrained, emotional and external eating traits (Section 2.2.3.4).

The aesthetic group had the highest median score for restrained eating (3.00), followed by the instrumental who had a slightly lower score (2.80 ±0.80), and the disciplined had the lowest score (2.05 ±1.53) but the largest IQR. No differences were observed in scores. The higher the score the more likely the individual will eat foods that help to maintain weight or that will not cause weight gain or that are deliberately slimming. Thus, a score of 3 suggests that the aesthetics ate these foods 'sometimes', whereas a score of 2 suggests that the disciplined rarely ate these food types. In the first study, the aesthetic group had the lowest score and the disciplined group had the highest score, however, results are similar in that no significant difference was observed in scores. In understanding these scores, restrained eating in particular, pertains to restricting calories and food intake in order to maintain or control weight. All aesthetic participants expressed that they felt they 'eat too much', and one particularly expanded on restricting her/himself (especially bread) in order to maintain her/his weight. The disciplined participants overall expressed being conscious of the number of calories they were eating and so would limit food portions at mealtimes, i.e. would not go back for second helpings (whereas an aesthetic participant was more likely to), in addition to restricting the amount of sugar and/or fat. Moreover, all aesthetic and disciplined participants explained that they felt they had a healthy diet, and the majority aimed to try to eat a variety of fruits and vegetables. It is interesting that the instrumental group also had a slightly higher score compared to the disciplined group. The instrumental participants expressed that their 'ideal' way of eating was to restrict intake of junk food and eat more fruit and vegetables, however, it was not a goal easily obtained. Therefore, their higher score may pertain to their 'ideal'. In any event, scores between 2 to 3 are indicative that participants eat these food types 'rarely to sometimes'. We found a strong, significant association between restrained eating and overweight preoccupation (OP from MBSRQ-AS) in the first study, and observed a similar association here (r_s = 0.59, p < 0.0001).

For external eating, the instrumental group had a significantly higher median score (3.75 ±1.00) compared to the disciplined group (3.05 ±1.35) (p = 0.05), but not the aesthetic group who had a score in between the two groups (3.50). A higher score suggests the propensity to eat foods that looked and smelled good regardless of hunger state. A score of 3 suggests this is done sometimes, whereas, a score of 4 suggests external eating occurs often. This is consistent with SSi findings where, instrumental participants expressed that cakes or sweeties at work were tempting, or if

shopping with another person who might be buying sweets, would also influence them to purchase the item, or shopping when hungry or when seeing a new food item would purchase it. Whereas, disciplined participants explained that, when shopping, they were stricter on themselves to either not purchase snack food because if it is in their cupboard, they are more likely to be tempted by it, or they restrict the amount they purchase or buy the 'healthier' snack food. Two aesthetic eaters expressed that eating whatever they wanted, but only a small amount, and one felt that s/he would delay eating something nice for later, as a reward. The findings from this study are similar to the first study, where both the disciplined and aesthetic groups had lower scores, but there was no significant difference observed among the IDA groups' scores. Moreover, in the first study, we found a weak, non-significant association between external eating and OP scores, and found a similar non-significant weak association here (Spearman, $r_s = 0.27$, $p = 0.12$).

In relation to emotional eating: the instrumental group had a significantly higher median score (3.69 ±1.25) compared to the disciplined group (2.15 ±1.52) ($p = 0.001$), but not the aesthetic group although they had the lowest score (1.92). Scores between 3 and 4 suggest that the instrumental group ate foods, sometimes to often, in response to negative emotions, boredom or loneliness. In contrast, the aesthetic and disciplined groups ate in response to these emotions never to rarely. This follows a similar pattern to the first study, although no difference was found in study one (most likely due to the smaller sample size). Additionally, these findings correspond with the interview statements from the participants: the instrumental participants expressed a higher propensity to eat when they were feeling sad, bored, upset and/or lonely. The disciplined group comprised a few participants who expressed eating in response to boredom. Only one aesthetic eater expressed that when s/he was feeling down, eating her/his 'normal food' made her/him feel better, but s/he did not resort to eating 'junk' food. The other aesthetic eaters did not express eating in response to negative emotions or when bored. We previously explored, in the first study, the association between emotional eating and the OP scale and found a moderate, significant association, this was confirmed in the second study ($r_s = 0.41$, $p = 0.01$).

Overall, these findings are similar to the first study's findings and they support the findings from the interviews.

4.4.5 Modified Yale Food Addiction scale (mYFAS) (version 1)

This questionnaire explores food dependency and possible food addiction (loss of control over food intake) among the participants. As previously described (Section 2.2.3.5), this questionnaire comprises a symptom count score (SCS) indicating food dependency, and a 'suggested' food addiction diagnosis score (FAD).

The SCS median score among the instrumental participants was significantly higher (3.00 ±3.25) compared to the disciplined participants (0.0 ±1.25) ($p < 0.0001$), but not the aesthetic (2.00). The score range for the instrumental group was much larger (0 to 7) compared to the disciplined (0 to 3) and lowest among the aesthetic group (0 to 2). A score of 1 meets the criteria for food dependence: it measures behaviours that could conceivably occur occasionally in non-problem eaters (i.e. criteria associated with excess consumption, dieting, or emotional eating). Higher scores suggest stronger food dependence. These findings are very similar to the first study where the instrumental participants had higher scores, and the disciplined and aesthetic had similar scores. Additionally, these findings are supported by the accounts from the instrumental participants who expressed using food, especially sugary, high fat (i.e. crisps, chocolate, biscuits), for comfort to feel better when stressed, bored or feeling low, some felt that they 'craved' either sugary foods or chocolate, another participant expressed that eating certain 'bad' foods was a habit. Some of the disciplined participants admitted that when sad, bored or stressed they will eat, and enjoy 'sweeties' or 'rich' foods, high in fat. Two aesthetic participants expressed that when their day is particularly long they will go overboard with eating crisps.

A Spearman test showed a moderate, significant association between the SCS and DEBQ emotional eating scores ($r_s = 0.49$, $p = 0.003$), and DEBQ external eating scores ($r_s = 0.43$, $p = 0.009$). The first study found only a weak, non-significant association between the SCS construct and emotional eating, and external eating, however, this can perhaps, be explained by its' smaller sample size. However, the first study found a moderate, negative association that was borderline significant between age and SCS scores ($r_s = -0.37$, $p = 0.055$). This finding suggests that food dependency may be age related, specifically because the second study did not find this association ($r_s = 0.25$, $p = 0.16$); perhaps to detect a significant association in a narrower age range, more participants are required.

The suggested FAD diagnosis median scores were also significantly higher among the instrumental participants (2.00 ±1.8) compared to the disciplined (0.0 ±1.0) ($p < 0.0001$), but not the aesthetic (1.0) participants. The score range for the instrumental participants was very large (0 to 9),

whereas the disciplined and aesthetic had an identical score range (0 to 2). A score of 4 is considered a diagnosis of a problem with suggested food addiction. Scores between 4 to 5 suggest having a moderate problem with food addiction, and 6 or higher suggests food impairment or distress. These findings are very similar to the first study, particularly the disciplined and aesthetic groups had similar score ranges. However, the instrumental group from this second study had a larger score range (study 1: was 2 to 6). The findings from this second study support the accounts from the participants' interviews. Particularly among the instrumental group, there were at least two participants who expressed being self-professed food addicts, and one felt s/he was addicted to sugar.

A Spearman correlation test showed a moderate, significant association (r_s = 0.48, p = 0.004) between FAD and DEBQ emotional eating scores. We also observed a moderate, significant association between FAD and DEBQ external eating scores (r_s = 0.43, p = 0.009). This finding was not observed in the first study, but this is most likely explained by the smaller size of that study. Moreover, a Spearman correlation test between age and FAD, found a weak association but not significant (r_s = 0.22, p = 0.22). Whereas, the first study observed a moderate, negative association between these two factors, but did not reach significance (r_s = -0.37, p = 0.056). This finding from the first study may be due to the broad age range of that study, whereas the second study, age range was narrower, therefore, if food addiction is related to age, more participants may be required to detect a significant association.

4.4.6 Food Choice Value questionnaire (FCV)

This questionnaire explored factors which may have had an effect on individuals' choices when food shopping. These factors include concepts such as food safety, organic, accessibility, convenience, comfort, traditional, health and weight concern, and sensory appeal (Section 2.2.3.6).

For the food safety scale, the disciplined group had a higher median score (2.33 ±2.42) compared to the instrumental and aesthetic groups (1.67 ±1.00 and 1.33, respectively). No difference was observed in scores. Both the instrumental and aesthetic participants felt that how safely food has been prepared or properly processed to the extent it would not cause illness, was not at all to a little bit important. Whereas, the disciplined participants felt that eating these foods was a little bit more important. Discussions regarding food safety did not emerge during the interviews and

no questions were asked regarding this concept. However, at least two instrumental participants commented that they were unwilling to try new foods because they were afraid it would make them sick or they just would not like it. They also expressed that they would never cook either a new recipe or meat (one expressed it made her/him sick). In the first study, the disciplined also had the highest score, however, an identical pattern of no significant difference in scores was observed.

Regarding the convenience scale, the disciplined group had a higher score (3.83 ±1.42) compared to the aesthetic and instrumental (3.33 and 3.00 ±1.08, respectively) groups. No differences were observed between scores. All scores suggest that participants' feel that how easily food can be prepared is moderately to quite a bit important. This supports the interview findings where participants expressed, they would buy convenience foods for work or school lunches, or to take a break from cooking, so would order takeaway as a treat and because it was convenient. Additionally, more convenience foods were purchased when feeling stressed, as some participants relayed that especially feeling stress when studying for exams. These scores differ slightly from the first study where the instrumental had the highest score, but it is similar in that no significant differences were found in scores.

For the health and weight concern scale, the aesthetic group had the highest score (3.67) compared to the instrumental and disciplined groups (2.50 ±1.75 and 2.00 ±2.33). No difference was observed in scores. Scores between 3 and 4 suggests that eating foods that either help to maintain weight or lose weight are moderately to quite a bit important. Whereas, scores between 2 and 3 suggests these foods are a little bit to moderately important. Both the aesthetic and disciplined groups, during the interviews, expressed that they tried to eat healthy foods and have a healthy balance of foods and felt that they were more or less accomplishing this or were successful in it. Furthermore, both groups expressed that they paid attention to food labelling and in particular the amount of sugar and fat, although several participants commented that they paid more attention overall to the number of calories. Whereas, the instrumental group expressed that they needed to improve their diet and overall felt they were not very successful, or that attempts were not successful. Moreover, they also stated that they did not pay too much attention to food labelling. In the first study, the disciplined had the highest score (they paid attention to both fat and sugar), and the aesthetic group had the lowest score (they paid more attention to sugar than fat). However, there was no significant difference found in the first study's scores either.

The aesthetic group had the highest score on comfort eating (3.00), followed by the instrumental (2.33 ±1.33) and disciplined (1.83 ±2.42). However, no difference was observed in scores. Food

that either elicits positive emotions or alleviates negative emotions was moderately important for the aesthetic participants. For the instrumental participants, this food type was a little bit important and for the disciplined group it was not at all to a little bit important, however, they also had a very large IQR. This is an interesting finding since it is not consistent with the accounts from the interviews, where instrumental participants professed to eating comfort foods when feeling stressed or down. Moreover, a number of the disciplined participants also expressed that they comfort eat and the aesthetic participants did not express comfort eating, instead they expressed food in terms of being a reward, where at the end of a long, hard day two participants stated they would have pizza or beer and crisps as a reward. Furthermore, the aesthetic participants had the lowest score for emotional eating on the DEBQ. Therefore, upon further inspection of questions related to the FCV 'comfort' eating scale, the questions are in reality, more related to how food helps one relax or cope and not comfort eating per se: 'How much it helps me relax', 'Whether I think it will help me cope with stress', and 'Degree to which it will help me cope with life events'. These three questions are not directly related to comfort eating in terms of when someone is feeling down or sad. This might help to explain the discrepancy in scores. However, in the first study, the instrumental participants had a significantly higher score compared to both the disciplined and aesthetic groups, this difference could be a result of how these 3 'comfort' scale questions are interpreted by the participant. In the first study, we also explored if the 'comfort' scale was related to 'emotional' eating and found only a weak, non-significant association. However, in this second study we observed a moderate, significant association (Spearman test, $r_s = 0.42$, $p = 0.01$).

For the sensory appeal scale, all participants scored similarly, the instrumental group: 3.67 ±1.33; the disciplined: 3.50 ±1.17; and aesthetic: 3.00. Scores suggest that all participants felt that foods that were pleasing to the senses, i.e. looked and smelled good, were moderately to quite a bit important. This agrees with the interview findings where participants expressed buying the best brand or a better brand, or organic foods, because they knew it would taste nicer, or chose fresh over frozen. Some participants expressed that they would not eat healthy food for the sake of being healthy if it did not taste nice. Whereas, some participants felt that they preferred healthy or homemade meals because they tasted nicer. Some participants expressed 'tasting nice' in terms of enjoying foods that were sugary, salty or savoury. The topic 'smell' did not emerge very much except in terms of smelling freshly baked breads or cakes when in the supermarket and how these participants would want to purchase these items because they smelled good. These scores (and answers) are similar to the first study, in addition to no difference was found in scores.

Regarding the organic scale, both the aesthetic and disciplined groups had similar scores, (3.00 and 3.00 ±1.88, respectively), where the instrumental had a significantly lower score (2.25 ±0.81) compared to the disciplined (p = 0.03). A score of 3 suggests that foods that have minimal impact on the environment, and/or that contain natural ingredients, minerals and vitamins, are moderately important. A score of 2 suggests that they are a little bit important. Both the aesthetic and disciplined groups expressed that buying fruits and vegetables was important when shopping, and a number of the disciplined participants stated that buying organic meat and produce was important to them, and some expressed that they were willing to pay more for organic meat and produce. Moreover, one disciplined participant conveyed pride in that her/his family grew their own vegetables. Several of the instrumental participants expressed that they try to buy organic or local produce and/or meat when possible, and a few others expressed buying organic free-range eggs. These scores are very similar to those of the first study, where there was also no significant difference found in scores.

For the accessibility scale, the disciplined and instrumental groups had similar scores (4.17 ±1.00 and 4.00 ±1.08, respectively) and the aesthetic group had a slightly lower score (3.67). No significant difference was found in scores. A score of 4 or higher suggests that proximity to grocery stores (from home or work) is quite a bit important, whereas a score of 3 suggests that it is moderately important. These scores and answers are very similar to the first study where participants explained that the majority of their food shopping was either close to home or work, such that they would shop after work, on their way home.

Both the aesthetic and disciplined groups had similar scores for the traditional scale (2.33 and 2.33 ±2.08, respectively), whereas the instrumental group had the lowest score (1.33 ±1.33). No differences were observed in scores. For the aesthetic and disciplined participants, how familiar food is recognisable with their heritage or background is a little bit to moderately important. Whereas for the instrumental participants, it was not at all to a little bit important. This is consistent with how some of the disciplined and aesthetic participants felt and expressed, that food was a way to connect either socially, or as cultural identity. In the first study, only the aesthetic group had a high score, however, in terms of no significant difference found in scores is a similar pattern for both studies.

4.4.7 Short Form – Health Survey version 1 (SF-36v1) Quality of Life

This questionnaire measured 8 core general health concepts regarding the presence and the extent of physical and emotional limitations that an individual may experience in regard to her/his everyday quality of life at work and home. These general health concepts are comprised 4 physical health subscales, and include physical functioning (PF), role physical (RP), bodily pain (BP) and general health (GH); in addition to 4 mental health subscales, and include vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). Each of these 8 subscales are discussed separately, scores are based on 0 to 100 scale (Section 2.2.3.8) where a score of 0 represents the poorest or worst state of health and wellbeing, and a score of 100 denotes the most optimal state of health and wellbeing (Brazier et al. 1992). All scores are reported as median ±IQR.

Regarding the PF subscale, both the disciplined and aesthetic groups had similar median scores (100.0 ±5.0 and 95.0, respectively), whereas, the instrumental group had a significantly lower score (82.5 ±33.8) compared to the disciplined (p = 0.007). The higher scores suggest that both disciplined and aesthetic participants felt that they were able to perform all physical activities related to everyday life, including the most vigorous, without limitation. Whereas, the instrumental group's lower score suggests that they experienced a degree of some physical limitation in their everyday life (daily activities also include dressing and bathing).

For the RP subscale, both the disciplined and aesthetic groups scored identically (100.0 ±0). The instrumental also had a score of 100, but a very large IQR (±75.0), as such there was a significant difference in scores between the disciplined and instrumental groups (p = 0.04). Participants who had the highest scores for this scale, suggests that they were able to perform work and daily activities with no limitation. Lower scores suggest a limitation in these activities due to physical health.

BP subscale: both the disciplined and aesthetic groups scored similarly (84.0 ±38.3 and 84.0, respectively). The instrumental group had a lower score (62.0 ±33.0) but it did not reach significance compared to the disciplined group (p = 0.09). Lower scores suggest that an individual experiences bodily pain such that it places a limitation on their daily activities, whereas a higher score suggests no limitations.

Regarding the GH subscale, the aesthetic group had the highest score (92.0), followed by the disciplined group (82.0 ±32.5), which was significantly higher compared to the instrumental group

(53.5 ±39.5) (p = 0.002). Higher scores suggest that the aesthetic participants believed their personal health to be excellent. Whereas, the lower the score the more an individual believes her/his personal health is poor and likely to get worse.

For the VT subscale, both the disciplined and aesthetic groups had similar scores (70.0 ±21.3 and 65.0, respectively). The instrumental had a significantly lower score (42.5 ±20.0) compared to the disciplined group (p < 0.0001). Lower scores for this scale suggest feelings of constantly being tired and worn out, whereas, higher scores suggest feeling energy and pep (i.e. liveliness).

Regarding the SF subscale, the disciplined group had the highest score (93.8 ±28.1) followed by the aesthetic group (87.5), whereas the instrumental group had the lowest score (75.0 ±25.0) but it did not quite reach significance compared to the disciplined group's score (p = 0.06). Higher scores suggest that the individual experiences no emotional or physical problems that would interfere with normal social activities. Whereas, lower scores suggest that there is some degree of emotional and/or physical problems that might interfere with normal social activities.

RE subscale: both the disciplined and aesthetic had similar scores (100.0 ±33.3 and 100.0, respectively). The instrumental group had a significantly lower score (16.7 ±100.0) but an extremely large IQR, compared to the disciplined group (p = 0.02). Low scores suggest experiencing emotions such that they interfere with daily activities. In contrast, high scores suggest that the individual does not experience emotions that would interfere with daily activities.

For the MH subscale, both the disciplined and aesthetic scored similarly (74.0 ±13.0 and 76.0, respectively), whereas the instrumental had a significantly lower score (56.0 ±35.0) compared to the disciplined (p = 0.02). Lower scores suggest experiencing feelings of depression and/or nervousness such that they cause distress and effect psychological wellbeing. Higher scores are related to experiencing feelings of calm, happiness and/or peace.

Regarding the summary health measures, Physical Component Summary' (PCS, comprises PF, RP, BP and GH) and 'Mental Component Summary' (MCS, comprises VT, SF, RE and MH) which provide an overall portrayal of subjective physical and mental health status, respectively. For both summary health measures, a score of 70 is indicative of 'best health' whereas a score of 30 is suggestive of 'worst health'. Fifty (50) is average health (QualityMetrics 2016). Scores are reported as median ±IQR.

For the PCS, the disciplined and aesthetic groups had similar scores (57.6 ±8.5 and 54.1, respectively). The instrumental group had a significantly lower score (48.4 ±13.5) compared to the disciplined group (p = 0.03). Overall, the disciplined and aesthetic participants felt their physical health was slightly above average compared to the instrumental participants who overall felt their physical health was slightly below average. From the interviews, all the aesthetic participants discussed exercising in one form or another, either exercise classes or weekend team sports. All disciplined participants expressed that they were engaged in some form of physical activity as well. Activities ranged from walking every day (13,000 to 15,000 steps) to playing football, or some form of resistance and/or cardio training at the gym. More than half of the instrumental participants expressed that they do not exercise but none gave a reason as physical disability being a limitation, the reasons pertained to either having kids which prevents them, or feeling embarrassed about going to the gym, and one explained that it would only stress her/him out thus causing her/him to eat more, so does not bother, additionally, a couple of other instrumental participants explained they had just started up with exercise. However, six instrumental participants (33%) did express being engaged in one form or another of exercise, anywhere from 2 to 5 days a week, activities varied from workout classes (such as Zumba), to running, rowing or swimming, and one participant was training for a marathon.

For the MCS, both the disciplined and aesthetic group had similar scores (50.6 ±12.7 and 52.1, respectively). The instrumental group had a significantly lower score (36.7 ±21.2) compared to the disciplined group (p = 0.01). The disciplined and aesthetic participants' scores suggest that they felt their mental health was average. In contrast, the instrumental participants' score suggests that overall, they felt that their mental health was worse off (recall, a score of 30 is worst mental health). This finding supports the accounts from the instrumental participant interviews where a number of them reported experiencing either low moods or depression. Moreover, a number of the disciplined participants expressed that they felt food was important from a mental health perspective. This topic did not emerge with the aesthetic participants.

Previously, Pallant & Lae (2002) found a significant correlation between SOC and physical health and psychological wellbeing, therefore we explored each construct (i.e. SF-36 subscale) with both the SOC and BIQLI questionnaires and found moderate (i.e. r_s = 0.36 to 0.59) to very strong (i.e. r_s = 0.63 to 0.72), significant correlations (i.e. p = 0.03 to < 0.0001) between these questionnaires and each subscale (Table 4.6). In relation to the SOC construct, this may suggest that an individual's physical and mental wellbeing is connected to how s/he interprets her/his salutogenic outlook on life or vice versa. The only subscale where there was a weak, non-significant

association observed: BP scale and SOC (r_s = 0.27, p = 0.12), which could potentially make sense because depending on the level, duration and/or type of bodily pain an individual experiences, it does not necessarily reflect her/his outlook on life, especially if it is short-term bodily pain. If, however, an individual is suffering from a long-term illness or injury that causes bodily pain, then this could affect her/his salutogenic outlook.

In relation to the BIQLI construct and BP we observed a weak, significant association (r_s = 0.36, p = 0.03), this makes sense because the BIQLI measures an individual's overall body image related to quality of life, so it follows that participants who experience bodily pain to a degree where it effects their quality of life, thus these two constructs affect each other.

We also observed only a weak, non-significant association between the PCS and SOC (r_s = 0.30, p = 0.09), but between and PCS and BIQLI the weak association was just below significance (r_s = 0.33, p 0.06). These outcomes suggest that the degree of physical limitation/s can potentially affect either an individual's outlook on life and/or body image related to quality of life, that is, the degree or level of quality of life.

Table 4.6 SF-36v1 subscales and summary health measures correlation with SOC and BIQLI.
Spearman correlation tests.

SF-36 subscales	SOC-13	BIQLI
Physical functioning (PF)	r_s = 0.44, p = 0.008	r_s = 0.51, p = 0.002
Role physical (RP)	r_s = 0.47, p = 0.004	r_s = 0.51, p = 0.002
Bodily pain (BP)	r_s = 0.27, p = 0.12	r_s = 0.36, p = 0.034
General health (GH)	r_s = 0.59, p < 0.0001	r_s = 0.49, p = 0.004
Vitality (VT)	r_s = 0.72, p < 0.0001	r_s = 0.66, p < 0.0001
Social functioning (SF)	r_s = 0.63 p < 0.0001	r_s = 0.53, p = 0.001
Role emotional (RE)	r_s = 0.62, p < 0.0001	r_s = 0.65, p < 0.0001
Mental health (MH)	r_s = 0.72, p < 0.0001	r_s = 0.70, p < 0.0001
Physical component summary (PCS)	r_s = 0.30, p = 0.088	r_s = 0.33, p = 0.058
Mental component summery (MCS)	r_s = 0.71, p < 0.0001	r_s = 0.66, p < 0.0001

PCS comprises PF, RP, BP and GH subscales. MCS comprises VT, SF, RE and MH.

4.5 Somatotype ratings and BMI

This section reports the somatotype ratings each participant was represented by, through the help of 3-dimensional (3D) body scans and visual ratings. Participants' body shapes were quantified using somatotype categories based on the Heath-Carter system (Carter 2002; Carter & Heath 1990) (Section 2.2.4.5). The reliability of the researcher's ratings was within a ½ integer rating (in either direction) of an international, highly qualified and experienced somatotype rater (Carter & Heath 1990), who is one of only 9 worldwide and has 14 years' experience. The objective was to investigate where individuals would cluster onto a somatochart, based on similar body shapes, or phenotypes. Specifically, the three components: mesomorphic (i.e. muscular robustness), endomorphic (degree of fatness) and ectomorphic (height and linearity, slenderness). Figure 4.2 shows a 3D representation of how each individual is represented on a somatochart. Each participant's BMI value is identified on the chart by either a red dot (OB), blue dot (OW), or a green dot (NW). The larger diamond shapes represent males and females, because females generally carry more adipose tissue, and males carry more muscle; in order to accurately represent BMI categories, it was felt that we should pay homage to this difference (between men and women). The lighter pastel coloured diamonds represent the female somatotype average in their respective BMI group, whereas the darker coloured diamonds represent the male somatotype average for each respective BMI group. These average measures are calculated by first calculating the somatotype attitudinal distance (SAD_3) which is the distance between any two somatopoints, then the somatotype attitudinal mean (SAM) is calculated and is the average of the SAD_3s of each somatopoint from the average S of a sample (Duquet & Hebbelinck 1977, cited by Carter & Heath 1990, p. 411). No individuals that represent the ectomorphy area of the somatotype chart (right hand side) have been identified in this study. For individuals to be represented in this area of the chart, their somatotype rating must be highly ectomorphic, that is, necessarily tall and linear (i.e. skinny or thin), with very little muscle and fat. An example of individuals who might represent this area, could be basketball players (although muscular their sport generally requires them to be quite tall), or those with anorexia nervosa. Reference can also be made to Figure 1.5 on page 28.

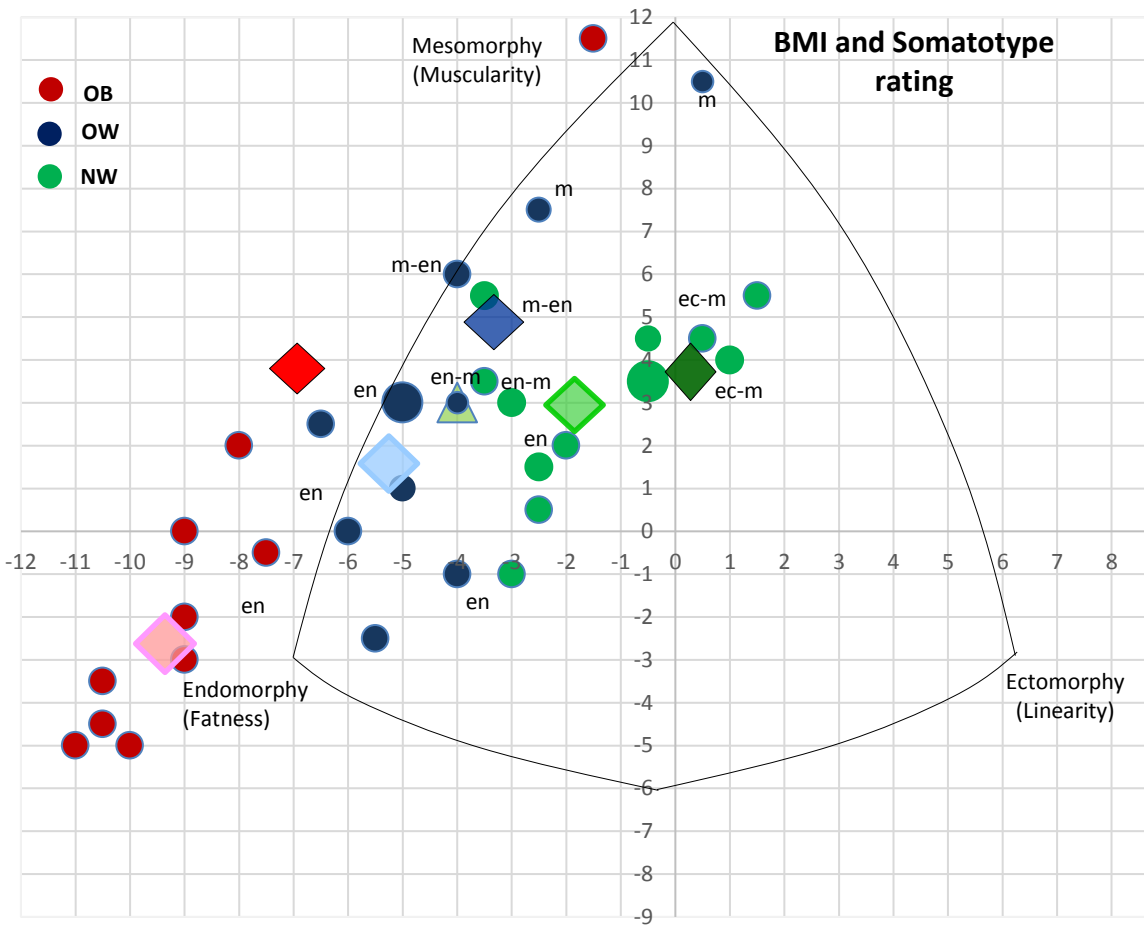

Figure 4.2 Somatochart representing each individual's somatotype according to her/his BMI value.
Light green triangle with a blue dot (at coordinates -4, 3) represents two individuals (one NW and one OW) who have identical somatotype numbers. Additionally, the 2 double size circles, blue and green (at coordinate -5, 3; and 0, 3.5, respectively) represent two individuals who have identical somatotype numbers. Diamond shapes represent the average somatotype for each female and male BMI category, where the pastel colours represent the females (OB, OW, and NW); and darker colours represent the males (OB, OW, and NW).
Endomorphy: en; Endo-mesomorphy: en-m; Meso-endomorphy: m-en; Ecto-mesomorphy: ec-m; Mesomorphy: m.

Overall, with the exception of one individual, all participants in the OB group (n = 10) (i.e. 9 out of 10, or 90%) were represented by the endomorphic (fatness) somatotype. The one OB participant (10%) who was not represented as this somatotype, but instead was represented by the mesomorph (muscular) somatotype and was clearly not obese. His muscularity adds to his body weight such that he is mis-categorised as obese according to BMI calculations, and is therefore, of a mesomorphic body shape. Figure 4.3 below shows this mesomorphic individual (on the left) compared with an endomorphic male (on the right).

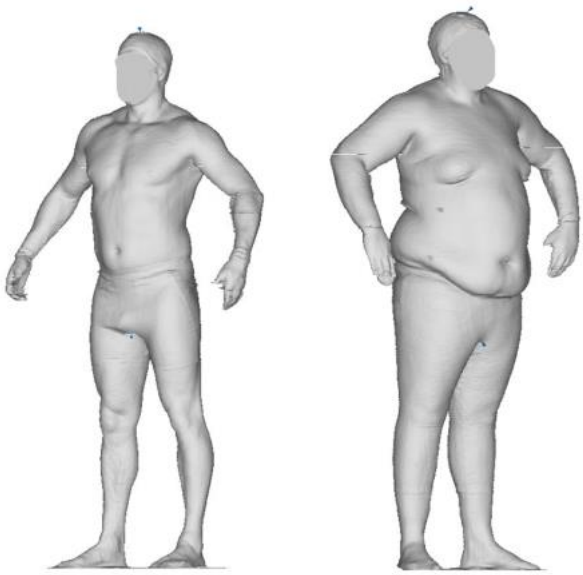

Figure 4.3 Somatotype example of mesomorph (muscular) and high endomorphy (fatness).
Mesomorph on the left (categorised as OB according to BMI) compared with a male with high endomorphy (fat) (also categorised as OB on the BMI scale).

Moreover, 2 OW individuals (n = 11) (18%) were represented as more mesomorphic than endomorphic, Figure 4.4 shows these 2 individuals, in addition to 1 OW individual (9%) who was slightly more meso-endomorphic (mixture of muscularity and fatness), and 1 OW individual was approximately equidistant and is represented as endo-mesomorphic (fat and muscle).

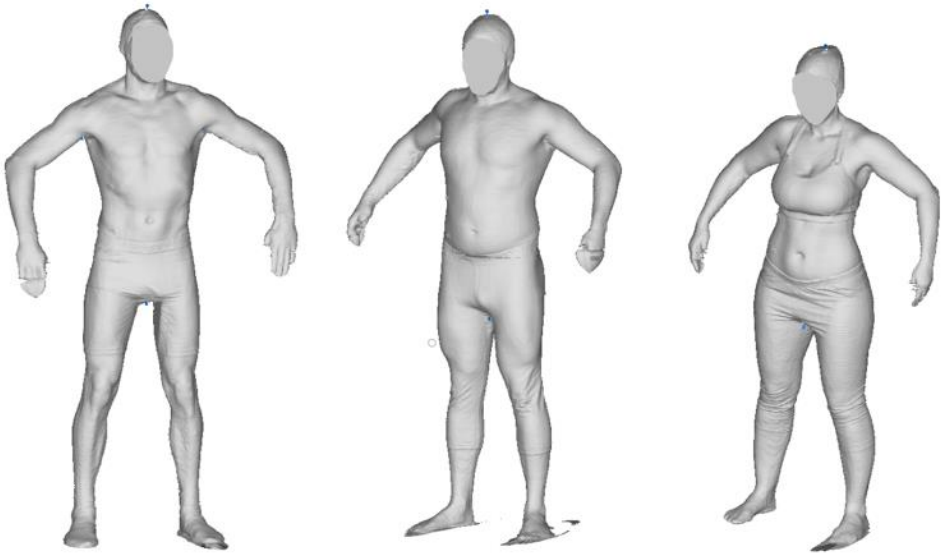

Figure 4.4 Examples of meso-endomorph and endo-mesomorph.
Three individuals classified as OW on the BMI scale, figure on left is meso-ectomorph (muscular and linear), centre is endo mesomorph (fat and muscular), and right is meso-endomorph (muscular and fat); thus, representing variations in the proportions of fat and muscle.

The remaining 7 OW (73%) individuals were more endomorphic (fat) than either mesomorphic (muscle) or ectomorphic (slender/linear), examples are shown in Figure 4.5.

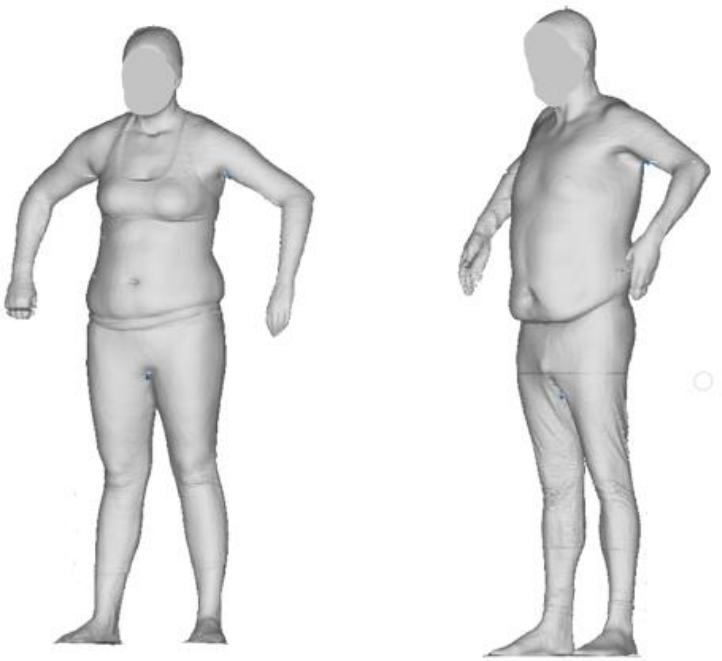

Figure 4.5 Somatotype examples of high endomorphy (fatness) and classified as OW on the BMI scale.

Four NW individuals (i.e. 4/14) (28.5%) clustered more closely to endomorphy than ectomorphy (slender or linear), which suggests they were carrying more fat than their other NW counterparts, shown in Figure 4.6. Three NW individuals (21%) were mid-way between endo-mesomorphy, which suggests they were carrying a mixture of fat and muscle, shown in Figure 4.7. One NW individual (1.5%) was a mixture of meso-endomorphy (muscle and fat, but slightly more muscle than fat) also shown in Figure 4.7.

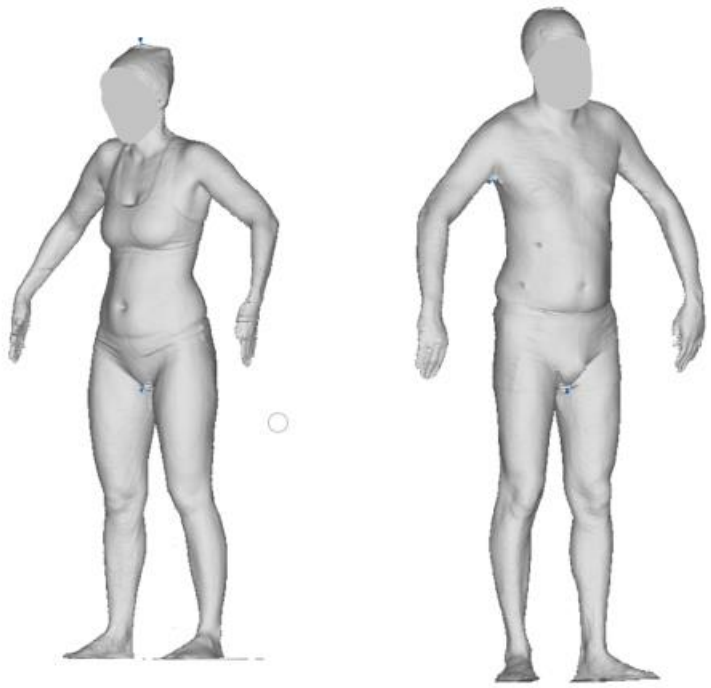

Figure 4.6 Somatotype examples of endomorphy (fatness) and ectomorphy (linearity).
Female on left is slightly more endomorphic (4½-4-2), whereas the male on right is slightly more ectomorphic (4½-4½-2½) both classified as NW individuals according to the BMI scale.

Figure 4.7 Somatotype examples of mid-way between endo-mesomorphy (fatness-muscular).
The two figures on the left are midway between endomorphy and mesomorphy, while the individual on the right is more mesomorphic-endomorphic (muscular-fatness). Categorised as NW according to BMI scale.

The remaining 6 NW individuals (43%) are clustered between ectomorphy and mesomorphy, suggesting a mix of slenderness/linearity with some muscularity, Figure 4.8.

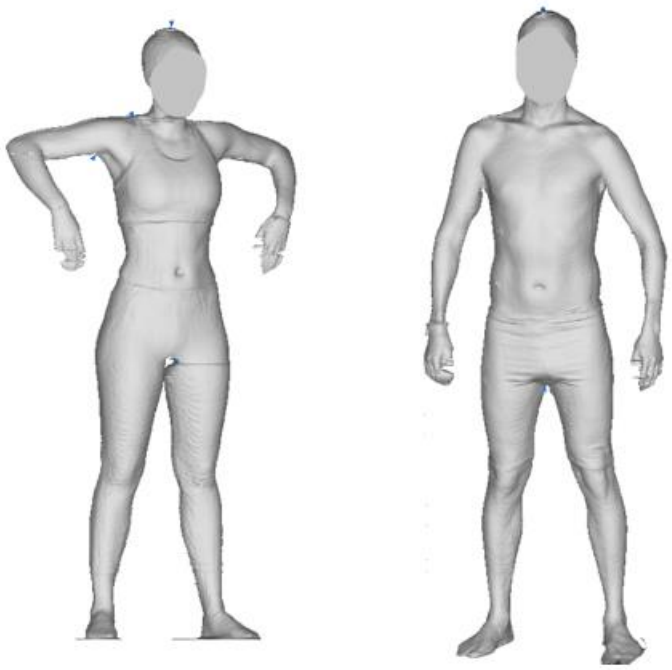

Figure 4.8 Examples of somatotype ecto-mesomorph (slender/linearity-muscular) individuals.
Categorised as NW according to BMI scale.

The consequences of being 'mis-categorised' by the body mass index suggests that there will be some individuals who will perceive that they are of 'healthy' weight because they are 'normal weight', and yet in reality these individuals are 'skinny fat', or another term which has been used is, 'metabolically obese, normal-weight' (MONW) individuals (Dvorak et al. 1999; Conus et al. 2004). These types of individuals can present metabolic disturbances which are typically expected to be found in obese individuals, such as increased visceral adiposity, insulin resistance, elevated fasting blood glucose levels and triglycerides, low levels of high-density lipoprotein (HDL) cholesterol and hypertension. Alternatively, there can also be individuals who are obese but metabolically healthy (MHO), where they present normal insulin sensitivity and have a favourable cardiovascular risk profile (Succurro et al. 2008). Research has shown that there is a 3- to 4-fold risk for T2D in individuals who present the MONW-like phenotype, compared with individuals who do not present this phenotype (Meigs et al. 2006). Although, this study did not investigate insulin levels or insulin resistance in the participants, this study did measure blood biomarkers for inflammation (see section 4.6). The somatochart gives a visual representation of how an individual can be 'normal weight' but with adiposity. In addition to being 'obese' but slender, specifically

because these individuals tend to have slender frames and low muscularity, where they can accumulate considerable fat without graduating to the overweight category. Furthermore, this somatochart shows how BMI is only a best approximation for fatness and comorbid disease related to it.

The somatotype findings from this study are to a certain degree similar to the study by Olds et al. (2013) who found that among 301 Australian participants (17 to 56 years of age) who were also categorised according to their BMI values, among their OB participants, the majority (94% of their male OB participants and all their OB female participants, in addition to 91% of OW female participants) represented the endomorph somatotype. Ninety percent of the OB participants in our study also comprised the endomorphic somatotype.

Olds et al. (2013) had participants represented by endo-mesomorphy, which included only men, but no women, whereas our study had a mix of males and females in this category. Olds et al. (2013) had a cluster of men and women who were represented by the ectomorph rating only, whereas, our study had no participants in this category. However, Olds et al. (2013) had individuals which represented the ecto-mesomorph category, and it comprises only women, whereas, this study also had individuals who comprised this ecto-mesomorphic region, and it comprised one male and the remainder, female.

Olds et al. study (2013) comprises no individuals in the mesomorph region, and yet this current study comprises 3 individuals (8.6%) in this region (1 OB and 2 OW). Additionally, Olds et al. (2013) found no individuals in the meso-endomorphic region, however, this study found 2 individuals (6%) who represented this region.

Overall, however, even though there were some slight somatotype variations between these two studies, it is interesting that there was another study, which explored, explicitly, somatotype ratings among BMI categories. To the best of our knowledge, our study is the second study to have done this. These two studies show an alternative way that may be better for assessing adiposity (or at least in conjunction with other measures, i.e. BMI, WHR, WSR, WC, SAD_1 etc.). Specifically, because, once a 3D scan is obtained other measurements can be taken from the scan (i.e. minimum, maximum waist, hip circumference, height, etc.).

4.5.1 Somatotype ratings and IDA profiles

Figure 4.9 shows a somatochart representing each individual according to her/his IDA profile with her/his respective somatotype rating. The 18 participants who have an instrumental profile (represented by magenta coloured small squares in the somatochart) 14 individuals (78%) were represented by the endomorph (fatness) somatotype, and 2 (11%) were mid-way between endo-mesomorph (fat-muscle), 1 (5.5%) was represented by the meso-endomorph (muscle-fat) somatotype, and 1 was represented by the ecto-mesomorph (linear-fat) somatotype.

Of the 14 individuals who have a disciplined profile (represented by small green triangles), 3 (21.5%) participants were represented with a mesomorph (muscular) somatotype, 5 individuals (36%) were represented by the endomorph (fatness) somatotype, 1 individual (7%) was represented by the endo-mesomorph (fat-muscle) somatotype, while the remaining 5 individuals (35.5%) were represented by the ecto-mesomorph (linear-muscle) somatotype.

Of the 3 individuals who have an aesthetic profile (represented by small blue circles), 1 individual (33.3%) was represented by the endomorph (fatness) somatotype. One individual (33.3%) was represented by the endo-mesomorph (fat-muscle) somatotype, and one (33.3%) was represented by the meso-endomorph (muscle-fat) somatotype.

The larger lightly shaded hexagonal figures represent the average somatotype for each IDA profile, where the light pink represents the instrumental, the light green represents the disciplined and the light blue, the aesthetic group.

Overall, the instrumental group was represented by the endomorph (fatness) somatotype. The disciplined and aesthetic profiles were represented by the endo-mesomorph (fat-muscle) somatotype; although the disciplined profile individuals average somatotype rating was slightly more closely represented by ectomorphy (linearity) than endomorphy (fatness) (Figure 4.9).

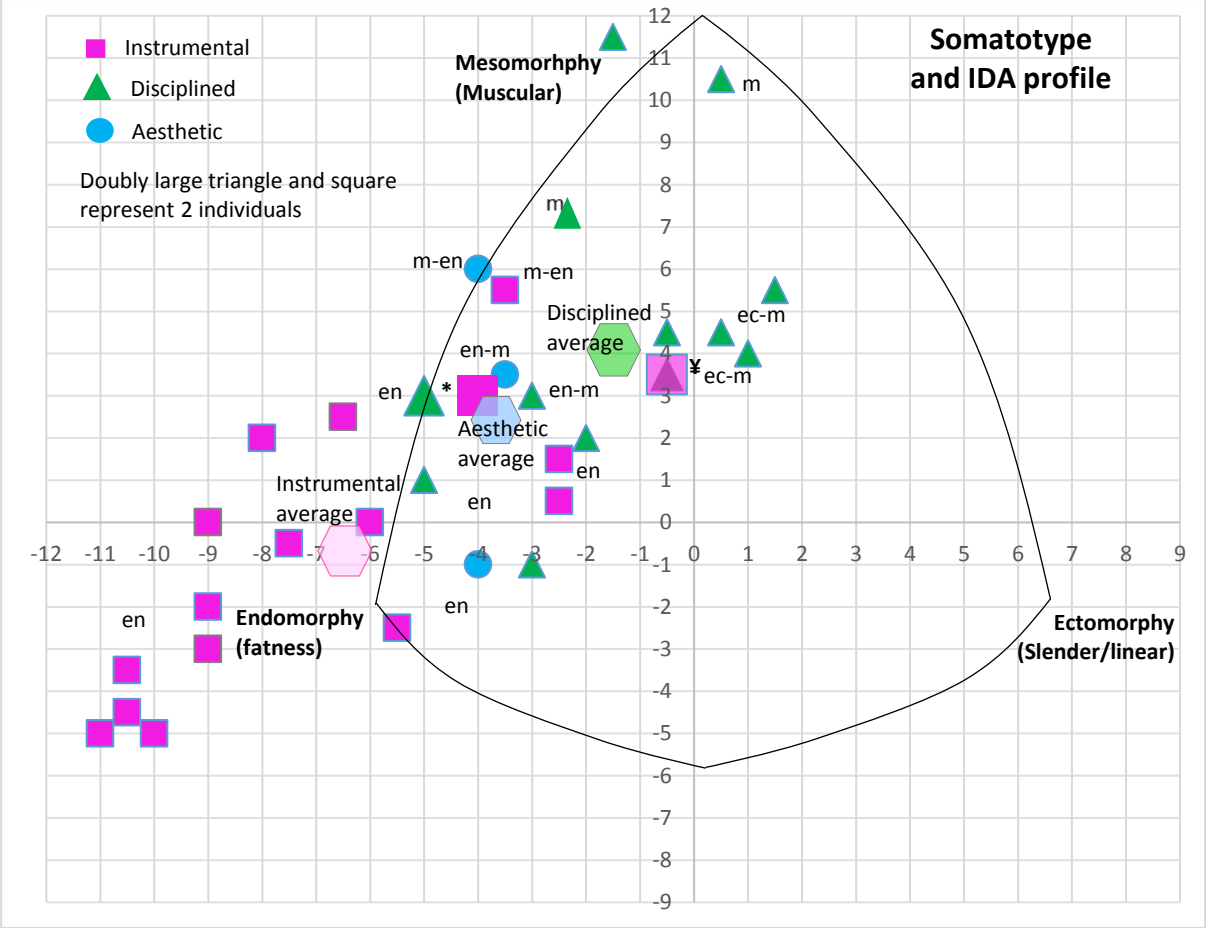

Figure 4.9 Participants' IDA profile somatochart.
Inst: n = 18; Disc: n = 14; Aesth: n = 3. **¥**Light green triangle inside magenta square represents one disciplined and one instrumental participant who have identical somatotype numbers. Additionally, the double size green *triangle and *magenta square each represent two individuals who have identical somatotype numbers. Large hexagonal shapes represent the average IDA somatotype (i.e. instrumental, disciplined, and aesthetic).
Endomorphy: en; Endo-mesomorphy: en-m; Meso-endomorphy: m-en; Ecto-mesomorphy: ec-m; Mesomorphy: m. BMI mean (±SD) values for IDA groups: Inst, 32.8 (±8.3 kg/m²); Disc, 24.2 (±3.1 kg/m²); Aest, 26.0 (±3.4 kg/m²).

Three examples of somatotype rating for the instrumental group are shown in Figure 4.10 below. Figure 4.11 shows three examples of somatotype rating for the disciplined group, and Figure 4.12 shows the three somatotype ratings in the aesthetic group.

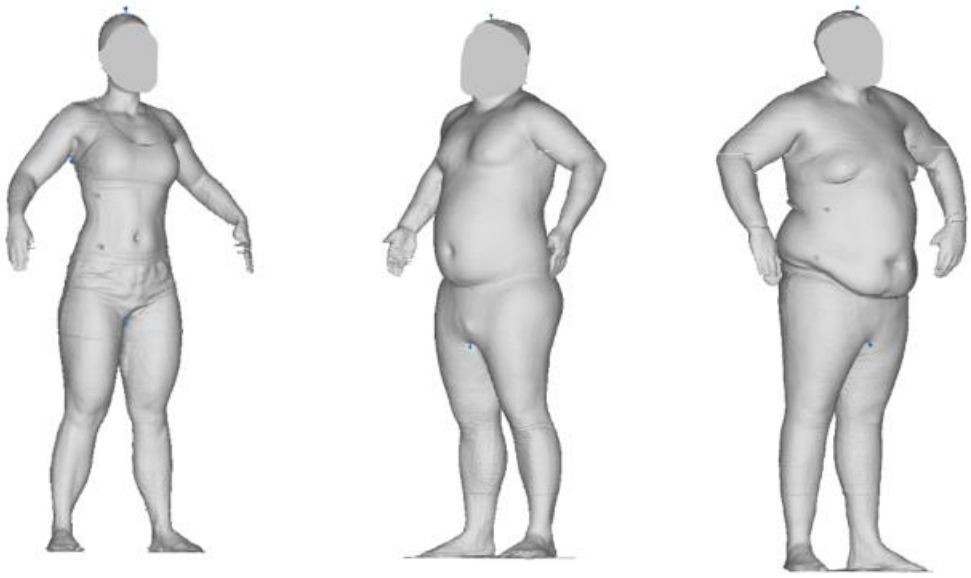

Figure 4.10 Instrumental profile, somatotype variety.
Left figure is an example of a meso-endomorph, middle and right figures are examples of endomorph.

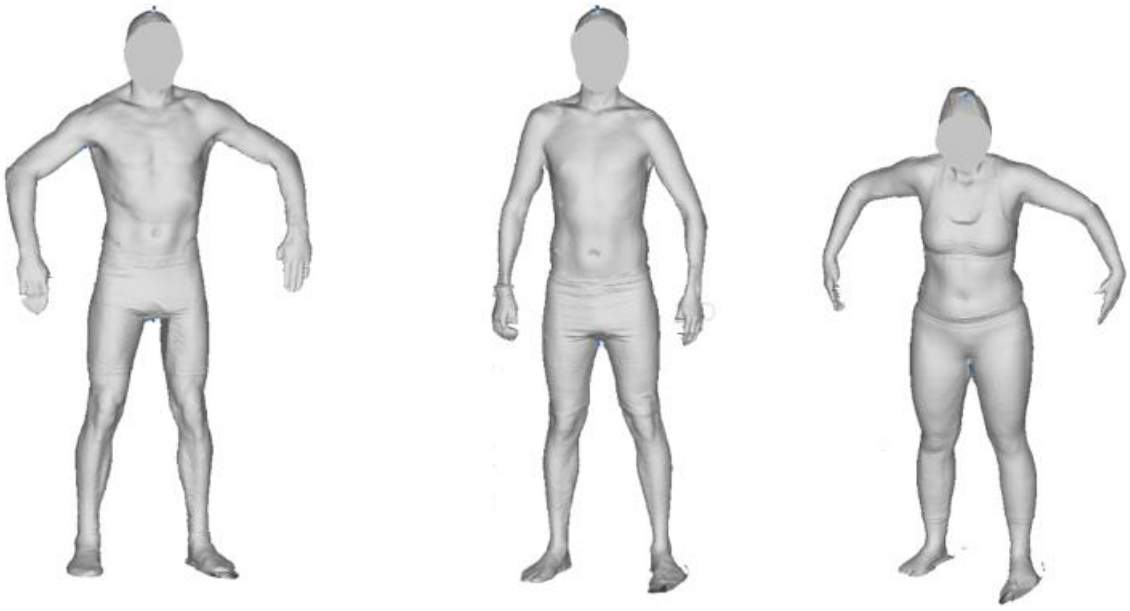

Figure 4.11 Disciplined profile, somatotype variety.
Left figure is an example of a mesomorph, middle is an ecto-mesomorph and figure on right is an endomorph somatotype.

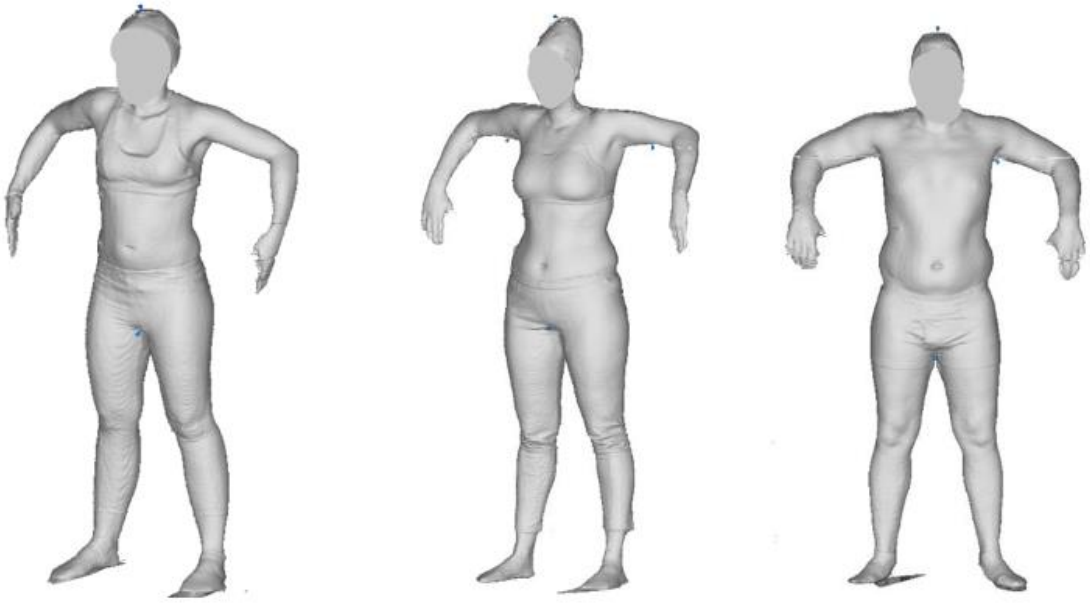

Figure 4.12 Aesthetic profile somatotype variety.
Left figure is an example of an endo-mesomorph, middle is an endomorph and figure on right is a meso-endomorph example.

These somatotype findings are interesting because previously Kretschmer (1936) believed that an individual's body shape was key to the matter or "problem" of her/his constitution. Specifically, Kretschmer proposed that body shape determined the level of illness or psychoses in the individual. Kretschmer (1936) found that the 'pyknic' type or 'circulars' (also 'cycloid'), that is round and fat throughout the body, were more prone to depression, as well as more susceptible to obesity, diseases of the metabolism, diabetes, atherosclerosis and rheumatism. They were generally more likely to die of heart failure. The IDA profile which closely resembles Kretschmer's pyknic type is the instrumental group.

Our study has found that overall, the individuals with an instrumental profile had a larger BMI, more adiposity, experienced an overall, more negative embodied disposition, i.e. lower levels of self-esteem, and either indifference, embarrassment or negative feelings towards their body shape and self-perceived body image. They also expressed that food was not an important aspect of their lives and they articulated eating a lot of the same foods, that were either familiar, or foods they could trust. Interestingly, the food addiction questionnaire showed that these individuals experienced more food impairment and distress, and food dependence. Additionally, the Dutch eating behaviour questionnaire showed that these individuals were more prone to

emotional eating. These individuals also experienced a lower salutogenesis, lower body image related to quality of life, in addition to lower physical and mental wellbeing.

In contrast, both the disciplined and aesthetic groups experienced a more positive embodied disposition, and overall had lower BMIs, less adiposity, experienced more satisfaction with their bodies and self-perceived body image. Food held much more importance in these individuals' lives, where these two groups, overall, enjoyed choosing a variety of foods to eat, so as not to get bored with the food they were eating. These individuals were much less likely to eat due to negative emotions or experience impairment or distress around food. Additionally, they experienced a higher salutogenesis and better physical and mental wellbeing.

The disciplined profile is more similar in physique to Kretschmer's (1936) 'asthenic' type; which was generally more linear with long limbs. These individuals were more prone to contracting tuberculosis, but less susceptible to diabetes, atherosclerosis and rheumatism, and generally lived longer compared to their 'pyknic' counterparts. Kretschmer found asthenic types had a temperament more related to 'schizophrene' (schizoid temperament). Kretschmer described the schizophrene temperament as having more depth (to their personality, compared to the cycloid who was more natural, sociable and good natured) with a temperament that was more difficult to get to know. The schizoid temperament was more prone to "'autism' – the living inside oneself" (p. 151). However, Kretschmer also felt that it was more difficult to identify the (physically) healthy schizophrene from the diseased (p. 151), compared to the pyknics.

The aesthetic profile is more similar to Kretschmer's (1936) 'athletic' type, which was described as having a stronger, more developed skeleton and musculature. Kretschmer found that these individuals' temperaments were also similar to schizophrenes. Although, in the realm of psychic disorders he could not find any clear direction or tendencies to formulate an opinion. Moreover, in terms of disease, Kretschmer also found that he could not "discern anything accurate" (p. 30).

It must be remembered that Kretschmer's work was carried out primarily in patients; his estimates were subjective (although very methodical with numerous anthropometric measurements recorded). It was the work of Sheldon who first introduced the concept and term of somatotype rating, which he based on Kretschmer's earlier work (Carter & Heath 1990). To become a somatotype rater involves working with others who are qualified and passing a test, none of which is simple. However, it was Kretschmer's work, which contributed greatly to the creation of somatotype ratings (Carter & Heath 1990). Although the schizophrene temperament is suspect, in today's terminology, it is interesting that in terms of disease Kretschmer found that

among his patients who he called circulars, were more prone to what is essentially today, obesity, T2D, CVD and rheumatoid arthritis.

4.6 Blood biomarkers and BMI

Inflammatory biomarkers including interleukin-6 (IL-6), tumour necrosis factor alpha (TNF-α), interleukin-1 beta (IL-1β), interleukin-10 (IL-10), monocyte chemoattractant protein-1 (MCP-1), leptin, adiponectin and c-reactive protein (CRP) were analysed in non-fasting blood samples collected from participants in the second study. IL-6, TNF-α, IL-1β, IL-10 and MCP-1 levels were analysed using Bio-Rad's Bio-Plex Human Cytokine Group I 5-Plex Assay (Catalogue # Y00000DQD) at the University of Aberdeen. Assay sensitivity (pg/mL) for each cytokine was as follows: IL-6, 0.34; TNF-α, 1.13; IL-1β, 0.24; IL-10, 0.69; MCP-1, 0.44, which is "the concentration of analyte for which the fluorescence intensity is 2 standard deviations above the background signal". Intraassay and interassay coefficient of variation for each cytokine was as follows: IL-6, 2.2%-3.0%; TNF-α, 3.5%-3.0%; IL-1β, 3.6%-3.2%; IL-10, 2.3%-3.4%; MCP-1, 3.2%-3.4%, which is "the percentage coefficient of variation at concentrations within assay working range" (Bio Rad 2018). Dilution factor for each of the analytes was as follows: IL-6, dilution 1; TNF-α, dilution 1; IL-1β, dilution 1; IL-10, dilution 1; MCP-1, dilution 4.

Adiponectin (dilution 400) and leptin (dilution 4) were analysed using the Bio-Plex Pro Human Diabetes Assay (Catalogue #171B7009M) and Bio-Plex Pro Human Diabetes Leptin Set (Catalogue # 171B7009M), respectively. Assay sensitivity (pg/mL) for adiponectin and leptin were 32.7 and 3.1, respectively. Intraassay and interassay coefficient of variation for leptin was 3-4%, and adiponectin was 4-2%.

CRP was analysed at Robert Gordon University's laboratory using an enzyme-linked immunosorbent assay (ELISA) by R&D Systems Human C-Reactive Protein DuoSet ELISA (Catalogue # DY1707). Assay guidelines were followed, CRP dilution factor was 400, and each sample was analysed in duplicate. Assay sensitivity was 15.6 pg/mL, and assay range was 15.6 – 1000 pg/mL.

Best practice recommends that blood samples should be analysed within 2 years from collection (De Jager et al. 2009). All blood samples were analysed within approximately 1 year and 10 months from collection. The results for each biomarker are discussed below and Table 4.7 lists both values, mean ±SE and, the minimum and maximum concentration ranges (which were large for all analytes except for CRP), and each respective concentration unit, for all participants and

each BMI category. Biomarkers were not obtained for all 35 participants. Additionally, some blood sample values fell below the detection threshold for the analyte of interest and were therefore not included in analysis. Thus, the number of participants relevant to each of the biomarkers is different and stated in Table 4.7. The discussions (below) of each biomarker is reported as mean ±SE.

Table 4.7 Plasma blood biomarkers for inflammation among all participants and BMI categories.
Non-fasting values expressed as mean ±SE, and minimum-maximum range.

Plasma sample	**IL-6** (pg/mL) Dilution 1	**TNF-α** (pg/mL) Dilution 1	**IL-1β** (pg/mL) Dilution 1	**IL-10** (pg/mL) Dilution 1	**MCP-1** (pg/mL) Dilution 4	***CRP** (mg/L) 400 Dilution	**ŧLeptin** (ng/mL) Dilution 4	**Adiponectin** (µg/mL) 400 Dilution
All BMIs	n = 32	n = 15	n = 21	n = 27	n = 32	n = 33	n = 31	n = 32
Mean ±SE	14.7 ±5.9	20.5 ±10.6	2.1 ±1.2	55.1 ±34.9	94.4 ±13.7	0.4 ±0.04	20.8 ±5.8	9.7 ±1.2
Range	0.2 - 168.5	0.4 - 158.4	0.1 - 20.7	0.4 - 945.7	18.1 - 387.7	0.1 - 0.8	0.2 - 111.6	1.9 - 34.5
OB	n = 8	n = 6	n = 7	n = 6	n = 8	n = 8	n = 7	n = 8
Mean ±SE	24.7 ±10.4	33.7 ±25.3	2.9 ±2.5	43.9 ±26.8	120.5 ±41.9	0.6 ±0.03	61.6 ±16.0	6.5 ±1.9
Range	0.7 - 68.1	0.01 - 158.4	0.1 - 17.8	0.5 - 165.0	40.1 - 387.7	0.5 - 0.7	5.0 - 111.6	1.9 - 18.3
OW	n = 11	n = 5	n = 6	n = 10	n = 11	n = 11	n = 11	n = 11
Mean ±SE	17.6 ±15.1	17.2 ±10.2	3.7 ±3.4	101.3 ±93.9	90.4 ±13.7	0.4 ±0.1	13.4 ±6.8	10.4 ±1.7
Range	0.7 - 168.5	0.9 - 56.5	0.1 - 20.7	0.4 - 945.7	50.2 - 202.2	0.1 - 0.8	0.7 - 78.6	3.5 - 21.6
NW	n = 13	n = 4	n = 8	n = 11	n = 13	n = 14	n = 13	n = 13
Mean ±SE	6.0 ±3.2	4.9 ±1.6	0.3 ±0.1	19.3 ±6.9	81.8 ±19.5	0.4 ±0.1	5.2 ±1.2	11.1 ±2.2
Range	0.2 - 43.0	0.01 - 7.7	0.1 - 0.6	0.6 - 66.7	18.1 - 266.9	0.1 - 0.8	0.2 - 14.6	4.2 - 34.5

*****CRP Significant difference between OW and OB (U = 20.00, z = -1.98, p = 0.048), and borderline significance between NW and OB (U = 28.00, z = -1.91, p = 0.056). **ŧ** Leptin, significant difference between NW and OB (U = 5.00, z = -3.21, p = 0.001); and between OW and OB (U = 11.00, z = -2.49, p = 0.01). Note, pg: picogram; ng: nanogram; µg: microgram; mg: milligram; mL: millilitre; L: litre.

4.6.1 IL-6 and TNF-α (pg/mL)

The OB group had the highest mean level of IL-6 (24.7 ±10.4) compared with the OW group which had a lower level (17.6 ±15.1), and the NW group had the lowest IL-6 level (6.0 ±3.2). No significant differences were observed between groups. Furthermore, a similar pattern was found for TNF-α levels: the OB group had the highest level (33.7 ±25.3). The OW group had a lower level (17.2 ±10.2), and the NW group had the lowest TNF-α level (4.9 ±1.6), but no significant differences were observed among the groups. The lack of a significant difference may be due to the very large concentration ranges found among the groups. For IL-6 the concentration range for the OB group was from 0.7-68.1, the OW group had a range from 0.7-168.5, and the NW group's range was 0.2-43.0 pg/mL. Moreover, the concentration range for TNF-α was also large, the OB group had a range from 0.01-158.4, the OW group had a range from 0.9-56.5 and the NW group had a range from 0.2-43.0 pg/mL. Another possible reason for a lack of a significant finding may be small sample size.

Both IL-6 and TNF-α are inflammatory cytokines which are directly associated with adiposity (Fantuzzi 2005). Our findings are consistent with this, where increasing levels of inflammatory

cytokines were associated with increasing levels of body adiposity. Moreover, higher concentration levels are associated with a low-grade, chronic inflammatory state (Berg & Scherer 2005; Shoelson, Lee & Goldfine 2006; Gregor & Hotamisligil 2011).

When we compare our BMI groups' IL-6 and TNFα levels to NW and OB groups (of similar sample size) in a French study (Bastard et al. 2000) exploring the potential role these cytokines have in obesity, related to insulin resistance, we found that both cytokine mean (±SE) values are higher in our study compared to the French study (Table 4.8).

Table 4.8 IL-6 and TNF-α in a French study (adapted from Bastard et al. 2000).
Serum levels compared with Study 2 BMI groups (plasma levels). Values reported as mean ±SE.

Study:	**French study)**		**Study 2**		
Participants	NW (n = 8)	OB (n = 14)	OB (n = 8)	OW (n = 11)	NW (n = 13)
Age (years)	42 ±5	45 ±4	30 ±2	28 ±2	24 ±1
BMI (kg/m^2)	20.6 ±0.6	39.5 ±1.1	39.2 ±1.5	27.4 ±0.5	22.3 ±0.4
WHR	0.77 ±0.01	0.96 ±0.02	0.83 ±0.02	0.84 ±0.03	0.75 ±0.02
IL-6 (pg/mL)	0.39 ±0.06	2.78 ±0.30	24.65 ±10.35	17.56 ±15.09	6.03 ±3.22
***TNF-α** (pg/mL)	0.74 ±0.09	1.48 ±0.15	33.69 ±25.31	17.18 ±10.24	4.86 ±1.57

***Study 2 participant numbers for TNF-α, OB: n = 6; OW: n = 5; NW: n = 4.

In particular, the NW group in our study had a much higher IL-6 level compared to the NW French group (6.03 ±3.22 vs 0.39 ±0.06 pg/mL, respectively). In addition, the OB group from our study had a much higher IL-6 level compared to the French OB group (24.65 ±10.35 vs 2.78 ±0.30 pg/mL, respectively). Moreover, a similar pattern was found for TNF-α levels: NW group from this study compared to the French NW group (4.86 ±1.57 vs 0.74 ±0.09 pg/mL, respectively), and OB group from this study compared to the French OB group (33.69 ±25.31 vs 1.48 ±0.15 pg/mL, respectively). However, in both studies, levels of IL-6 and TNF-α are increased in the OB compared to the NW.

The differences in IL-6 and TNF-α levels between our study and Bastard et al.'s (2000) study may be due to the differences in blood collection and analysis: IL-6 and TNF-α were analysed on non-fasted plasma samples compared to fasted serum samples in the French study.

Similar levels of TNF-α to our findings were found in a cohort of individuals from Italy. The study by Corica et al. (1999) explored the relationship between plasma TNF-α levels in NW and OB participants (Table 4.9).

Table 4.9 TNF-α levels in an Italian study (adapted from Corica et al. 1999).
Italian control and obese plasma levels compared with Study 2 BMI categories (plasma). Values reported as mean ±SE.

Study	**Italian study**		**Study 2 BMI categories**		
Participants	**Controls** (n = 16)	**Obese** (n = 42)	**OB** (n = 7)	**OW** (n = 11)	**NW** (n = 13)
Age (years)	29.6 ± 0.7	29.0 ±0.8	30.0 ±2.3	28.1 ±1.7	24.3 ±1.3
BMI (kg/m^2)	21.0 ±0.3	38.4 ±1.0	39.2 ±1.5	27.4 ±0.5	22.3 ±0.4
WC (cm)	76.2 ±1.6	104.1 ±2.3	109.2 ±2.0	88.3 ±3.2	71.6 ±1.7
WHR	0.81 ±0.02	0.87 ±0.01	0.83 ±0.02	0.84 ±0.03	0.75 ±0.02
***TNF-α** (pg/mL)	27.7 ±3.8	44.1 ±3.3	33.7 ±25.3	17.2 ±10.2	4.9 ±1.6

*Study 2, for TNF-α, OB: n=6; OW: n=5; NW: n=4. WHR: waist-hip ratio; WC: waist circumference

TNF-α levels (mean ±SE) in the Italian NW and OB groups, although higher (27.7 ±3.8 and 44.1 ±3.3 pg/mL, respectively) compared to this study's NW and OB groups (4.9 ±1.6 and 33.7 ±25.3 pg/mL, respectively) are more similar comparatively speaking (than the French study).

The Italian OB group are similar to the OB group in this study, in terms of age (29.0 ±0.8 and 30.0 ±2.3 years, respectively) and BMI (38.4 ±1.0 and 39.2 ±1.5, respectively), which is possibly why TNF-α levels in our OB group are more similar than they were in the French study.

4.6.2 IL-1β (pg/mL)

The OW had the highest mean concentration (3.7±3.4) of IL-1β followed by the OB (2.9 ±2.5), whereas, the NW group had the lowest concentration (0.3 ±0.08). No significant differences were found among the groups. This lack of a difference may be due to the large minimum – maximum concentration range found among the groups. Specifically, IL-1β range in the OW group was larger (0.1-20.7) than the OB (0.1-17.8) and narrower in the NW group (0.1-0.6). Among the OB and OW groups, two individuals had very high IL-1β levels (one OB participant had 17.8, and one OW participant had 20.7), and if these two values were removed the results shifted to similar levels in the NW group, (0.4 ±0.3 and 0.3 ±0.1, respectively).

This biomarker is also recognised as a proinflammatory cytokine which can be found increased in obesity compared to lean counterparts, and in addition with TNF-α and IL-6, it contributes to low-grade, chronic inflammation (Berg & Scherer 2005; Shoelson, Lee & Goldfine 2006; Gregor & Hotamisligil 2011). IL-1β, (along with TNF-α and IL-6) is produced by adipocytes, hepatocytes, myocytes and cells in the pancreas and contributes to the inflammatory status observed in obesity and diabetes. These cytokines promote insulin resistance by acting in a paracrine and autocrine manner, which interferes with insulin signalling and promotes tissue inflammation (Esser et al. 2014).

A review of IL-1β by Speaker & Fleshner (2012) argue that IL-1β levels increase in response to repeated stress. Citing their own study, where in non-obese rats that received repeated exposure to tail shock, had a 5-fold increase in IL-1β levels in the sacrificed rats' subcutaneous fat depots compared to control rats. They hypothesised that this response release of IL-1β serves a metabolic and/or immunological function that acts in conjunction to fuel the high energy demands of stress and acts to promote host survival. Furthermore, Speaker & Fleshner (2012) theorise that repeated exposure to stress can shift the body's balance of subcutaneous fat stores and redistribute to visceral fat development and adipogenesis. This redistribution of fat stores may be possible through the actions that IL-1β has on inducing changes in leptin secretion and glucocorticoid activity, which can serve as potential mechanisms for a maladaptive shift of body-fat regulation (Speaker & Fleshner 2012).

A study by Mojtaba et al. (2011) investigating the response of IL-1β to acute incremental exercise in a group of Iranian healthy men both with (n = 15) and without obesity (n = 14) (mean age 40 ±5 years) found that mean (±SD) baseline overnight fasting levels of serum IL-1β were significantly higher in the OB group (2.03 ±0.36 pg/mL) compared to the non-OB group (1.48 ±0.23 pg/mL) (p = 0.031), (Table 4.10), similarly to the differences found in our study. However, the NW group in this study, had a lower IL-1β level (0.32 ±0.23 pg/mL) compared to the Iranian male non-obese group (1.48 ±0.23 pg/mL).

Table 4.10 IL-1β levels in an Iranian study (adapted from Mojtaba et al. 2011).
Serum levels compared with Study 2 BMI groups plasma levels. Values reported as mean ±SD.

Study	**Iranian study-males**		**Study 2 BMI categories**		
Participants	**Non-OB** (n=14)	**OB** (n=15)	**OB** (n=7)	**OW** (n=6)	**NW** (n=8)
Age (years)	39 ±6	40 ±5	31 ±7	25 ±5	25 ±5
BMI (kg/m^2)	24.50 ±2.1	33.0 ±3.2	39.5 ±4.3	27.8 ±1.8	22.6 ±1.3
Blood pressure -Sys (mm/Hg)	113 ±6	127 ±10	131.3 ±14.1	130.0 ±14.7	114.8 ±9.4
Blood pressure -Dia (mm/Hg)	77 ±5	88 ±7	81 ±10	73 ±5	68 ±10
IL-1β (pg/mL)	1.48 ±0.23	2.03 ±0.36	2.87 ±6.59	3.66 ±8.34	0.32 ±0.23

Mojtaba et al. (2011) clarified that both male groups had not engaged in any regular physical exercise or diet, and were asked to avoid any heavy physical activity for 48 hours prior to blood collection. This might explain the differences in IL-1β levels found in the NW group between our study and Mojtaba et al. (2011). As participants in our study were not asked to refrain from any form of physical activity.

To investigate if IL-1β levels are affected by age, we refer to a study by Hammad et al. (2015) who explored IL-1β serum levels in Egyptian patients with chronic obstructive pulmonary disease

(COPD), and a control group, which comprised 20 'apparently' healthy female and male volunteers. The control group's age ranged from 38 to 62 years (mean, 55.05, SD ±9.25 years). No information on BMI was reported, nor if blood collected was fasting or non-fasting. Our study's participants had a higher mean (±SD) IL-1β level (2.13 ±5.71 pg/mL) compared to the Egyptian health control group (1.52 ±0.15 pg/mL). Moreover, our participants had a broader IL-1β range (0.05 to 20.7 pg/mL) compared to the Egyptian control (1.2 to 3.0 pg/mL). However, if we omit the two participants from our study who had very high IL-1β levels, the new mean (0.33 ±0.40 pg/mL) becomes lower and range among our participants becomes narrower (0.05 to 1.7 pg/mL) and more similar to the Egyptian control group (Table 4.11).

Table 4.11 IL-1β levels in an Egyptian study (adapted from Hammad et al. 2015).
Egyptian participants serum levels compared with this current study's 21 participants and with 2 highest values (theoretically) omitted. Values reported as mean ±SD.

Study	**Egyptian study**	**Our study participants**	
Participants	**Healthy controls** (n = 20)	**Current study** (n = 21)	**Current study** (n=19) 2 highest values omitted
Age (years) range	55.05 ±9.25 38 - 62	26.71 ±5.94 20 - 41	27.32 ±5.93 20 - 41
IL-1β (pg/mL) range	1.52 ±0.15 1.2 – 3.0	2.13 ±5.71 0.05 – 20.7	0.33 ±0.40 0.05 – 1.7

4.6.3 CRP (mg/L)

Both the NW and OW groups had identical mean (±SE) CRP levels (0.4 ±0.1 mg/L). The OB group had a higher CRP level (0.6 ±0.03 mg/L), which was significant compared to the OW group (p = 0.05), but did not reach significance with the NW group (p = 0.06). However, all groups had levels that were considered to be at low risk for CVD.

CRP is a nonspecific acute phase protein which responds to most forms of inflammation, tissue damage or infection, it is generally produced by hepatocytes and is principally under transcriptional control by IL-6 (Pepys & Hirschfield 2003, p. 1805). CRP is a surrogate marker for the proinflammatory IL-6 cytokine (Bataille & Klein 1992; McPherson, Mathew & Pincus 2011). Concentration levels are usually expressed in either mg/L or mg/dL (Williams 2011)].

When comparing median levels of CRP, McPherson, Mathew & Pincus (2011) state that the median CRP concentration in 'normal' individuals is approximately 1 mg/L, based on this we investigated the median levels among our BMI groups. We found that the NW group had the

lowest median CRP level (0.3 ±0.05), the OW group had a slightly higher median value (0.4 ±0.4), and the OB group had the highest median level (0.6 ±0.2). Concentration values above 1.0 mg/L are indicative of being at increased risk for diseases such as stroke, myocardial infarction and coronary heart disease (CHD). However, the relationship between CRP and CHD remains unresolved and a precise mechanism is still lacking (McPherson, Mathew & Pincus 2011, p. 254-5). Because CRP is under transcriptional control by IL-6 (Pepys & Hirschfield 2003) we explored if there was an association between IL-6 and CRP levels. We observed a very weak, negative association, and it was not statistically significant (r_s = -0.01, p = 0.96). This finding is perhaps due to the age range of our participants. (i.e. 20-41 years), as higher CRP levels can be found in older adults, although may not necessarily be statistically significant (Shine, de Beer & Pepys 1981).

A study by Shine, de Beer & Pepys (1981), who developed a precise assay for measuring serum CRP concentration levels, suggested that the concentration levels they found established the normal range in humans, which is a median concentration of 0.8 mg/L in 'normal' male and female adults (n = 468; age range: 18-63 years). The researchers did not discuss how or from where they obtained their volunteers, however, they stated that their results corresponded very closely with Claus et al.'s (1976) earlier data, which comprised a smaller sample size (i.e. 153 healthy adults, in addition to a diseased comparison group). In Shine, de Beer & Pepys' (1981) study, men had an increased level of serum CRP (i.e. above 1 mg/L) above 48 years of age, and overall, the female volunteers CRP levels remained lower and were not significant, CRP levels did not go above 0.9 mg/L. Additionally, in that study, all male and female participants between the age of 18 to 47 years had median CRP levels between 0.4 to 0.9 mg/L, which corresponds with our study's 33 participants' median CRP level of 0.5 mg/L, and CRP range 0.1 to 0.8 mg/L.

Blüher et al. (2005) investigated plasma concentrations of inflammatory markers in 142 German Caucasian individuals with and without obesity, hyperglycaemia and insulin sensitivity (mean ±SD; age 46.8 ±1.2 years). The participants were allocated to 1 of 3 subsamples according to normal glucose tolerance (NGT), impaired glucose tolerance and T2D diagnosis. The subsample of NGT participants (23 females, 22 males) had a mean BMI of 24.2 (±1.6 kg/m^2, mean age for this group was not reported). Their fasting serum level (mean ±SD) CRP was higher (1.1 ±1.0 mg/L), compared with our 33 participants' mean plasma CRP level (0.4 ±0.2 mg/L) (our sample mean age 27.1 ±5.7 years and mean BMI 28.8 ±7.5 kg/m^2). It is possible that Blüher et al.'s (2005) NGT participants had a slightly higher CRP level because their study population overall was approximately 20 years older. Moreover, it is possible the discrepancy lies between fasting and non-fasting blood samples.

However, the American Heart Association, in a discussion panel in 1998 expressed that 2 measurements of CRP [specifically, high sensitivity CRP (hsCRP)] should be taken and averaged. These measures could be taken in either a fasting or non-fasting state and would represent a better measure of the accuracy of CRP as a cardiovascular disease risk (Pearson et al. 2003). Therefore, it is unlikely that the discrepancy between our study and Blüher et al.'s (2005) study is due to the fasting or non-fasting status, but more likely due to either the age difference or the assay used.

Helal et al. (2011) reported not finding a correlation between CRP levels and BMI (although BMI values were not reported) they stated that this lack of a correlation might have been due to the small number of participants in their study population. Our study did not find an association between age and CRP levels, (r_s = 0.06, p = 0.75), although this makes sense because of the narrow age range in our study. However, we did find a moderate association between BMI and CRP levels (r_s = 0.45, p = 0.01), which was statistically significant.

A study in Paris investigated serum (fasting state) cytokine IL-6 and CRP levels in obese and non-obese women. Dalmas et al. (2011) were specifically interested in investigating if cytokine, IL-6, and hsCRP levels could be reduced in obesity with weight loss *via* gastric band surgery coupled with caloric restriction. High sensitivity CRP serum levels in both the NW and OB French groups were much higher (3.4 ±0.8 and 8.5 ±1.1 mg/L, respectively) compared to our NW and OB groups (0.4 ±0.07 and 0.6 ±0.03 mg/L, respectively) (Table 4.12). This difference may be due to either the difference in age, or assays used.

Table 4.12 hsCRP and IL-6 in a French study (adapted from Dalmas et al. 2011).
French study serum levels compared with Study 2 BMI groups plasma levels. Values reported as mean ±SE.

	French study		**Study 2 BMI categories**		
Participants	**Non-Obese** (n = 14)	**Obese** (n = 33)	**OB** (n = 8)	**OW** (n = 11)	**NW** (n = 13)
Age (year)	38.6 ±2.3	39.7 ±1.9	30.0 ±2.3	28.1 ±1.7	24.3 ±1.3
BMI (kg/m^2)	21.5 ±0.3	48.2 ±1.4	39.2 ±1.5	27.4 ±0.5	22.3 ±0.4
***CRP** (mg/L)	3.4 ±0.8	8.5 ±1.1	0.6 ±0.03	0.4 ±0.07	0.4 ±0.07
IL-6 (pg/mL)	3.0 ±0.3	3.9 ±0.5	24.6 ±10.4	17.6 ±15.1	6.0 ±3.2

*hsCRP in French study vs. CRP in Study 2.

Additionally, in contrast, the NW and OB French groups had lower serum IL-6 levels (3.0 ±0.3 and 3.9 ±0.5 pg/mL, respectively) compared with our NW and OB groups, which had much higher plasma IL-6 levels (6.0 ±3.2 and 24.6 ±10.4 pg/mL, respectively). This difference might be explained by the differences in serum vs plasma collection, where serum IL-6 concentration levels can be found to be lower than IL-6 concentration levels in plasma, due to the differences in coagulation factors in the collection tubes (de Jager et al. 2009). Additionally, depending on length

of storage of blood samples, this can also affect results of analysis. De Jager et al. (2009) found that cytokines were stable for a period of up to 2 years, but beyond that started to degrade. Upon further inspection of Dalmas et al.'s (2011) study, their recruitment occurred over a 2-year period and it was not clear from their study how long serum samples had been frozen before analysis. De Jager et al. (2009) had found that IL-6 (in addition to IL-10) degraded by as much as 50% from baseline values within 2 to 3 years of storage. Additionally, the more a cytokine is subjected to freeze-thaw cycles, this can also affect the stability of the cytokine, [although de Jager et al. (2009) found that IL-6 (and IL-10) were 2 of the more stable cytokines during freeze/thaw cycles].

Nevertheless, what the French study shows is that both hsCRP and IL-6 levels were significantly higher in individuals with obesity compared to normal weight individuals. Our study shows a similar pattern, although not statistically significant (or borderline significance in the case of CRP).

Dalmas et al. (2011) found that hsCRP levels in the OB group decreased significantly to the baseline values of the NW group after gastric band surgery. In addition, the OB group's IL-6 levels decreased significantly below their NW counterpart's baseline IL-6 values, after gastric band surgery, and 1-year post-op.

4.6.4 MCP-1 (pg/mL)

The OB group had the highest mean MCP-1 level (120.5 ±41.9) compared to the OW and NW groups who had similar levels (90.4 ±13.7 and 81.8 ±19.5, respectively). No significant differences were observed among the groups. This lack of a difference may be explained by the large min-max range in each group, OB: 40.1 to 387.7; OW: 50.2 to 202.2; NW: 18.1 to 266.9.

MCP-1, (in addition to the cytokines TNF-α and IL-6), is secreted by adipose tissue, and can influence endocrine activity of adipocytes, which in turn can influence metabolism and insulin signalling. MCP-1 is produced in response to cytokines such as TNF-α and IL-1β, which can interfere with insulin signalling (Hoogeveen et al. 2005; Mosser & Edwards 2008). MCP-1 recruits additional macrophages to adipose tissue, which propagates chronic inflammation (Mosser & Edwards 2008). MCP-1 plays an important role in mediating and infiltrating macrophages into obese adipose tissue and may play a part in establishing and maintaining the proinflammatory state that predisposes the individual to developing insulin resistance and metabolic syndrome (Inadera 2008, p.255). Additionally, inflammatory macrophages may well contribute to the deposition of calcium and lipids in the arterial lumen, thus aiding in the promotion of CVD risks

that comprise part of obesity which is associated with metabolic syndrome (Bastard et al. 2006). Furthermore, CRP increases MCP-1 expression (Hribal, Fiorentino & Sesti 2014, p. 609), therefore we investigated the relationship between CRP and MCP-1 levels but observed only a weak, non-significant association (r_s = 0.157, p = 0.390).

To understand the MCP-1 values in this study, we look to a Dallas heart study (Deo et al. 2004) which comprised approximately 3,500 patients (age range 18-65 years; mean and SD, 44 ±10). The fasting, plasma median MCP-1 concentration among the participants was 167.9 pg/mL. The lowest percentile (25^{th}) had a concentration of $\leq$123.1 pg/mL, and the highest percentile (95^{th}) had a concentration of 380.5 pg/mL. The median value for all 32 participants in this study was 70.2 pg/mL, the 25^{th} percentile was 53.1 and the 95^{th} percentile was 200.7 pg/mL with a range of 18.1-387.7 and was overall lower compared to the Dallas heart study. Deo et al. (2004) found that higher MCP-1 levels were more closely related with older age ($p < 0.0001$) and higher CRP levels ($p < 0.01$).

This study's participants were overall younger, compared to the Dallas heart study patients. Additionally, our study comprised far fewer participants which is a possible explanation for a weak and non-significant association found between MCP-1 and CRP levels (r_s = 0.16, p = 0.39).

In a subgroup of participants (n = 2151) Deo et al. (2004) did not find a significant association between MCP-1 and BMI (p = 0.35), or percent body fat (%BF as measured by DEXA) (p = 0.80). Which agrees with our results, specifically a weak, non-significant association was found between MCP-1 and BMI (r_s = 0.20, p = 0.27), and MCP-1 and %BF (measured by BOD POD) (r_s = -0.04, p = 0.83). However, Deo et al. (2004) found a significant association between MCP-1 and systolic blood pressure (p = 0.03), but our study found a moderate, nonsignificant association (r_s = 0.29, p = 0.11), but this may be explained by the smaller sample size of our study, in addition to the narrow age range. Indeed, the correlation between MCP-1 levels and age was very weak, and not significant (r_s = 0.03, p = 0.86).

Deo et al. (2004) found that increasing MCP-1 levels were associated with other cardiovascular risk factors such as diabetes, hypercholesterolemia, lower creatinine clearance, smoking and family history of premature coronary artery disease, none of which this study investigated. Deo et al. (2004) explained that the variable most closely associated with increasing MCP-1 levels, was age, and cited a Japanese study by Inadera et al. (1999) which showed that the MCP-1 level increase in both men and women was age dependent.

Although Deo et al. (2004) did not find a significant association between MCP-1 levels and BMI in individuals with no evidence of subclinical atherosclerosis, they did find a significant association between MCP-1 levels and BMI in individuals who had detectable coronary calcification (p = 0.01).

However, there are discrepancies in studies about whether circulating MCP-1 levels are increased or not in individuals with obesity. Specifically, Dahlman et al. (2005), a Swedish/British study which investigated MCP-1 gene expression, secretory patterns in subcutaneous tissue and isolated adipocytes, in addition to circulating fasting plasma levels of MCP-1. Dahlman et al. (2005) did not explain where their participants came from, only that "all subjects were examined in the morning" and that no selection was made based on menopause since there is no evidence to suggest that it is a factor influencing gene expression in adipose tissue. Their study comprised 13 healthy non-obese (BMI: 23 ±2 kg/m^2; age: 40 ±10 years) and 10 healthy obese women (BMI: 41 ±5 kg/m^2; age: 43 ±12 years) who were not taking any medications.

The OB group (in Dahlman et al. 2005) had a non-significantly lower MCP-1 level (127 ±52 pg/mL) (mean ±SD) compared to their non-OB counterparts (132 ±27 pg/mL). The OB group in our study had a similar MCP-1 level (121 ±119 pg/mL) as the OB group in Dahlman et al. Whereas, the NW group in our study had a lower level (82 ±70 pg/mL) compared to the non-OB in Dahlman et al. However, relatively speaking, these values are not too different, what is very different are the standard deviation values, which are much larger in our study. The SD differences may be due to the fact that our study comprises non-fasting blood samples.

Dahlman et al. (2005) observed that secretion of MCP-1 from adipose tissue was 6- to 10-fold higher in OB compared to the non-OB group, depending on if units expressed were per unit of tissue weight or expressed per number of fat cells, respectively (p. 5838). Additionally, the amount of MCP-1 mRNA in adipose tissue was 2-fold higher in the OB participants compared to their non-OB participants. Moreover, in a separate sample of 22 participants (OB, n = 11; non-OB, n = 11), Dahlman et al. (2005) investigated circulating levels of MCP-1, by comparing MCP-1 levels in arterialised blood and abdominal venous blood and found no difference between OB and non-OB groups. The researchers concluded that MCP-1 acts primarily as a local factor on other adipocytes, that it is secreted into the extracellular space, and no or little spillover occurs into the circulation. This may explain why in the Dallas heart study, Deo et al. (2004) found that increased levels of MCP-1 was found to be more closely associated with aging than any other factor. That is, perhaps MCP-1 accumulates over time (i.e. with age) in the circulation, although this is only speculation.

An Italian study, which specifically aimed to investigate (cytokine) and chemokine MCP-1 levels in 3 age groups of young, healthy individuals with an objective of establishing reference guidelines. Kleiner et al. (2013) explained that because the immune system responds and changes its properties with development, it is worthwhile knowing how cytokine levels and/or physiological ranges may differ among various healthy age groups. The participants were recruited from a child's hospital (Institute for Maternal and Child Health) in Trieste Italy. Any participants that had a chronic or an acute infection were not included. The age groups included: infants (n = 7, 1-6 years), adolescents (n = 30, 7-17 years) and adults (n = 35, 21-86 years, median age 36 years).

Serum, median MCP-1 levels in the Italian adults was 41.5 pg/mL, with a 25^{th}-75^{th} percentile range of 20.1 - 78.9 pg/mL. The plasma median MCP-1 level in our study was higher, 70.2 pg/mL, but our participants' 25^{th}-75^{th} percentile was similar, 53.1 - 92.0 pg/mL.

Although MCP-1 levels in our study were higher and had a slightly larger 25^{th}-75^{th} percentile, these values were not too dissimilar to the Italian study, nor were they too dissimilar from Dahlman et al.'s (2005) study, or the Dallas heart study by Deo et al. (2004). This might suggest that our study comprises a mix of healthy and perhaps not so healthy participants, or the beginning of a disease state in some participants, because some of the participants have very high cytokine values as well, which contributed to the overall mean or median cytokine values of this study.

4.6.5 IL-10 (pg/mL)

Circulating, plasma levels of IL-10 were found to be the highest in the OW group (101.3 ±93.9), followed by the OB (43.9 ±26.8), with the NW having the lowest mean level (19.3 ±6.9). No significant differences were observed among groups. This may be explained by the very large min-max range found in the OW group (0.35 to 945.73), and in particular, 1 OW participant had an IL-10 level that was extremely high (945.7). Among the OB participants, the range was narrower (0.46 to 164.97), while the NW group had the narrowest range (0.57 to 66.66). If the largest value in the OW group is omitted, the new range becomes much narrower (0.35 to 36.91) with a much lower mean ±SE (7.4 ±3.9), however, it did not result in a significant difference among the other BMI groups.

IL-10 is an anti-inflammatory cytokine which is produced in response to systemic inflammation. It is secreted by macrophages, B- and T-cells, monocytes and lymphocytes which have become activated by systemic inflammation (Jung et al. 2008; Goldwater et al. 2018). It can suppress

macrophage function and other immune responses, by negatively regulating cytokines which cause inflammation (Esposito et al. 2003; Mosser 2010). It is believed to protect against the occurrence of atherosclerotic plaque formation (Jha et al. 2010; George et al. 2012; Mirhafez et al. 2015) and has been found to be elevated in individuals with obesity (Esposito et al. 2003).

Before 2003, no studies had quantified circulating levels of IL-10 in humans. Additionally, before Esposito et al.'s study (2003), there was a belief that circulating IL-10 levels would be found to be low in the obese state, perhaps because adiponectin plays a role in inducing the synthesis of IL-10, (Tilg & Moschen 2008). Therefore, because adiponectin is generally found to be lower with increased fat mass, it was reasonable to hypothesise that IL-10 would also be lower. Consequently, Esposito et al. (2003) sought to investigate this theory and obtain values of (overnight fasting) IL-10 circulating serum levels in Italian, premenopausal women who were non-obese (n = 50) and with obesity (n = 50), (aged 22-44 years).

Esposito et al.'s (2003) women with obesity had a significantly higher IL-10 median and 25^{th}-75^{th} percentiles (2.45, 1.1 - 4.45 pg/mL, respectively) compared to their non-obese counterparts (1.2, 0.7 - 2.9 pg/mL, respectively) (p = 0.045). This study's OB group also had the highest median and 25^{th}-75^{th} percentile (11.3, 0.6 - 97.5 pg/mL, respectively), but was much higher compared to OB women in Esposito et al.'s (2003) study. It is possible that the OB group in our study had a higher IL-10 level because their mean BMI was higher compared with the OB women in the Italian study (39.0 vs. 35.5 kg/m^2, respectively). However, the OB group in our study had a lower mean (±) WHR compared to the Italian OB women (0.84 ±0.06 vs 0.89 ±0.07, respectively). Nevertheless, the Italian study comprised more OB participants compared to our study (50 vs. 6, respectively) which may be a reason for why there was a large discrepancy in IL-10 values in our study (Table 4.13).

Table 4.13 IL-10 levels in an Italian study (adapted from Esposito et al. 2003).
Italian serum samples compared with our BMI groups plasma samples. Values reported as mean ±SD, except IL-10 reported as median and 25^{th} – 75^{th} percentiles.

Study	**Italian study**		**Study 2 BMI groups**		
Participants	**Non-OB** (n = 50)	**OB** (n = 50)	**OB** (n = 6)	**OW** (n = 10)	**NW** (n = 11)
Age (year)	35.9 ±4.9	36.9 ±4.6	30.2 ±7.4	28.1 ±5.8	23.8 ±4.3
BMI (kg/m^2)	23.8 ±1.2	35.5 ±2.9	39.0 ±4.9	27.6 ±1.8	22.6 ±1.5
WHR	0.73 ±0.04	0.89 ±0.07	0.84 ±0.06	0.85 ±0.10	0.75 ±0.06
IL-10 (pg/mL)	1.2 (0.7-2.9)	2.45 (1.1-4.45)	11.3 (0.6-97.5)	2.6 (1.0-17.3)	8.55 (1.8-25.5)

WHR: waist-hip-ratio

The NW group in this study, IL-10 median and 25^{th}-75^{th} percentile was much higher (8.55, 1.8 - 25.5, respectively) compared to the Italian non-OB women's, median and 25^{th}-75^{th} percentile (1.2, 0.7 - 2.9, respectively).

Esposito et al. (2003) did not discuss if there were any extreme IL-10 values in their study. It is difficult to believe that there were no extreme values, especially considering how in our study, of 32 participants, although a very small study, there have been extreme values found in nearly all blood biomarkers, and we have not omitted any values (except for theoretical discussion) Esposito et al.'s study (2003) comprised nearly 4 times more participants than our study (100 vs 27). Moreover, they obtained overnight, fasting blood samples, which might explain the extreme values found in our study.

Esposito et al. (2003) did not discuss their OB and non-OB groups' IL-10 ranges but did report finding that low IL-10 values were associated with metabolic syndrome in both their non-obese and obese participants. Specifically, among their OB group; 52% were diagnosed with metabolic syndrome and low IL-10 levels. Esposito et al. (2003) cited Westendorp et al. (1997) when explaining that cytokine production can be strongly influenced by genetic heritability, and that approximately 75% of the differences in human IL-10 production is derived from heritable factors (i.e. 75% of the variation is genetically determined), which suggests that not all humans can upregulate IL-10 levels in response to proinflammatory cytokine production. This may also explain why our study found very broad IL-10 ranges among each BMI group.

Previously, Kleiner et al. (2013) who investigated cytokine levels in infants, adolescents and adults, also investigated IL-10 serum levels. In adult participants' (n = 35, median age, 36, and range 21-86 years), median IL-10 level was 12.6 pg/mL, while the 25^{th}-75^{th} percentile range was from 8.5 to 16.7 pg/mL. Our study's 27 participants' median IL-10 level was slightly lower, 8.0 pg/mL, while the 25^{th}-75^{th} percentile range was broader, from 1.0 to 25.5 pg/mL. Kleiner et al. (2013) were establishing baseline IL-10 values among this group but did not report collecting information on weight or height. Therefore, we cannot directly compare our participants to those of Kleiner et al.'s, but overall values only. However, the IL-10 median value among our participants is not too dissimilar from the adults in Kleiner et al.'s (2013) study.

In a study that explored cytokine levels before and after weight loss, Jung et al. (2008) investigated levels of IL-10, TNF-α and IL-6 among a group of South Korean individuals with obesity. The researchers defined obesity, for this Asian community, as a BMI $\geq$27 kg/m^2 with comorbid hypertension, dyslipidaemia or diabetes; or a BMI $\geq$30 kg/m^2. Participants, 18-65 years, comprised females (n = 41) and males (n = 37).

In all cases, the OB group in our study had much higher cytokine levels compared to the Korean OB group, specifically, IL-10 mean (±SD) levels were 43.95 (±65.69 pg/mL) vs 12.02 (±4.44 pg/mL)

respectively. IL-6 levels were 24.65 (±29.27 pg/mL) vs 2.50 (±0.81 pg/mL), respectively. TNF-α levels were 33.69 (±61.98 pg/mL) vs 2.94 (±0.90 pg/mL), respectively (Table 4.14).

Table 4.14 IL-10, IL-6 and TNF-α levels in a Korean study (adapted from Jung et al. 2008). Korean serum levels compared with this Study 2 BMI groups plasma levels. Values reported as mean ±SD.

Study	**Korean study**	**Current study BMI groups**		
Participants	**OB** (n = 78)	**OB** (n = 8)	**OW** (n = 11)	**NW** (N = 13)
Age (year)	38.5 ±11.8	30.0 ±6.4	28.1 ±5.5	24.3 ±4.8
BMI (kg/m^2)	32.2 ±3.5	39.1 ±4.2	27.4 ±1.8	22.3 ±1.5
***IL-10** (pg/mL)	12.02 ±4.44	43.95 ±65.69	101.25 ±296.93	19.29 ±22.85
IL-6 (pg/mL)	2.50 ±0.81	24.65 ±29.27	17.56 ±50.08	6.03 ±11.60
ŧTNF-α (pg/mL)	2.94 ±0.90	33.69 ±61.98	17.18 ±22.89	4.86 ±3.15

Not all participants' blood values were included because some values were out of range.
*IL-10: OB n = 6, OW n = 10, NW n = 11.
ŧTNF-α: OB n = 6, OW n = 5, NW n = 4.

It was not clear in Jung et al.'s (2008) study if all blood samples were analysed at the same time (i.e. before and after weight loss) or analysed at separate stages. Furthermore, it was not explained in the study how much time had elapsed between blood sample collection and analysis. Previously explained, blood samples that are stored for longer than 2 years can lead to cytokine degradation. Jung et al. (2008) did not report any anomalies in cytokine concentration values. It may be that they did not report anything because there was nothing to report. It is possible that the discrepancy between our study and the Korean study is due to the comparison in mean and standard deviation values, specifically for IL-10, since other studies looked at median and 25th to 75th percentiles, where our values (although differed somewhat) were not as extreme as the difference between the Korean study's mean value and SD values. Another possible explanation may be the difference between an Asian and Caucasian sample.

However, Jung et al. (2008) reported that with weight loss, the reduction in cytokine levels was significant, and IL-10 levels increased with weight loss. Jung et al. (2008) reported that the raised level of IL-10 was significantly correlated with the decrease in TNF-α (r = -0.32, p < 0.01) and IL-6 levels (r = -0.30, p < 0.01). Based on Jung et al.'s (2008) findings, we investigated if TNF-α and/or IL-6 had an association with IL-10 levels in our study and found a moderate association between TNF-α and IL-10, but was not significant (r_s = 0.31, p = 0.30). However, we found a stronger association between IL-6 and IL-10, which was significant (r_s = 0.57, p = 0.002). It is possible we did not find a significant association between TNF-α and IL-10 because for TNF-α the blood analysis results were for only 15 participants.

4.6.6 Leptin (ng/mL) and adiponectin (µg/mL)

Mean leptin levels (ng/mL), in the OB group was significantly higher (61.6 ±16.0) compared to the OW (13.4 ±6.8) (p = 0.01) and NW (5.2 ±1.2) (p = 0.001) groups. No difference was observed between the OW and NW groups. This finding agrees with the literature, which states that leptin is generally higher in individuals with higher adiposity. Moreover, we observed a strong, significant association between BMI and leptin levels (r_s = 0.64, p < 0.0001), and between percent body fat (% BF BOD POD) and leptin levels (r_s = 0.84, p < 0.0001).

Adiponectin levels (µg/mL) were higher in both the NW and OW groups, who had similar values (11.1 ±2.2 and 10.4 ±1.7, respectively) compared to the OB group who had a lower level (6.5 ±1.9). However, no significant differences were observed among groups. Adiponectin levels are generally found in the circulation to be approximately 3-30 mg/L (equivalent to 3-30 µg/mL) (Persson et al. 2015). The range in this study was from 1.9 to 34.5 µg/mL. Additionally, adiponectin levels in this study decreased with increasing BMI, which is consistent with the literature which has stated that adiponectin levels decrease with increasing levels of BMI. Indeed, we found a negative, moderate, significant association between BMI and adiponectin levels (r_s = -0.34, p = 0.05). However, between adiponectin and % BF (BOD POD) there was a very weak, negative association, but not significant (r_s = - 0.03, p = 0.89). This result may be more of a reflection of the men (in this study), who generally have lower fat mass, but lower adiponectin levels as well compared to women (Persson et al. 2015), and so may be skewing these results. Additionally, in keeping with the literature, we found a moderate, inverse association between adiponectin and leptin levels (r_s = -0.25, p = 0.18), but this was not significant.

Leptin and adiponectin are adipokines, which are generally found to have an inverse association with each other. Leptin is considered a proinflammatory cytokine (Lord 2006) and has a positive correlation with increasing adiposity (Gesta & Kahn 2017). Whereas adiponectin is an anti-inflammatory cytokine, and because it can aid in suppressing the synthesis of inflammatory cytokines, such as TNF-α, it decreases with increasing adiposity (Matsubara, Maruoka & Katayose 2002; Tilg & Moschen 2008).

In a Japanese study that explored leptin and adiponectin levels (Matsubara, Maruoka & Katayose 2002), we found our values are closely matched with this Japanese study. The Japanese study recruited over 350 non-diabetic women, aged 16 to 86 years (mean 52.6, SE, ±0.6 years), and stratified into three BMI tertiles (i.e. BMI $\leq$ 22.0 or normal weight, 22.0-25.0 or overweight, $\geq$ 25.0 kg/m^2, obese). According to 'Japan's Obesity Society criteria', a BMI value above 25 is considered

moving towards upper values of obese (Matsubara, Maruoka & Katayose 2002). The BMI range was from 14.8 to 36.3 kg/m^2 (mean 22.9, SE ±0.2 kg/m^2). The Japanese study's plasma adiponectin concentration mean value was 8.4 µg/mL and ranged from 0.9 to 26.1 µg/mL. Our study's 32 participants had a mean plasma concentration of 9.7 µg/mL and range from 1.9 to 34.5 µg/mL. Furthermore, serum leptin concentrations in the Japanese study, mean value was 8.1 ng/mL, and ranged from 1.2 to 44.5 ng/mL. Our study had a higher mean plasma leptin concentration of 20.8 ng/mL with a larger range, 0.2 to 111.6 ng/mL (Table 4.15).

Table 4.15 Adiponectin and leptin levels in a Japanese study.
(Adapted from Matsubara, Maruoka & Katayose 2002). Serum levels in BMI tertiles compared with this study's BMI groups' plasma levels. Values reported as mean ±SE.

Study	**Japanese study**			**Current study**		
BMI values **Participants**	**Tertile 1: NW** ≤ 22.0 kg/m^2 (n=158)	**Tertile 2: OW** 22-25.0 kg/m^2 (n=102)	**Tertile 3: OB** ≥25kg/m^2 (n=93)	***OB** (n=8)	**OW** (n=11)	**NW** (n=13)
Age (years)	49.0 ±0.9	54.8 ±1.0	55.9 ±	30.0 ±2.3	28.1 ±1.7	24.3 ±1.3
BMI (kg/m^2)	19.9 ±0.1	23.5 ±0.1	27.8 ±0.2	39.2 ±1.5	27.4 ±0.5	22.3 ±0.4
Adiponectin (µg/mL)	9.2 ±0.3	8.6 ±0.4	6.7 ±0.3	6.5 ±1.9	10.4 ±1.7	11.1 ±2.2
Leptin (ng/mL)	5.2 ±0.2	8.1 ±0.2	13.2 ±0.4	61.6 ±16.0	13.4 ±6.8	5.2 ±1.2

***Current study, Leptin missing value (outside of range), OB category, n = 7.

The Japanese tertile 1, NW group had a similar adiponectin level compared to the NW group in this study (mean ±SE) (9.2 ±0.3 vs 11.1 ±2.2 µg/mL, respectively). The Japanese tertile 2, OW group also had a similar adiponectin level compared with this study's OW group (8.6 ±0.4 vs 10.4 ±1.7 µg/mL, respectively). The 3rd Japanese tertile, OB group had an adiponectin level which was very similar to the OB group in our study (6.7 ±0.3 vs 6.5 ±1.9 µg/mL, respectively). Matsubara, Maruoka & Katayose (2002) reported that adiponectin levels between each tertile was significantly different. Both studies show decreasing levels of adiponectin with increasing BMI values. Which agrees with the literature that adiponectin is negatively related with BMI values. Matsubara, Maruoka & Katayose (2002) reported finding a negative, significant correlation between BMI and adiponectin levels (r = -0.26, p < 0.0001). [Which agrees with the results from our study. Previously, we found a negative, borderline significant association between BMI and adiponectin levels (r_s = -0.34, p = 0.05)].

In relation to leptin, the Japanese tertile 1, NW group had an identical leptin level (mean ±SE) as the NW group in our study (5.2 ±0.2 vs 5.2 ±1.2 ng/mL, respectively). The Japanese tertile 2, OW group had a similar leptin level compared with the OW group in our study (8.1 ±0.2 vs 13.4 ±6.8 ng/mL, respectively). The Japanese tertile 3, OB group had a much lower leptin level compared with the OB group in our study (13.2 ±0.4 vs 61.6 ±16.0 ng/mL, respectively) where there was a

very large difference between leptin values. However, in the Japanese study, the high end of the leptin range was 44.5 ng/mL, suggesting that the Japanese study comprised some individuals whose leptin values were much larger compared to their leptin mean value. Additionally, in our study there were two OB participants who had very high leptin concentrations (110.6 and 111.6 ng/mL, perhaps because their BMI values were above 43 kg/m^2) which contributed towards a much larger mean and SE among our OB group. If these two values are theoretically omitted, the new mean value for the OB group becomes 41.8 ng/mL, although the SE is still large (±14.1 ng/mL) it is closer to the high-end range of the Japanese study. Another possible reason for such large leptin values in our study among the OB group, may be due to the much larger BMI values compared to the Japanese study. Specifically, the OB group's mean BMI value was 39.2 kg/m^2, which is very close to morbid obesity. Whereas, the Japanese tertile 3, OB group's mean BMI value, 27.8 kg/m^2, which is considered obese, but not morbidly obese. Although Matsubara, Maruoka & Katayose's (2002) study did comprise some participants who had much higher BMI values since the high end was 36.3 kg/m^2, hence, a possible explanation for the higher end leptin range found in their study. Matsubara, Maruoka & Katayose (2002) reported finding a significant difference in leptin levels among their BMI tertiles. They did not comment on whether or not they found a significant association between leptin and BMI values. However, they reported that they found leptin and adiponectin values to be negatively correlated (r = -0.35, p < 0.0001), which agrees with the results from our study, a negative correlation between leptin and adiponectin levels, although it was not significant (r_s = -0.25, p = 0.18) was found.

A Danish study by Christiansen, Richelsen & Bruun (2005) explored leptin levels in 23 participants with morbid obesity (51.1 ±6.4 kg/m^2). The OB Danish sample had a baseline plasma leptin level which was lower (mean ±SE) (40.8 ±3.3 ng/L) compared with our study's OB participant's plasma leptin level, which was much higher (61.6 ±16.0 ng/L). Although if the previously mentioned two highest values are omitted, the new mean leptin level for our OB group becomes (41.8 ±14.1 ng/mL), which is more similar to the Danish study.

Previously, the French study by Bastard et al. (2000) in addition to investigating IL-6, TNF-α and CRP levels between their NW and OB groups, also investigated fasting serum leptin levels. The NW group in Bastard et al. (2000) had a somewhat higher mean (±SE) serum leptin level compared to the NW group in our study (9.5 ±1.7 vs 5.2 ±1.2 ng/mL, respectively). However, the leptin level in their OB group, compared with our OB group, was more similar (54.9 ±4.5 vs 61.6 ±16.0 ng/mL, respectively). In addition, the OB BMI values (in both studies) were nearly the same (39.5 ±1.1 and 39.1 ±1.5 kg/m^2, respectively) (Table 4.16). This agrees with the literature that leptin levels

increase with increasing BMI levels, and indeed Bastard et al. (2000) reported finding a very strong, significant association between BMI and leptin levels ($r = 0.841$, $p < 0.0001$), which agrees with our findings.

Table 4.16 Leptin levels in a French study (adapted from Bastard et al. 2000).
Serum samples among NW and OB French, compared with this study's BMI groups', plasma samples. Values reported as mean ±SE.

Study Participants	**French study**		**Current study**		
	NW (n=8)	**OB** (n=14)	**OB** (n=7)	**OW** (n=11)	**NW** (n=13)
Age (yr)	42 ±5	45 ±4	30 ±2	28 ±2	24 ±1
BMI (kg/m^2)	20.6 ±0.6	39.5 ±1.1	39.1 ±1.5	27.4 ±0.5	22.3 ±0.4
WHR	0.77 ±0.01	0.96 ±0.02	0.83 ±0.02	0.84 ±0.03	0.75 ±0.02
Leptin (ng/mL)	9.5 ±1.7	54.9 ±4.5	61.6 ±16.0	13.4 ±6.8	5.2 ±1.2

WHR: waist-hip-ratio.

Furthermore, Bastard et al. (2000) reported finding a strong significant association between leptin and CRP levels ($r = 0.636$, $p < 0.001$). We observed a similar finding, where CRP and leptin were strongly and significantly correlated ($r_s = 0.560$, $p = 0.001$). This agrees with other studies, which have shown that in obesity and other inflammatory conditions, these two markers have been found to be moderate to strongly, significantly correlated (Hribal, Fiorentino & Sesti 2014). Although the mechanism is complex, it is believed that leptin induces hepatic production of CRP (Hribal, Fiorentino & Sesti 2014, p. 611). Moreover, a study showed that in primary human hepatocytes there was a dose dependent increase in CRP synthesis with increasing leptin concentrations (0 to 400 ng/mL), but at physiological concentrations of 5 to 10 ng/mL, CRP synthesis was not induced (Singh et al. 2007). This may explain the lower leptin and CRP concentration levels in the NW and OW groups in this study. Specifically, because these two BMI groups had lower levels of leptin and CRP compared to the OB group.

Lastly, a French study by Dalmas et al. (2011) who previously investigated CRP and IL-6 levels in healthy non-OB and OB groups (and a diabetic OB group before and after gastric band surgery), also explored baseline leptin and adiponectin concentrations in these groups (Table 4.17).

Table 4.17 Leptin and adiponectin in a French study (adapted from Dalmas et al. 2011).
Serum levels among French non-OB and OB groups compared with this study's BMI groups' plasma samples. Values reported as mean ±SE.

Participants	Non-OB (n=14)	Obese (n=33)	Current study *OB (n=8)	OW (n=11)	NW (n=13)
Age (year)	38.6 ±2.3	39.7 ±1.9	30.0 ±2.3	28.1 ±1.7	24.3 ±1.3
BMI (kg/m^2)	21.5 ±0.3	48.2 ±1.4	39.2 ±1.5	27.4 ±0.5	22.3 ±0.4
Leptin (ng/mL)	8.1 ±0.9	70.6 ±4.4	61.6 ±16.0	13.4 ±6.8	5.2 ±1.2
Adiponectin (µg/mL)	14.8 ±2.6	6.6 ±0.8	6.5 ±1.9	10.4 ±1.7	11.1 ±2.2

*****Current study, Leptin missing value (outside of range)**,** OB category, n = 7.

The French non-OB group had a slightly higher leptin level compared with our NW group (8.1 ±0.9 vs 5.2 ±1.2 ng/mL, respectively). Whereas, French OB group had similar leptin levels to our OB group (70.6 ±4.4 vs 61.6 ±16.0 ng/mL, respectively). Additionally, the French non-OB group had a similar adiponectin level compared with our NW group (14.8 ±2.6 vs 11.1 ±2.2 µg/mL, respectively). The adiponectin levels between the French OB group and our OB group were nearly identical (6.6 ±0.8 and 6.5 ±1.9 µg/mL, respectively). Altogether, the results are quite similar, and both studies agree with the literature that leptin is higher in adiposity and adiponectin is lower in adiposity.

Summary of blood biomarkers

In summary, the plasma blood samples among the participants in our study were highly variable, with very large minimum-maximum ranges found for each of the cytokine values in each of the BMI groups, except for CRP. Few studies, for which we made comparisons, discussed the variability in their samples. Additionally, only a few discussed their results in terms of median values with 25th-75th or 95th percentiles, and only two studies published their blood value range but did not discuss them (i.e. Deo et al. 2004; Hammad et al. 2015). Only Dalmas et al. (2011) remarked on the high variability they found in their participants' cytokine and chemokine levels. All studies used for comparison expressed their results in terms of mean ±SE, or ±SD values, hence the reason we chose to discuss our values in terms of mean ±SE. Additionally, it is plausible that, if we omitted extreme or very high values from our BMI categories, results would have, more than likely, resembled results obtained in other studies. The frustration in attempting to compare our results with other studies is that it is rare to identify studies, which have discussed their findings in terms of unusually high values or anomalies.

Nevertheless, what our study has found is that the proinflammatory markers (IL-6, TNF-α, IL-1β, MCP-1, CRP and leptin) all increased with increasing BMI values, and in some cases, it was statistically significant (i.e. CRP and leptin). The increase in proinflammatory markers among our

younger age group may suggest the beginnings of the low-grade, chronic inflammatory state seen in obesity, which has been discussed previously (Florido, Tchkonia & Kirkland 2011). Moreover, this agrees with other studies (Cevenini et al. 2010; Florido, Tchkonia & Kirkland 2011) who have found that proinflammatory markers are found at increased levels in obesity compared to normal weight individuals. Additionally, adiponectin decreased with an increasing BMI value. Only, IL-10, the anti-inflammatory cytokine, was found to be higher in the OW than the OB group, but only because one participant contributed to this overall high value. When this value was theoretically omitted, the OW group resulted in having the lowest IL-10 level. There is discrepancy in the literature as to whether or not IL-10 is expected to be higher or lower in individuals with obesity compared to their normal weight counterparts. Specifically, both Fain et al. (2004) and Esposito et al. (2003) state that IL-10 is elevated in obesity; and yet because adiponectin induces IL-10 (Tilg & Moschen 2008) the theorisation that IL-10 is, or was believed to be lower with adiposity, makes theoretical sense. However, as previously mentioned, discrepancy in findings may be due to genetic heritability (Westendorp et al. 1997).

4.6.7 Blood biomarkers and IDA profiles

The objective of investigating blood biomarkers among the IDA groups is to explore if biomarkers for inflammation are higher in the instrumental group compared to the aesthetic and disciplined groups. We can hypothesise that because inflammatory biomarkers were higher among obese participants, these same markers will be higher in the instrumental participants. As with the questionnaire results, significant differences were observed mainly between the instrumental and disciplined groups, because of sample size. All values are reported as mean ±SE (Table 4.18).

Starting with the inflammatory marker, IL-6 (pg/mL), the instrumental group had a higher level (21.3 ±11.1) compared to the disciplined (9.1 ±4.7) and the aesthetic (3.4 ±2.7) groups. However, no differences were observed in these values.

Table 4.18 Study 2 IDA profile blood plasma biomarkers for inflammation.
Values reported as mean ±SE, and minimum-maximum range values.

Plasma sample	**IL-6** (pg/mL) Dilution 1	**TNF-α** (pg/mL) Dilution 1	**IL-1β** (pg/mL) Dilution 1	**IL-10** (pg/mL) Dilution 1	**MCP-1** (pg/mL) Dilution 4	***CRP** (mg/L) 400 Dilution	**ŧLeptin** (ng/mL) Dilution 4	**Adiponectin** (µg/mL) 400 Dilution
Instrumental	n = 16	n = 9	n = 12	n = 13	n = 16	n = 16	n = 15	n = 16
Mean ±SE	21.3 ±11.1	29.3 ±17.1	3.6 ±2.1	99.4 ±71.7	107.7 ±24.1	0.6 ±0.04	37.9 ±10.4	8.9 ±1.5
Range	0.7-168.5	1.5-158.4	0.1-20.7	0.5 - 945.7	38.8-387.7	0.1-0.8	2.7-111.6	1.9 - 21.6
Disciplined	n = 13	n = 5	n = 7	n = 11	n = 13	n = 14	n = 13	n = 13
Mean ±SE	9.1 ±4.7	7.7 ±5.5	0.3 ±0.1	10.7 ±3.5	83.3 ±15.8	0.3 ±0.05	3.7 ±1.2	10.8 ±2.3
Range	0.2-50.6	0.4-29.2	0.1-0.6	0.4 - 36.9	18.1-202.2	0.1-0.8	0.2-16.8	2.4 -34.5
Aesthetic	n = 3	n = 1	n = 2	n = 3	n = 3	n = 3	n = 3	n = 3
Mean ±SE	3.4 ±2.7	5.1(.)	0.1±0.02	26.1 ±20.5	72.0 ±14.7	0.5 ±0.16	10.0 ±1.9	8.8 ±3.3
Range	0.7-8.8	(.)	0.1-0.1	0.9 - 66.7	53.0-101.1	0.2-0.7	7.7-13.9	3.5 - 14.8

***CRP**, significant difference between Disc and Inst (U = 33.00, Z = -3.28, p = 0.001). **ŧ**Leptin, significant difference between Disc and Inst (U = 24.00, Z = -3.39, p = 0.001); and between Disc and Aest (U = 4.00, Z = -2.09, p = 0.037). BMI mean (±SD) values for IDA profiles: Inst, 32.8 (±8.3 kg/m^2); Disc, 24.2 (±3.1 kg/m^2); Aest, 26.0 (±3.4 kg/m^2).

There was a similar trend found with TNF-α (pg/mL), where the concentration was more than tripled in the instrumental group compared to the disciplined group (29.3 ±17.1 and 7.7 ±5.5, respectively). No significant differences were observed among groups. There was only one participant in the aesthetic group where this individual was characterised as having a low TNF-α level (5.1), comparatively speaking.

IL-1β (pg/mL) was also more than tripled in the instrumental group compared to the disciplined group (3.6 ±2.1 and 0.3 ±0.1, respectively). However, there was no significant difference found between these two levels. The aesthetic group comprised only 2 participants where their IL-1β level was characterised as having the lowest value (0.1 ±0.02).

IL-10 (pg/mL) was higher in the instrumental group (99.4 ±71.7) compared to the disciplined group (10.7 ±3.5). No significant difference was observed. The aesthetic group were characterised by having a higher IL-10 level (26.1 ±20.5) than the disciplined group, but not nearly as high as the instrumental group.

MCP-1 (pg/mL) followed a similar pattern where it was also higher in the instrumental group (107.7 ±24.1) compared to the disciplined group (83.3 ±15.8), but the aesthetic group had the lowest level (72.0 ±14.7). No significant differences were observed among groups.

CRP (mg/L) was significantly higher in the instrumental group (0.6 ±0.04) compared to the disciplined group (0.3 ±0.05) (p = 0.001). The aesthetic group had a higher CRP concentration (0.5 ±0.16) compared to the disciplined, but not quite as high as the instrumental group. Although, previously, even though there was a significant difference found, no participants had CRP levels above 1 mg/L, which is considered low risk for a cardiac event.

Leptin (ng/mL) was significantly higher in the instrumental group (37.9 ±10.4) compared to the disciplined group (3.7 ±1.2) (p = 0.001). The aesthetic group also had a significantly higher leptin level (10.0 ±1.9) compared to the disciplined group (p = 0.04). Although, there was no significant difference in leptin levels between the instrumental and aesthetic groups. This may be explained by the minimum-maximum range, between these two groups. Specifically, the aesthetic group had a leptin range (although much lower, 7.7-13.9) it was within the range of the instrumental's minimum-maximum range (2.7-111.6). Additionally, there were 15 participants in the instrumental group compared to 3 in the aesthetic group, which is most likely the explanation for there being no difference. Although this does not explain why there was a significant difference between the disciplined (n = 13) and aesthetic groups. Specifically, the disciplined groups' leptin range was 0.2-16.8. However, had there been more participants in the aesthetic group, this significant difference might have become non-significant.

Adiponectin (µg/mL) was lower in the instrumental group compared to the disciplined group (8.9 ±1.5 vs 10.8 ±2.3, respectively). The aesthetic group had a similar adiponectin level (8.8 ±3.3) as the instrumental group, but with a larger SE. No significant differences were observed among groups.

Overall, the instrumental group had higher levels of proinflammatory cytokines compared to both the disciplined and aesthetic groups.

There has been research, which has suggested that stress can induce or increase certain pro-inflammatory cytokines. In particular, a study in Italy by La Fratta et al. (2018) found that impending stress had a direct effect on IL-6 and IL-1β levels. These two inflammatory biomarkers which were collected in the non-fasting state (but with no food or drink 1 hour prior to collection) increased when healthy male university students [aged 22-26 years, with an average BMI = 22.16 (±SD of 1.47 kg/m^2)] were waiting to sit an exam. La Fratta et al. (2018) were investigating saliva and plasma samples of these biomarkers (in addition to CRP and IL-18). The researchers were exploring the differences (if any) in measuring salivary and plasma levels (mean ±SD) before and after a mentally stressful event. La Fratta et al. (2018) found that plasma IL-6 levels continued to significantly increase (from baseline in both salivary and plasma) 30 minutes prior and 30 minutes post exam. Specifically, 30 minutes prior to stress event IL-6 was 0.9 ±0.5 pg/mL, whereas post stress event it was significantly higher (2.6 ±1.4 pg/mL). Plasma IL-1β was significantly higher (from baseline) 30 minutes before the stress event (4.3 ±2.7 pg/mL), and although it was significantly lower 30 minutes after the stress event (0.9 ±0.5 pg/mL), it was still significantly

higher from baseline, (baseline levels were shown in a chart but not reported). For completion sake, CRP was unaffected.

The interesting point of this Italian study is that, among the IDA profiles in our study, the instrumental group expressed feeling stress 'a lot of the time' or 'all of the time'. This group also experienced more emotional eating when experiencing negative emotions (which could be perceived as stressful events). Additionally, they experienced a lower salutogenesis, whereas the aesthetic and to some degree the disciplined group, expressed feeling stress some of the time. These two groups (aesthetic and disciplined) appeared to view stress as 'just a part of life' and felt that they could deal with it either through exercise or meditating or just trying to see things in perspective, however, overall, they experienced a higher salutogenesis.

Chronic stress however, elicits different inflammatory responses as opposed to acute stress (Slavish et al 2015). A review of the damaging effects of stress by McEwen (1998b) discusses that chronic or frequent stress has been linked to the development of insulin resistance. Moreover, it can result in surges in blood pressure, which over time can trigger a myocardial infarction in susceptible individuals (p. 172). In nonhuman primates, psychosocial stress increases the deposition of abdominal fat, which is a risk factor for CHD and diabetes; this response may also occur in humans (McEwen 1998b). Stress hormones can serve to regulate immune functions and have the capacity to increase the production of some cytokines, whilst decreasing the expression of other cytokines (McEwen 1998b, p. 177).

Chapter 5 Discussion

Using critical realism as a methodological approach in this study, has allowed us to explore several causal mechanisms and uncover some of the demi-regularities that interact, or counteract each other in the different IDA groups. Critical realism's modes of inference, abduction and retroduction permitted us to make inferences where other research has not been successful, primarily because of its siloed approach, based in epistemology, thus committing epistemic fallacy. Specifically, this research has taken an ontological, complexity approach to investigating obesity. The ontological approach asked what the world or reality must be like for obesity to occur or exist, and the complexity approach allowed for the exploration of several mechanisms simultaneously, to pool the information together, to help in understanding what the world/reality must be like for obesity to occur/exist. This is the first study, to the best of our knowledge, to specifically explore obesity using critical realism.

The first part of the study was used to 'pilot' the tools from the qualitative and quantitative methods (i.e. semi-structured interviews, validated questionnaires and anthropometric measures) utilising the methodological framework of critical realism, in a variety of individuals, with a wide age range and different BMI categories, that could be used to explore and better understand obesity, in order to help reduce its prevalence. The second study was to validate these tools and methodological approach, in addition to establish if findings from the first study were supported, or could be reproduced in an age group that could be potentially targeted for intervention. Moreover, additional methods (body scans, percent bodyfat, and blood samples) were collected and used to help quantify how these different measures would map on to the IDA groups and BMI categories.

5.1 Primary finding

The results of study 2 supported the findings from the first study, where similar attitudes and behaviours/dispositions towards food, self and orientation to life were replicated among younger individuals. In particular, among the IDA profiles: the aesthetic group and to some degree the disciplined group: their more positive embodied disposition towards food resulted in a better relationship with food, because food was seen as an important part of their day and was given a priority. Whereas, the instrumental profile had a more negative embodied disposition and dissonant relationship with food, because on one hand food was not an important aspect of their

life and as a result, food was given less of a priority in their life, and yet this group was more likely to turn to food for some level of comfort in times of stress or when experiencing negative emotions. The aesthetic and disciplined profiles appeared to have a better relationship with food, or at least they appeared to have more of a balanced relationship with food. Moreover, the aesthetic and disciplined profiles appeared to have a better relationship with their body shape and image, or were at least content with their physical appearance, therefore it is possible, because of their subjective body image, they may experience a better quality of life. In contrast, the participants who were allocated to the instrumental profile held a dim view or indifference about their body shape/image, which may result in having lower wellbeing and quality of life. These explanations were supported, by the results of the 7 questionnaires which explored body image, quality of life related to body image, orientation towards life, psychological eating profile, possible tendency for food addiction or food dependence, food choice, and overall quality of life in terms of physical and mental wellbeing.

Critical realism's mode of analysis, abduction, permitted the ability for us to find the demi-regularities among the participants with an instrumental profile; and these demi-regularities acted together to promote obesity among these individuals. Namely, the dissonant relationship with food, where these participants were more likely to eat under a variety of circumstances and yet viewed food as unimportant. Whereas, among the aesthetic participants, some demi-regularities were cancelled out by other demi-regularities. As an example, although these participants (aesthetic eaters) professed to 'probably' eating too much, this demi-regularity was counteracted by the demi-regularity of losing their appetite under stress or when experiencing negative emotions, or delaying eating, as the anticipation of waiting to eat something nice later; in addition to their motto of 'all things in moderation', therefore, not restricting anything, except for possibly sugar (study 1) and to some degree fat (study 2), where overall, these participants had a degree of awareness of how much they were consuming (because of their belief in all things in moderation), as this was important for them when checking food labelling. For the participants allocated to the disciplined profile, some participants were more similar to the instrumental group, and others were more similar to the aesthetic group. The overarching demi-regularity in the disciplined group, that counteracted the demi-regularities for emotional or stress eating, was their 'awareness' of how much they were eating, awareness of food labelling and paying attention to either the number of calories, and amount of sugar or fat intake, which they would limit. These demi-regularities have been identified through some of the causal mechanisms and mainly through the behavioural/psychological mechanism in the real domain, and to some extent, the socio-cultural (through interviews) and biological (through blood biomarkers analysis)

mechanisms. The phenotype was explored or used mainly to identify how individual's body size and shape would relate to body image salience, relationship to food and orientation to life.

There were fewer aesthetic eaters found in the second study compared to the first study, this may be due to the differences in the age groups between the two studies. Having an aesthetic disposition, especially to food, may be more related to age where older individuals are more settled and may have more time to explore their interests. It is also possible that fewer aesthetic eaters were found because of the region in the UK. In other words, if we were to explore individuals' attitudes/dispositions and/or behaviours in a different region, for example in a larger metropolitan city, we may find more aesthetic eaters. Moreover, another possible reason for finding fewer aesthetic eaters may be due to income level: this second study comprised fewer participants who reported an income level between £17,000 to £30,000 compared to the first study (25.7% vs 40.7%, respectively). The majority of participants in the second study (65.7%) had an income between £0 to £16,000, which might have had a bearing on participants' attitude/disposition to food, and other aspects explored in this study.

What this study did not uncover was the transfactual condition of how these different embodied dispositions may have been formed and how they might have emerged. [Specifically, a transfactual condition asks the question of what must the world (society and/or culture) be like for obesity to be possible?] As the primary objective of this study was to carry out an exploratory investigation from individuals' perspectives, to gain a better understanding of what some of the preconditions and linkages are for obesity to emerge. This has been achieved by exploring the differences or similarities in individuals' view points and attitudes/behaviours and dispositions using a novel approach which has, to the best of our knowledge, not been used before, for the study of obesity. Specifically, using a methodology that adopts an approach and attends to complexity, critical realism has provided a broader understanding of what the world must be like (from a psychological/behavioural point of view) for the individual, and for obesity to emerge.

5.2 Consequences/benefits of these demi-regularities

The instrumental group had the highest level of proinflammatory cytokines; however, it was not possible to determine if these cytokine levels were higher because of stress or increased body adiposity or some underlying, hidden disease. By comparing findings from SSi and questionnaires it is evident that this group was experiencing stress most of the time, had the lowest scores in salutogenesis, and physical and mental wellbeing, and had the highest scores for emotional eating

and were more dependent on highly processed foods. In essence, it would appear that not only the instrumental group has a higher bodyfat percent, which may be negatively affecting these proinflammatory markers, but also stress may be affecting cytokine levels and may be contributing to the chronic, low-grade inflammatory state seen in individuals with obesity; thus, placing these individuals at a disadvantage and increase risk of developing obesity associated diseases later in life.

It would appear that the aesthetic group, although somewhat overweight, are not predisposed to the same disadvantage of being more susceptible to non-communicable co-morbid diseases as the instrumental group. Primarily because their proinflammatory markers were more similar to the disciplined group. Moreover, it may be possible that having a more positive, embodied salience is protective from proinflammation: primarily because the aesthetic group were less likely to be emotional and/or stress eaters, and were less food dependent. They were more interested in eating a broad variety of foods, they paid more attention to food labelling, in addition to eating more vegetables and fruits daily. This suggests that the aesthetic eaters are getting more of the vitamins, minerals and anti-oxidants required for healthy functioning. Whereas, the instrumental group ate a lot of the same foods, were more dependent on convenience foods (which are higher in salt, sugar and fat), were not interested in food labelling, and were less likely to eat vegetables and fruits on a daily basis, thus possibly limiting the vitamins, minerals and antioxidants needed by the body for reducing levels of inflammatory biomarkers.

The disciplined group comprised participants where some were more similar to the instrumental group, and others were more similar to the aesthetic group. Overall, however, the disciplined group were aware of how much they were eating, they paid attention to food labelling: tried to limit their amount of sugar and fat intake, and ate vegetables and fruits on a daily basis.

5.3 International study exploring how attitude contributes to health

Rozin et al. (1999, p. 164) state that medical literature has postulated that composition of food, especially in relation to fat and salt content, may have more bearing on how long a person lives than does an individual's attitude towards food. Rozin et al. (1999) set out to reveal a link between diet and health and how attitude towards food contributes to overall health. Because

food can function either as a stressor or viewed as a pleasure, these different embodied dispositions towards food may have an influence on health and wellbeing. More specifically, Rozin et al. (1999) explored differences in attitudes among a student and adult population in 4 different countries (i.e. USA, Japan, France and Belgium) using a 25-item questionnaire. Interestingly, Americans, associated food most with health and least with pleasure, but felt they ate the least healthy, and were the most worried and stressed about their diet, and had the largest BMI. In contrast, the French were the least health orientated and viewed food as pleasure, but had a significantly lower BMI. The French viewed healthy eating more in terms of variety, freshness and balance (much like the aesthetic group in our two studies). Whereas, the Americans viewed it as restricting certain foods. Rozin et al. reported finding only a small effect in these attitudinal dispositions between the student and adult populations. The work of Rozin et al. (1999) suggests that exploring attitude and behaviour is as important to understand, (in relation to health and wellbeing), as is understanding the effects different foods (i.e. nutrients) have on health and wellbeing. What Rozin et al. (1999) were not able to link was diet/health attitudes to health outcome measures, which is what we have done, in terms of overall blood biomarkers and overall physical and mental wellbeing, also in relation to bodyfat percent, and not merely BMI. To the best of our knowledge, we are the first study to have investigated a relation between food, body and life disposition, relating it back to level of inflammation status.

5.3.1 Food attitudes

The previous study by Cornil & Chandon (2016) identified epicurean and visceral eaters, similar to our aesthetic and instrumental eaters respectively, but they did not identify a third group, corresponding to the disciplined eaters, as identified in this study, who in many respects are the most interesting category of eating attitude behaviour. This study has gone even further however, and suggests that it is possible that obesity emerges due to an overall negative embodied disposition in all aspects which we have discussed, and it is possible that instrumental eaters, and to some extent, disciplined (or normal weight) eaters who have an underlying negative embodied disposition, are more prone towards being obese.

A point which needs to be clarified is that not all normal weight individuals were classified as disciplined eaters, indeed a number of normal weight individuals had an instrumental approach towards food. Additionally, not all obese individuals were instrumental eaters; overall, the

majority were, and only 2 obese participants were classified as disciplined eaters. In addition, not all overweight individuals were designated as aesthetic eaters.

5.4 Secondary finding

In function of BMI, the OW participants were actually more similar to the NW participants, than they were the OB participants; and indeed, the OW participants had either better scores or similar scores (compared to the NW) on nearly all scales. Yet, the WHO, public health websites and many studies refer to OW individuals in an almost comparable fashion with OB individuals. Moreover, in many instances the OW individuals are referred to as 'pre-obese'. This begs the question: is this form of nomenclature stigmatising? Specifically, could it be more detrimental than beneficial? To refer to OW individuals as pre-obese appears to be a method of persuasion to frighten individuals. If public health officials and the WHO believe this type of persuasion will prevent climbing rates of obesity, then why not go one step further and label NW individuals as pre-pre-obese?

Being overweight does not necessarily imply that these individuals will become obese any more than it implies that normal weight individuals will become obese. It appears that an individual's overall embodied salience and disposition to self, food and life, plays a larger role towards being obese. Specifically, this study has found that dispositions towards food, life and self-perception is linked to food choice and in turn is linked to body-weight status and blood biomarkers for inflammation. However, this study is not able to predict if an overweight individual, or an individual with an aesthetic disposition, will not become obese in a year's time. Specifically, because life events can happen, and can in turn affect an individual's overall embodied salience.

This study is a pioneering piece of research, which shows that there is a different way to look at, and think about obesity. Moreover, this study casts doubt on the idea that being overweight is a stepping stone to becoming obese, specifically because an individual's disposition to important facets to life, appears to have more of an effect towards being obese. However, this study does have some limitations.

5.5 Limitations

1) Acquiescence bias (Schriesheim & Hill 1981; Furnham 1986), that is, during the interviews, participants could have been giving answers they felt the interviewer wanted to hear or was

seeking. However, because the researcher could not foresee how the interviews would unfold or what she would find, there was no way the interviewer could indicate (through a physical gesture, facial expression or otherwise) a suggestion for how the volunteer should answer a question.

2) The volunteers could have answered the questionnaires in a favourable light where their answers might better reflect on them, however, if this were the case, we would not have found the questionnaires and interviews to support each other. Instead, there would be contradictions between the two. Furthermore, the phenotype and blood analysis would not support the findings (i.e. the ability to map phenotype, disposition and biomarkers to each other).

3) The possibility for the primary researcher to be biased towards the interview analysis. Specifically, the researcher may have held a bias towards one of the IDA profiles. However, the primary researcher could identify with all 3 profiles, which is perhaps why they developed in the way that they did.

4) The lack of aesthetic eaters. Although the findings are highly promising, more research needs to be done to clarify and/or support the findings of, especially the blood biomarkers, and also the aesthetic profile overall, since there were only 8 in total for both studies, and only 3 from the second study. Conclusions cannot be made about biomarkers of inflammation from just 3 participants, or in some cases only 1 participant. However, this work has shown that there is a positive trend among the aesthetic profile, and has the potential to change public health policy.

5) The second study: participants were given a £15 gift voucher, although they had not been made aware that it was a voucher to be used at ASDA. However, this inducement could have resulted in a different category of people willing to volunteer, specifically students who are generally known to struggle financially while at university. Especially given the fact that the second study comprised more participants who had a lower income compared to the first study.

6) This IDA analysis, and critical realist methodology, needs to be tested in different regions of the UK, (including all age groups), and in different socio-economic levels. Ecob (1996, p. 70-71) found in a multilevel analysis between 3 age groups (15, 35 and 55 years of age) in Western Scotland, that postcode sector and waist-hip ratio were associated. Among those in the age group of 55 years, waist-hip ratio increased with increasing deprivation. In addition, this group self-reported as having poorer health. However, in the 15-year age group there was a reduction in waist-hip ratio and no variation was found among those in the group of 35 years of age. Moreover, another study in Glasgow found that in the most deprived neighbourhoods, obesity was twice as high compared to a more affluent neighbourhood (Ellaway, Anderson & Macintyre 1997). However,

Cornil & Chandon (2015) found that 'aesthetic eaters' were not dependent on age, income or education level. Therefore, it would be advantageous to carry out this type of research in order to understand if attitudes and dispositions among these individuals differ from those with a more affluent status.

7) Understanding how women and men differ in attitudinal disposition towards food, themselves and life. Rozin et al. (1999) found that in each of the four countries (USA, Japan, Belgium and France) women consistently held a dimmer view towards food and their overall health compared to their male counterparts. However, Cornil & Chandon (2016) found that women were more likely to be aesthetic eaters. Due to the smaller sample size of our study, and unequal distribution of women and men, we were unable to analyse the sex differences according to the IDA profiles or their BMI categories.

This work was by its very nature an exploratory programme of work, as a result, it was not possible to utilise an approach such as quota sampling, which could have ensured age and gender matching between BMI categories. Understanding female-male differences would be an important step for future research.

5.6 Directions for future work

The nature of this research was to understand how different individuals of different body shapes and/or sizes, interpreted their world. We were specifically investigating attitudes, behaviours and or dispositions among different individuals. As such, this study did not set out to do quota sampling (in terms of obtaining equal numbers of men and women in different BMI categories). This study was an 'action research' study, that is, it evolved as more information was gathered about individuals' attitudes and dispositions towards life, food and self. Additionally, more methods (i.e. somatotype, fat-percent and blood biomarkers) were used in the second study than the first study, to help describe more the quantifiable differences between the IDA groups.

How these attitudes are formed, how, or why do individuals have this relationship or disposition to food, how does this relationship or disposition arise in an individual? What are the bigger social networks or assemblages that lead people to thinking and acting in the way that they do, especially in regard to susceptibility to obesity? This thesis did not capture some of the wider social and/or cultural mechanisms to understand this. What this research has accomplished is a more interesting methodology for how approaching the study of obesity can aid in a better

understanding of causal mechanisms with their underlying demi-regularities, which can work towards better methods for attenuating obesity's rising prevalence. Furthermore, as Prentice & Jebb (1995) expressed, recognition of the complexity of factors involved in obesity aetiology remains one of the barriers for designing effective strategies for attenuating its prevalence and optimising treatment. This research shows that in order to attenuate obesity, intervention strategies would work better if they encompassed multi-dimensional approaches. Explicitly, using siloed approaches to weight-loss or obesity reduction has not worked because it has not attenuated obesity prevalence. The outcome of this research suggests that a multi-strategy approach to designing interventions may work better specifically because obesity emergence is not unidimensional.

This study found that individuals with obesity, or who were very overweight, and designated as instrumental eaters, experienced more stress, had overall, greater global body-image dissatisfaction, lower self-esteem and/or confidence levels, in addition to experiencing a lower salutogenesis, lower physical and mental wellbeing. Additionally, they engaged in more emotional, stress and boredom eating and had a stronger food dependence, and yet ironically, they expressed that food was not an important aspect or part of their life. What this suggests to the researcher is that these individuals need support, not further stigmatising. More needs to be done to support these individuals. Perhaps these individuals had a disadvantaged start to life, which might have set them on a path of lower wellbeing. Although, the nature of this research did not explore why these individuals were generally and overall less happy or content compared to the individuals in this study who were. This could potentially be a point of future research. Specifically, to try to understand why some adults with obesity are unhappier and more discontent than their OW and to some degree their NW counterparts. This could be explored through the use of semi-structured interviews. However, this is not to suggest that all individuals with obesity are less content with life. A similar strategy as we used, specifically, the IDA analysis, could be employed to identify individuals who struggle with daily life and to understand why, and then get them the type of help they need to support them.

Future work to understand where individuals develop this overall negative embodied salience is important. If it begins as a young person, does this individual necessarily carry it throughout her/his whole life and/or how can it be altered. Questions such as, does home economics at school, or learning how to cook (from parents or grandparents, or others who know how to cook and enjoy cooking) help to better shape or give a healthier approach to food? Or does learning how to cook at home (providing they learn from someone who can teach them, or they have the

inclination to learn regardless of having someone to teach them) help young adults adapt better to student life or individuals just starting out at life? As it may give or lend to a more structured day; which was an important topic that emerged during the interviews (especially in the second study). Additionally, during some of the interviews, the topic of 'learned how to cook from parents or grandparents' emerged, but it did not arise in all interviews. However, it is an important question because this 'knowing or learning how to cook' may contribute to an individual's IDA disposition.

Moreover, how does the difference in body image salience for female and male affect her/his disposition to food? Do both women and men, who have a negative body image, each make the same poor choices in food? The interviews suggested that both men and women who held a dim view of their body, made the same poor food choices (i.e. eating crisps, biscuits, chocolate, etc), however, this research comprised more female than male participants. Additionally, how much do food marketers take advantage of an individual's negative embodiment? During the interviews, some participants mentioned how they were drawn to either purchasing, or wanting to purchase some new packaged food product because it 'looked nice'. Moreover, does an individual who holds an overall negative embodiment always (or necessarily) result in negative or poor food choices and experience a dissonant relationship with food? One participant, who was designated as an instrumental eater, expressed an attitude about purchasing whatever items s/he wanted because s/he felt nobody would notice or cared about her/his looks. How exactly does food marketing, or the fashion industry, culture or society, tell us to how to think about how we should feel about our bodies? One participant commented how she used to have a Marilyn Monroe figure, and that she still does, but it was under layers of fat. Research needs to explore more of the complexity of the socio-cultural generative mechanism and its underlying demi-regularities. As an example, semi-structured interview questions could be designed around these types of questions, listed above, and then with the methodological framework of using critical realism, could aid in drawing out some of these demi-regularities, in order to give us a better understanding of how our environment (i.e. marketing, fashion industry, society) affects pre-conditions and linkages to obesity emergence.

Another project for future work: exploring how a dissonant relationship with food and negative embodied salience might affect the biological system of the gut, and gene expression. Gene expression can ultimately have an effect on epigenetics. Specifically, if negative embodied salience affects food choice, and this food choice is negative food choice, such as eating less variety, less vegetables and fruits, and more processed and convenience foods, fast foods and,

eating more during times of stress, negative emotions, boredom and/or mindless eating, how does this affect the microbiota of the gut, and also importantly, how might this effect gene expression and thus epigenetics? In the bigger picture, how is society and/or the environment affecting this negative/positive embodied salience?

5.7 Conclusion

This research, which has used critical realism as its methodology, has allowed us to understand better each facet or mechanism and its demi-regularities, which plays a role in the aetiology of obesity. Specifically, by exploring/investigating different levels of mechanisms and pooling this information together, has given us a better understanding of what occurs for obesity to be what it is. In other words, it has helped to broaden our understanding of what the world must be like for obesity to exist.

We can no longer afford siloed, linear approaches to obesity research. Gaining more understanding about obesity would be more advantageous if methodologies such as critical realism are used. Specifically, drawing on the disciplines of multiple researchers to work together towards a common goal. New approaches are warranted which are able to interrogate extant data, develop new methodologies, and configure evidence in novel ways. Thus, overcoming methodological insularities that have dominated this field of study. An approach, which attends to the complexity of people, societies, cultures, bodies and biology, may be the way forward in providing insights and understandings into obesity and what are constructed as problematic embodied dispositions. Moreover, intervention strategies need to employ a multi-dimensional approach specifically because using siloed, linear approaches to weight-loss or obesity reduction has not worked because it has not attenuated obesity prevalence. The outcome of this research suggests that a multi-strategy approach to designing interventions may work better specifically because obesity emergence is not unidimensional. In addition, the outcome of this research also suggests that government and public health may be more successful if attention is placed on interventions for health and wellbeing, as opposed to weightloss specifically.

This study is a pioneering piece of research, which shows that there is a different way to look at, and think about obesity. Our research represents a substantial step in a new direction for obesity research; revisiting old paradigms using novel approaches. This pioneering work has fulfilled its aims in terms of establishing a new methodology which can hopefully serve as a catalyst and conduit for multiple research programmes addressing the multiple and complex causes and

experiences of obesity in a way that is sensitive to the individual and circumstances in which they eat and their disposition to food.

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Appendix 1

Four modes of inference used in Critical Realism (adapted from Danermark et al. 2002, pp. 81)

	Deduction	Induction	Abduction	Retroduction
Fundamental structure/thought operations	To derive logically valid conclusions from given premises. To derive knowledge of individual phenomena from universal laws	From a number of observations to draw universally valid conclusions about a whole population. To see similarities in a number of observations and draw the conclusion that these similarities also apply to non-studied cases. From observed co-variants to draw conclusions about law-like relations	To interpret and recontextualise individual phenomena within a conceptual framework or a set of ideas. To be able to understand something in a new way by observing and interpreting this something in a new conceptual framework	From a description and analysis of concrete phenomena to reconstruct the basic conditions for these phenomena to be what they are. By way of thought operations and counterfactual thinking to argue towards transfactual conditions
Formal logic	Yes	Yes	Yes and no	No
Strict logical inference	Yes	No	No	No
The central issue	What are the logical conclusions of the premises?	What is the element common for a number of observed entities and is also true of a larger population?	What meaning is given to something interpreted within a particular conceptual framework?	What qualities must exist for something to be possible?
Strengths	Provides rules and guidance for logical derivations and investigations of the logical validity in all argument	Provides guidance in connection with empirical generalisations, and possibilities to calculate, in part, the precision of such generalisations	Provides guidance for the interpretative processes by which we ascribe meaning to events in relation to a larger context	Provides knowledge of transfactual conditions, structures and mechanisms that cannot be directly observed in the domain of the empirical
Limitations	Deduction does not say anything new about reality beyond what is already in the premises. It is strictly analytical	Inductive inference can never be either analytically or empirically certain = the internal limitations of induction. Induction is restricted to conclusions at the empirical level = the external limitations of induction	There are no fixed criteria from which it is possible to assess in a definite way the validity of an abductive conclusion	There are no fixed criteria from which it would be possible to assess in a definite way the validity of a retroductive conclusion
Important quality on the part of the researcher	Logical reasoning ability	Ability to master statistical analysis	Creativity and imagination	Ability to abstract
Examples	If A then B A Thus: B	From an investigation of the attitude of a representative sample of Swedes, draw the conclusion that 30% of the Swedish population is in favour of the EU	Karl Marx reinterpretation/ redescription of the history of humankind from the historical materialist view	For a ritual to be just a ritual there must exist, inter alia, emotionally loaded symbols and common notions of inviolable/sacred values

Appendix 2

Information sheet

ROBERT GORDON UNIVERSITY ABERDEEN

Information about the research

Food and the City

An invitation to participate
We would like to invite you to participate in this research project. Before you decide whether you would like to take part, please read the information about the project and feel free to ask questions about anything that you are not sure about.

Why are we doing this research?
We believe that living in a city creates a certain relationship with our food: influencing how we think about food, what and when we eat, who we eat with, and how we go about buying our food. We want to know more about those relationships and how those relationships influence our biology and affect our health and bodies.

Who is doing the research?

The research is being carried out by a PhD student and academic researchers from Robert Gordon University in Aberdeen. All are experienced researchers who have looked at a wide range of social and health issues. The research is being funded partly by the MacRobert Trust and partly by Robert Gordon University.

Who can take part in this research?
We are looking for particular people to help us with our research, as follows:

- Aged between 20-40
- Live in Aberdeen city or shire
- Are not aware of having any issues or problems with eating (for example eating disorders such as anorexia)

What does the research involve?
There are few ways in which we will ask you to help us.

The first way is to try to get some basic health information about yourself and your body. You will be asked for a blood sample (about 1 tablespoons) so we can establish some indicators of health and then invite you to participate in a body scan, and other measurements in order to assess body size and composition.

The second way is to be interviewed for a maximum of forty minutes, and asked questions about food in your life; for example: where and when you eat, why you choose certain foods, where you purchase your food and what food means to you.

If you decide to take part in the study, we will also send you some questionnaires for you to complete before we arrange a convenient time for you to be interviewed. The questionnaires will take a maximum of 20 minutes to complete and the visit to the University will take up approximately 1 and half hour in total.

Any information gathered will be strictly confidential and your identity will be kept anonymous. You are not required to answer any questions you do not want and you are free to leave the research at any point.

By helping us with the above we can gather a rounded rich set of information that encapsulates a wide range of information helping us to understand food and the city in as wide and as deep a context as possible.

What will we do with the research?

The main finding will be published in a report that will be available for anyone to inspect and will also be sent to local and national health authorities. The research may also be published in academic journals to help further wider research in this area.

Who has reviewed this research?

The research has been reviewed by the Robert Gordon University Ethics Committee and they have given permission for the research to proceed.

What if I am unhappy about any aspect of taking part in this study?

Everything will be done to make sure that you are not inconvenienced and that we have protected your rights but, if you are concerned or unhappy about any aspects of the study, please contact Chris Yuill ☎01224 263379 or ✉c.yuill@rgu.ac.uk, or Giovanna Bermano ☎01224 262885 or ✉g.bermano@rgu.ac.uk, who are responsible for this research.

Appendix 3

Consent form

ROBERT GORDON UNIVERSITY ABERDEEN

CONSENT FORM

Study Name: Food and the City

PhD Student: Rachael Sibson

Name of Supervisors: Dr Giovanna Bermano and Dr Chris Yuill (Robert Gordon University, Aberdeen).

Please initial box.

1.	I confirm that I have read and understand the Information Sheet dated version 2 - 22/12/2016, for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2.	I agree to take part in the above study.	☐
3.	I agree to the interview being recorded on Dictaphone.	☐
4.	I agree that anything I may say during the course of the interview may be used as anonymous quotes in any presentation of the research [verbal presentation or paper publication].	☐
5.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.	☐

_____ _____ Date:

Name of Respondent Signature

_____ _____ Date:

Researcher Signature

1 to remain with Participant
1 for Researcher

This study is part funded by the MacRobert Trust and Robert Gordon University.

Appendix 4

Semi-structured interview -Topic Guide (page 1 of 4)

Food and the City
Topic Guide

Introduction

Aim: to introduce the research and set the context for the proceeding discussion.

- Introduce self and RGU
- Introduce the study.
- Information sheet, consent form
- Talk through key points:
    - Purpose of the interview
    - Length of the interview (45– 60 minutes)
    - Can stop at any time if you need a break
    - Can come back another day to finish
    - Voluntary nature of participation
    - No questionnaire, more like a conversation
    - Recording of the interview
- Confidentiality and how findings will be reported
- No right or wrong answers. just say what you think
- Any Questions

The aims of each section are to guide the interviewer only and should *not* be read out to the interviewee. The questions below are indicative of topics to be explored. The actual phrasing and order of the questions may vary in relation to the responses given by the interviewee. Follow up questions and 'mining' questions to further explore an interviewee's responses may also be used, but again depend on the answers of the interviewee.

Food purchasing experiences

Aim: the purpose of this bank of questions is to elicit the decisions, experiences and emotions surrounding the purchase of food.

1. Location

First of all, can you tell me where you do most of your food shopping?

Why do you shop in that place or those places?

How do you get there? (on foot, bus, car, lift from others?)

Do you go shopping with anyone else (e.g. partner, children, other relatives, friends?)

When do you go shopping – e.g. evening when there are reduced prices, early mornings?

How often do you go shopping for food?

Do you do a 'big shop' every so often?

Appendix 4 Semi-structured interview -Topic Guide (page 2 of 4)

2. Experience

Could you describe what a typical (food) shopping experience is like for you? (prompts could be is it fun/ not fun, enjoyable/not enjoyable that sort of thing)

Do you meet friends or neighbours when you are shopping?

When you are buying food what sort of things/ decisions influence what you buy? (possible prompts: cost, quality, part of a recipe, something you've seen Jamie or a celeb chef cooking? etc)

What is your main concern when you are shopping for food? (cost - that is value for money, freshness, variety, nutrition, balance, convenience?)

When shopping with others (e.g. children, partner) how does that impact on the choices you make (if at all).

When shopping are you influenced by the nutritional information on the food packaging?

Can you briefly tell me what sorts of foods are in your shopping trolley?

Do you shop at Specialty Food Stores?

3. Take-away food

How often do you purchase take-away food?

What Kind of take away?

What are your reasons for doing so? Convenience? Time? Treat?

How often do you eat out? (With family, friends, with partner?) Where?

And do you find that at the end of eating your meals, typically, do they fill you up, or do you go back for seconds or have a dessert?

4. Ideal contrastive

What would your ideal shopping for food experience be like?

What would be in your ideal shopping basket?

The eating of food

Aim: to explore the role that food plays in the respondent's life in terms of culture, relationships with others, time and other social aspects of food and nutrition.

Describe for me how you prepare a main meal. (prompts: how much time do you take, is it fun/ not fun, on your own or with others, ingredients)

--Are your meals made completely from scratch or do you use packaged or ready meal foods to help prep, such as packaged mixes or sauces?

What would your ideal food preparation experience be like?

Outline how food is eaten in your household? (Are you sat round a table, or in front of the telly or with others or on your own?)

When (what time) is food eaten? Breakfast, Lunch & Dinner

Appendix 4 Semi-structured interview -Topic Guide (page 3 of 4)

When eating, can you tell when you are full? And do you find that at the end of eating your meals, typically, do they fill you up, or do you go back for seconds or have a dessert?

How do you feel about the way you are eating?

Are there any foods in particular that you feel you have to have or you go out of your way to find?

Do you try (or have you tried) to limit certain food groups (i.e., sugar, soda, desserts, fats or meats, etc.)?
Do you eat Five-A-Day? That is vegetables and fruit?

Do you feel there are times when you mindlessly eat food, say in front of the T.V. or computer...?

How often do you eat with family or with friends? (And, do you enjoy this?)

Again, what would an ideal situation be like?

Would you describe yourself as a person who eats to live, or lives to eat?

Do you eat differently in the summer time than in the winter time?

General Questions

Aim: to explore some of the wider cultural and identity issues relating to food. These questions are to tease out of social location influences understandings and perceptions of food.

How would you describe your diet?

What do you think a healthy diet consists of?
If you were trying to eat healthily what kinds of foods would you be eating? Not eating?

What information exists about food and diet? Is it useful or not useful?
If you wanted more info on healthy food, healthy eating, diet & exercise where would you go to access this information?

Have you tried to access information from websites or books or journals, etc?

Do you think you eat a healthy diet?

How important is food in your life?

Now just some Questions on body image—

How do you feel about your body image?

What do you think is a healthy body shape?

Do you think that that is more expensive?

How important is your diet (i.e., the choices you make in your food selection) with respect to your body image?

Would you like to lose weight?

Appendix 4 Semi-structured interview -Topic Guide (page 4 of 4)

Do you exercise?

What kind of exercise do you do?

Patterns of work or other –

What general type of work do you do or have done?

How do you think it influences what you eat?

What are your choices of food at work, or do you pack a lunch?

Would you say your work shift allows for good eating & sleeping patterns? (Does work affect either of these in any way?)

Outside your working hours do you attach importance to your diet?

Questions about where you live –

Do you like where you live?

What are your choices for food shopping there?

What shops would you like to see?

Is there anything you'd like to say that could improve the area?

Just a few more general questions and then we're done –

Can you describe the level of stress in your life.. (are you stressed, or not stressed..)
Do you feel that it affects your choices in the foods you eat?

Can you describe your level of self-esteem or confidence (i.e., do you consider yourself to have a high level of self-esteem?)
And do you feel this affects the choices you make in the foods you eat?

Do you consider yourself to be well off, comfortable, just making ends meet, not making ends meet?
And as a result of this do you think the choices you make in the quality of food are affected?

Lastly,
Do you feel you have a support network of family and friends that are there for you when you need them?

Is there anything you would like to add with respect to food, or anything else that you feel affects what you eat?

Appendix 5

MBSRQ-AS questionnaire (page 1 of 3)

The following questions contain a series of statements about how you might think or feel about your body image, and how that might affect how you behave. You are asked to indicate the extent to which each statement pertains to you personally:

EXAMPLE:

_____ I am usually in a good mood.

In the blank space, enter a **1** if you **definitely disagree** with the statement;

Enter a **2** if you **mostly disagree**;

Enter a **3** if you **neither agree nor disagree**;

Enter a **4** if you **mostly agree**;

Or enter a **5** if you **definitely agree** with the statement.

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

_____ 1. Before going out in public, I always notice how I look.

_____ 2. I am careful to buy clothes that will make me look my best.

_____ 3. My body is sexually appealing.

_____ 4. I constantly worry about being or becoming fat.

_____ 5. I like my looks just the way they are.

_____ 6. I check my appearance in a mirror whenever I can.

_____ 7. Before going out, I usually spend a lot of time getting ready.

_____ 8. I am very conscious of even small changes in my weight.

_____ 9. Most people would consider me good-looking.

_____ 10. It is important that I always look good.

_____ 11. I use very few grooming products.

_____ 12. I like the way I look without my clothes on.

_____ 13. I am self-conscious if my grooming isn't right.

_____ 14. I usually wear whatever is handy without caring how it looks.

_____ 15. I like the way my clothes fit me.

_____ 16. I don't care what people think about my appearance.

Appendix 5 MBSRQ-AS questionnaire (page 2 of 3)

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

_____ 17. I take special care with my hair grooming.

_____ 18. I dislike my physique.

_____ 19. I am physically unattractive.

_____ 20. I never think about my appearance.

_____ 21. I am always trying to improve my physical appearance.

_____ 22. I am on a weight-loss diet.

For the remainder of the items, use the response scale given with the item, and enter your answer in the space beside the item.

_____ 23. I have tried to lose weight by fasting or going on crash diets.

1. Never
2. Rarely
3. Sometimes
4. Often
5. Very Often

_____ 24. I think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight
5. Very Overweight

_____ 25. From looking at me, most other people would think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight
5. Very Overweight

Appendix 5 MBSRQ-AS questionnaire (page 3 of 3)

For questions 26-34, Use this 1 to 5 scale to indicate **how dissatisfied or satisfied you are** with each of the following areas or aspects of your body:

1	2	3	4	5
Very Dissatisfied	**Mostly Dissatisfied**	**Neither Satisfied Nor Dissatisfied**	**Mostly Satisfied**	**Definitely Satisfied**

_____ 26. Face (facial features, complexion)

_____ 27. Hair (colour, thickness, texture)

_____ 28. Lower torso (buttocks, hips, thighs, legs)

_____ 29. Mid torso (waist, stomach)

_____ 30. Upper torso (chest or breasts, shoulders, arms)

_____ 31. Muscle tone

_____ 32. Weight

_____ 33. Height

_____ 34. Overall appearance

Appendix 6

BIQLI questionnaire (page 1 of 2)

Body Image: Different people have different feelings about their physical appearance. These feelings are called 'body image.' Some people are generally satisfied with their looks, while others are dissatisfied. At the same time, people differ in terms of how their body-image experiences affect other aspects of their lives. Body image may have positive effects, negative effects, or no effect at all. Listed below are various ways that your own body image may or may not influence your life. For each item, circle how much your feelings about your appearance affect that aspect of your life. Before answering each item, think carefully about the answer that most accurately reflects how your body image usually affects you.

-3	-2	-1	0	+1	+2	+3
Very Negative Effect	Moderate Negative Effect	Slight Negative Effect	No Effect	Slight Positive Effect	Moderate Positive Effect	Very Positive Effect

1.	My basic feelings about myself – feelings of personal adequacy and self-worth.	-3	-2	-1	0	+1	+2	+3
2.	My feelings about my adequacy as a man or a woman – feelings of masculinity or femininity.	-3	-2	-1	0	+1	+2	+3
3.	My interactions with people of my own sex.	-3	-2	-1	0	+1	+2	+3
4.	My interactions with people of the other sex.	-3	-2	-1	0	+1	+2	+3
5.	My experiences when I meet new people.	-3	-2	-1	0	+1	+2	+3
6.	My experiences at work or at school.	-3	-2	-1	0	+1	+2	+3
7.	My relationships with friends.	-3	-2	-1	0	+1	+2	+3
8.	My relationship with family members.	-3	-2	-1	0	+1	+2	+3
9.	My day-to-day emotions.	-3	-2	-1	0	+1	+2	+3
10.	My satisfaction with my life in general.	-3	-2	-1	0	+1	+2	+3
11.	My feelings of acceptability as a sexual partner.	-3	-2	-1	0	+1	+2	+3
12.	My enjoyment of my sex life.	-3	-2	-1	0	+1	+2	+3
13.	My ability to control what and how much I eat.	-3	-2	-1	0	+1	+2	+3
14.	My ability to control my weight.	-3	-2	-1	0	+1	+2	+3
15.	My activities for physical exercise.	-3	-2	-1	0	+1	+2	+3

Appendix 6 BIQLI questionnaire (page 2 of 2)

-3	-2	-1	0	+1	+2	+3
Very Negative Effect	Moderate Negative Effect	Slight Negative Effect	No Effect	Slight Positive Effect	Moderate Positive Effect	Very Positive Effect

16. My willingness to do things that might call attention to my appearance. -3 -2 -1 0 +1 +2 +3

17. My daily "grooming" activities (i.e., getting dressed and physically ready for the day). -3 -2 -1 0 +1 +2 +3

18. How confident I feel in my everyday life. -3 -2 -1 0 +1 +2 +3

19. How happy I feel in my everyday life. -3 -2 -1 0 +1 +2 +3

Appendix 7

SOC-13 questionnaire (page 1 of 2)

We all have a different approach to life, neither approach is right or wrong; some people see a glass half full, whereas others may see it half empty, this questionnaire helps us to understand how individuals feel about their control over their life's situations.

Each question has seven possible answers. Please mark the number, which expresses your answer, with number 1 and 7 being the extreme answers. If the words under 1 are right for you, circle 1: if the words under 7 are right for you, circle 7. If you feel differently, circle the number which best expresses your true feeling. Please answer all questions give only one answer to each question.

1. Do you have the feeling that you don't really care about what goes on around you?

1	2	3	4	5	6	7
Very seldom or never						Very often

2. Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?

1	2	3	4	5	6	7
Never happened						Always happened

3. Has it happened that people whom you counted on disappointed you?

1	2	3	4	5	6	7
Never happened						Always happened

4. Until now, your life has had:

1	2	3	4	5	6	7
No clear goals or purpose at all						Very clear goals and purpose

5. Do you have the feeling that you're being treated unfairly?

1	2	3	4	5	6	7
Very often						Very seldom or never

6. Do you have the feeling that you are in an unfamiliar situation and don't know what to do?

1	2	3	4	5	6	7
Very often						Very seldom or never

7. Doing the things you do every day is:

1	2	3	4	5	6	7
A source of deep Pleasure and Satisfaction						A source of pain and boredom

8. Do you have very mixed-up feelings and ideas?

1	2	3	4	5	6	7
Very often						Very seldom or never

Appendix 7 SOC-13 questionnaire (page 2 of 2)

9. Does it happen that you have feelings inside you would rather not feel?

1	2	3	4	5	6	7
Very often						Very seldom or never

10. Many people – even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?

1	2	3	4	5	6	7
Never						Very often

11. When something happened, have you generally found that:

1	2	3	4	5	6	7
You overestimated or underestimated its importance						You saw things in the right proportion

12. How often do you have the feeling that there's little meaning in the things you do in your daily life?

1	2	3	4	5	6	7
Very often						Very seldom or never

13. How often do you have feelings that you're not sure you can keep under control?

1	2	3	4	5	6	7
Very often						Very seldom or never

Appendix 8

DEBQ questionnaire (page 1 of 3)

This questionnaire asks about how you behave in relation to food:

OVER THE PAST FOUR WEEKS:

		Never	Rarely	Sometimes	Often	Very often
1.	Do you have the desire to eat when you are irritated?.....	1	2	3	4	5
2.	If food tastes good to you, do you eat more than usual?.....	1	2	3	4	5
3.	Do you have a desire to eat when you have nothing to do?.....	1	2	3	4	5
4.	If you have put on weight, do you eat less than you usually do?.....	1	2	3	4	5
5.	Do you have a desire to eat when you are depressed or discouraged?.....	1	2	3	4	5
6.	If food smells and looks good, do you eat more than usual?.....	1	2	3	4	5
7.	How often do you refuse food or drink offered because you are concerned about your weight?.....	1	2	3	4	5
8.	Do you have a desire to eat when you are feeling lonely?.....	1	2	3	4	5
9.	If you see or smell something delicious, do you have a desire to eat it?...	1	2	3	4	5
10.	Do you have a desire to eat when somebody lets you down?.....	1	2	3	4	5
11.	Do you try eat less at mealtimes than you would like to eat?.....	1	2	3	4	5
12.	If you have something delicious to eat, do you eat it straight away?.....	1	2	3	4	5
13.	Do you have a desire to eat when you are cross?.....	1	2	3	4	5
14.	Do you watch exactly what you eat?.....	1	2	3	4	5
15.	If you walk past the baker do you have the desire to buy something delicious?.....	1	2	3	4	5
16.	Do you have a desire to eat when you are approaching something unpleasant to happen?.....	1	2	3	4	5
17.	Do you deliberately eat foods that are slimming?.....	1	2	3	4	5
18.	If you see others eating, do you also have the desire to eat?.....	1	2	3	4	5
19.	When you have eaten too much, do you eat less than usual the following days?.....	1	2	3	4	5
20.	Do you get the desire to eat when you are anxious, worried or tense?....	1	2	3	4	5
21.	Do you find it hard to resist eating delicious foods?.....	1	2	3	4	5

Appendix 8 DEBQ questionnaire (page 2 of 3)

22.	Do you deliberately eat less in order not to become heavier?	1	2	3	4	5
23.	Do you have a desire to eat when things are going against you or when things have gone wrong?	1	2	3	4	5
24.	If you walk past a snack bar or a café, do you have the desire to buy something delicious?	1	2	3	4	5
25.	Do you have the desire to eat when you are emotionally upset?	1	2	3	4	5
26.	How often do you try not to eat between meals because you are watching your weight?	1	2	3	4	5
27.	Do you eat more than usual, when you see others eating?	1	2	3	4	5
28.	Do you have a desire to eat when you are bored or restless?	1	2	3	4	5
29.	How often in the evening do you try not to eat because you are watching your weight?	1	2	3	4	5
30.	Do you have a desire to eat when you are frightened?	1	2	3	4	5
31.	Do you take into account your weight with what you eat?	1	2	3	4	5
32.	Do you have a desire to eat when you are disappointed?	1	2	3	4	5
33.	When preparing a meal are you inclined to eat something?	1	2	3	4	5

34) Has your body weight been constant the past six months? (Please answer either a, b, c, or d)

a. Yes, my weight did not change much in the past six months.
b. No, I lost weight. Specifically, I lost _____kg in the past six months. (If you don't know how many kilograms you can also answer in stone or pounds, please write which unit)
c. No, I gained weight. Specifically, I gained _____kg in the past six months. (If you don't know how many kilograms you can also answer in stone or pounds, please write which unit)
d. No, sometimes I gained weight and sometimes I lost weight.

35) What is your highest weight ever (excluding pregnancy, if you are female): _____kg. (If you don't know how many kilograms you can also answer in stone or pounds, please write which unit)

36) What is your lowest weight ever (after age 15): _____ kg. (If you don't know how many kilograms you can also answer in stone or pounds, please write which unit)

Appendix 8 DEBQ questionnaire (page 3 of 3)

37) Have you ever had an eating binge? An eating binge is an episode of eating an amount of food that others would regard unusually large.

a. Yes _____
b. No _____

38) If so, how often in the past three months did you have an eating binge?

a. Weekly, namely _____ times a week
b. Monthly, namely _____ times a month
c. In the past three months I never had an eating binge

39) When having an eating binge, how often do you have the feeling that you cannot stop?

a. Early never _____
b. Sometimes _____
c. Often _____
d. Very often _____

Appendix 9

mYFAS questionnaire

The following questions ask about your eating habits in the past year. People sometimes have difficulty controlling intake of certain foods, (e.g., sweets, starches, salty snacks, fatty foods, sugary drinks and others).
With each statement please fill in the blank space with the corresponding number of how you feel the sentence best relates to you and your habits:

0	1	2	3	4
Never	Once a month	2-4 times/month	2-3 times/week	4+ times/week

_____ 1) I find myself consuming certain foods even though I am no longer hungry.

_____ 2) I worry about cutting down on certain foods.

_____ 3) I feel sluggish or fatigued from overeating.

_____ 4) I have spent time dealing with negative feelings from overeating certain foods, instead of spending time in important activities such as time with family, friends, work, or recreation.

_____ 5) I have had physical withdrawal symptoms such as agitation and anxiety when I cut down on certain foods. (Do not include caffeinated drinks: coffee, tea, cola, energy drinks, etc.)

_____ 6) My behaviour with respect to food and eating causes me significant distress.

_____ 7) Issues related to food and eating decrease my ability to function effectively (daily routine, job/school, social or family activities, health difficulties).

In the Past 12 Months... Please Answer Yes or No:

_____ 8) I kept consuming the same types or amounts of food despite significant emotional and/or physical problems to my eating

_____ 9) Eating the same amount of food does not reduce negative emotions or increase pleasurable feelings the way it used to.

Appendix 10

FCV questionnaire

FOOD CHOICE VALUES: Over The Past Four Weeks: You have purchased foods based on:

		Not at all				A little bit			Somewhat		Quite a bit		Very Imp
1.	How it tastes	1	2	3	4	5							
2.	Whether it is considered a traditional food (of your upbringing/childhood)	1	2	3	4	5							
3.	How it smells	1	2	3	4	5							
4.	Whether it is available in the shops and supermarkets	1	2	3	4	5							
5.	Degree to which it is good value for money	1	2	3	4	5							
6.	Whether I think it will help me cope with stress	1	2	3	4	5							
7.	Degree to which it will help me cope with life events	1	2	3	4	5							
8.	How likely it is to help me control my weight	1	2	3	4	5							
9.	Degree to which it reflects my cultural or ethnic traditions	1	2	3	4	5							
10.	Degree to which I can be sure it is not associated with food-borne illness	1	2	3	4	5							
11.	Whether it is grown or produced in an environmentally friendly way	1	2	3	4	5							
12.	The amount of calories in it	1	2	3	4	5							
13.	How easy or difficult it is to prepare	1	2	3	4	5							
14.	Degree to which it contains natural ingredients	1	2	3	4	5							
15.	Degree to which it has been prepared with extreme care and safety	1	2	3	4	5							
16.	Degree to which it will help me lose weight	1	2	3	4	5							
17.	Degree to which it looks good	1	2	3	4	5							
18.	The amount of vitamins and minerals in it	1	2	3	4	5							
19.	Whether it can be cooked very simply	1	2	3	4	5							
20.	How long it takes to prepare	1	2	3	4	5							
21.	How similar it is to the food I ate when I was a child	1	2	3	4	5							
22.	How much it will help me relax	1	2	3	4	5							
23.	Whether I am certain it does not contain harmful bacteria or viruses	1	2	3	4	5							
24.	How many artificial additives it contains	1	2	3	4	5							
25.	Whether it can be bought in shops close to where I live or work	1	2	3	4	5							

Appendix 11

SPAQ questionnaire

The following questions relate to your physical activity over the **previous week**. Please mark in the appropriate box the number of minutes spent doing a particular activity. Please try and think carefully and be as accurate as possible with your answers and only include activities of either **moderate** or **vigorous** intensity. Examples are given of what should and should not be included.		
	×	**LIGHT INTENSITY** - Your heart rate and breathing rate are no different from what they are when you are standing, sitting etc
	✓	**MODERATE INTENSITY** - Your heart rate and breathing rate are faster than normal. You may also sweat a little. Brisk walking or sweeping and mopping are good examples of how you might feel
	✓	**VIGOROUS INTENSITY** - Your heart rate is much faster and you have to breathe deeper and faster than normal. You will probably sweat. Playing football or squash are good examples of how you might feel

LEISURE TIME PHYSICAL ACTIVITY - Remember, **do not** include **light intensity** activities

In the **past week** how many minutes did you spend each day:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL
Walking outwith work? ***DO** include* ✓ e.g. walking to the shops, walking to work, walking the dog, stairwalking ✓ ***DO NOT** include* × e.g. standing, sitting, driving, walking whilst **at** work ×								
Manual labour outwith work? ***DO** include* ✓ e.g. cutting grass, decorating, washing car, DIY, digging ✓ ***DO NOT** include* × e.g. weeding, planting, pruning ×								
Active housework? ***DO** include* ✓ e.g. vacuuming, scrubbing floors, bed making, hanging out washing ✓ ***DO NOT** include* × e.g. sewing, dusting, washing dishes, preparing food ×								
Dancing? ***DO** include* ✓ e.g. only include time actually spent dancing ; disco, line, country ✓ ***DO NOT** include* × e.g. time spent not actually dancing ×								
Participating in a sport, leisure activity or training? ***DO** include* ✓ e.g. exercise classess, cycling, football, swimming, golf, jogging, athletics ✓ ***DO NOT** include* × e.g. darts, snooker / pool, fishing, playing a musical instrument ×								
Other Physical Activity if not already covered (*please write in*)								
							TOTAL	

PHYSICAL ACTIVITY **AT WORK** (Only complete if you are currently employed and remember not to include light intensity activities

In the **past week** how many minutes did you spend each day:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL
Walking whilst at work? ***DO** include* ✓ e.g. walking up or down stairs, to and from your desk,"doing the rounds" ✓ ***DO NOT** include* × e.g. standing, sitting at desk etc; i.e. time spent not actually walking ×								
Manual labour whilst at work? ***DO** include* ✓ e.g. lifting, stacking shelves, climbing ladders, building work, cleaning ✓ ***DO NOT** include* × e.g. sitting at desk, answering telephone, driving, check-out operation ×								
							TOTAL	

Was last week typical of the amount of physical activity you usually do?

YES					
NO - I usually do more		Normally, how much more?		Of which activity?	
NO - I usually do less		Normally, how much less?		Of which activity?	

Appendix 12

SF-36v1 questionnaire (page 1 of 4)

Health Survey: Please answer the following questions of the health survey completely, honestly and without interruptions.

GENERAL HEALTH:

1) In general, would you say your health is:
__Excellent __Very Good __Good __Fair __Poor

2) Compared to one year ago, how would you rate your health in general now?
__Much better now than one year ago
__Somewhat better now than one year ago
__About the same
__Somewhat worse now than one year ago
__Much worse than one year ago

LIMITATIONS OF ACTIVITIES:

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

3) Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

4) Moderate activities, such as moving a table, pushing a vacuum cleaner (hoovering), bowling or playing golf.
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

5) Lifting or carrying groceries
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

6) Climbing several flights of stairs
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

7) Climbing one flight of stairs
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

8) Bending, kneeling or stooping
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

9) Walking more than a mile
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

10) Walking several blocks
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

11) Walking one block
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

12) Bathing or dressing yourself
__Yes, limited a lot __Yes, limited a little __No, Not Limited at all

Appendix 12 SF-36v1 questionnaire (page 2 of 4)

PHYSICAL HEALTH PROBLEMS:
During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

13) Cut down the amount of time you spent on work or other activities
__Yes __No

14) Accomplished less than you would like
__Yes __No

15) Were limited in the kind of work or other activities
__Yes __No

16) Had difficulty performing the work or other activities (for example, it took extra effort)
__Yes __No

EMOTIONAL HEALTH PROBLEMS:
During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

17) Cut down the amount of time you spent on work or other activities
__Yes __No

18) Accomplished less than you would like
__Yes __No

19) Didn't do work or other activities as carefully as usual
__Yes __No

SOCIAL ACTIVITIES:
20) Emotional problems interfered with your normal social activities with family, friends, neighbours or groups?
__Not at all __Slightly __Moderately __Severe __Very severe

PAIN:
21) How much bodily pain have you had during the past 4 weeks?
__None __Very mild __Mild __Moderate __Severe __Very severe

22) During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
__Not at all __A little bit __Moderately __Quite a bit __Extremely

Appendix 12 SF-36v1 questionnaire (page 3 of 4)

ENERGY AND EMOTIONS:
These questions are about how you feel and how things have been with you during the last 4 weeks. For each question, please give the answer that comes closest to the way you have been feeling.

23) Did you feel full of pep?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

24) Have you been a very nervous person?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

25) Have you felt so down in the dumps that nothing could cheer you up?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

26) Have you felt calm and peaceful?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

27) Did you have a lot of energy?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

28) Have you felt downhearted and blue?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

Appendix 12 SF-36v1 questionnaire (page 4 of 4)

29) Did you feel worn out?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

30) Have you been a happy person?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

31) Did you feel tired?
__All of the time
__Most of the time
__A good bit of the time
__Some of the time
__A little bit of the time
__None of the time

SOCIAL ACTIVITIES:
32) During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?
__All of the time
__Most of the time
__Some of the time
__A little bit of the time
__None of the time

GENERAL HEALTH:
How true or false is each of the following statements for you?

33) I seem to get sick a little easier than other people
__Definitely true __Mostly true __Don't know __Mostly false __Definitely false

34) I am as healthy as anybody I know
__Definitely true __Mostly true __Don't know __Mostly false __Definitely false

35) I expect my health to get worse
__Definitely true __Mostly true __Don't know __Mostly false __Definitely false

36) My health is excellent
__Definitely true __Mostly true __Don't know __Mostly false __Definitely false

Appendix 13

Somatotype distribution table according to HWR (adapted from Carter 2002)

A	½ - 1	1	2	3	4	5	6	7	8	9	B
15.40										119,	50.91
15.20									118,	129, 219	50.25
15.00								117,	128, 218		49.59
14.80								127, 217	138, 318 228,		48.93
14.60							126, 216	137, 317 227,			48.27
14.40							136, 316 226,	237, 327			47.61
14.20						135, 315 225,	146, 416 236, 326				46.95
14.00					134, 314 224,	145, 415 235, 325	246, 426 336,				46.28
13.80					144, 414 234, 324	245, 425 335,					45.62
13.60				233,	154, 514 244, 424 334,	255, 525 345, 435					44.96
13.40				153, 513 333,	254, 524 344, 434						44.30
13.20			242, 422	163, 613 253, 523 343, 433	354, 534 444,						43.64
13.00			162, 612 252, 522	263, 623 353, 533 443,							42.98
12.80		341, 431	172, 712 262, 622 352, 532 442,	363, 633 453, 543							42.32
12.60		171, 711 261, 621 351, 531 441,	182, 812 272, 722 362, 632 452, 542								41.66
12.40		181, 811 271, 721 361, 631 451, 541	282, 822 372, 732 462, 642 552,								40.99
12.20		391, 911 281, 821 371, 731 461, 641 551,									40.33
12.00		291, 921 381, 831 471, 741 561, 651									39.67
11.70	5-6½-½, 6-6-1 10-2-1, 2-10-1	391, 931 481, 841 571, 751									38.68
11.40	10-3-1, 3-10-1 10½-2½-½, 11-2-1	491, 941 581, 851 671, 761									37.69
11.00	6½-7½-½, 7-7-1 10½-3½-½, 11-3-1	4-10-1, 10-4-1 5-9-1, 9-5-1 6-8-1, 8-6-1									36.37
10.50	7-8-1, 8-7-1 11½-3½-½, 12-3-1	4-11-1, 11-4-1 5-10-1, 10-5-1 6-9-1, 9-6-1									34.71
10.00	7½-8½-½, 8-8-1 11½-4½-½, 12-4-1 13-3-1	5-11-1, 11-5-1 6-10-1, 10-6-1 7-9-1, 9-7-1									33.06
9.50	12-5-1 13-4-1	7-10-1, 10-7-1 8-9-1, 9-8-1 11-6-1									31.41
9.00	12-6-1 13-5-1 14-4-1	8-10-1, 10-8-1 9-9-1 11-7-1									29.75

A = height in inches / cube root of weight in pounds
B = height in centimeters / cube root of mass in kilograms

Appendix 14

Demographics form (page 1 of 6)

Food and the City

Anonymous Code:_____

Thank you for agreeing to participate in our research. If you could fill in the information overleaf that would be useful. It is basic information similar to what you may provide for a census form.

A few general points:

- You do not have to do anything you do not want to do.
- You do not have to answer any questions you do not want to answer.
- You are free to leave at any point.

Appendix 14 Demographics form (page 2 of 6)

1. Sex

Male ☐ Female ☐

2. Residence

In which part of Aberdeen/Aberdeenshire do you live?

Please write name of neighbourhood _____

3. Age

To which age group do you belong?

18-24	
25-30	
31-35	
36-40	

4. Marital or same-sex Civil Partnership Status

single, that is, never married and never registered in a same-sex civil partnership	
married	
separated, but still legally married	
divorced	
widowed	
in a registered same-sex civil partnership	
separated, but still legally in a same-sex civil partnership	
formerly in a same-sex civil partnership which is now legally dissolved	
surviving partner from a same-sex civil partnership	

Appendix 14 Demographics form (page 3 of 6)

5. Employment

Which of the following best describe you?

Full-time employed	
Part-time employed	
Unemployed	
Full-time student	
Part-time student	
Full-time carer	
Full-time sick or disabled	

Other_____
_____

What is your job title?

_____

Briefly describe what you do in your main job or jobs:

_____
_____
_____

6. Income

Which income bracket do you fall in?

£0 - £16,000	
£17,000 - £30,000	
£31,000 - £70,000	
£71,000 - £80,000	
£81,000 - £90,000	
£91,000 - £98,000	
£99,000 +	

7. Health

How is your health in general?

Very good	
Good	
Fair	
Bad	
Very bad	

Appendix 14 Demographics form (page 4 of 6)

Do you have a long-term illness to do with your physical or mental health or a disability?

Yes	
No	

8. Ethnicity

Please select ONE of the following:

A White

Scottish	
English	
Welsh	
Northern Irish	
British	
Irish	
Gypsy/ Traveller	
Polish	

Other, please write in

_____

B Mixed or multiple ethnic groups

Any mixed or multiple groups, please write in

_____

C Asian, Asian Scottish or Asian British

Pakistani, Pakistani Scottish or Pakistani British	
Indian, Indian Scottish or Indian British	
Bangladeshi, Bangladeshi Scottish or Bangladeshi British	
Chinese, Chinese Scottish or Chinese British	

Other, please write in

_____

Appendix 14 Demographics form (page 5 of 6)

D African, Caribbean or Black

African, African Scottish or African British	
Caribbean, Caribbean Scottish or Caribbean British	
Black, Black Scottish or Black British	

Other, please write in

_____

9. Education

Which of the qualifications do you have? Please tick all that apply.

O Grade, Standard Grade, Access 3 Cluster, Intermediate 1 or 2, GCSE, CSE, Senior Certificate or equivalent	
GSVQ Foundation or Intermediate, SVQ level 1 or 2, SCOTVEC Module, City and Guilds Craft or equivalent	
GSVQ Advanced, SVQ level 3, ONC, OND, SCOTVEC National Diploma, City and Guilds Advanced Craft or equivalent	
HNC, HND, SVQ level 4 or equivalent	
Degree, Postgraduate qualifications, Masters, PhD,	
SVQ level 5 or equivalent	
Professional qualifications (for example, teaching, nursing, accountancy)	
Other school qualifications not already mentioned (including foreign qualifications)	
Other post-school but pre-Higher Education qualifications not already mentioned (including foreign qualifications)	
Other Higher Education qualifications not already mentioned (including foreign qualifications)	
No qualifications	

Appendix 14 Demographics form (page 6 of 6)

10. Your house

Please tick which of the following best describes where you live.

Homeowner (either paying mortgage or own outright)	
Rent from private landlord	
Rent from council	
Rent from housing association	
Rent from other	

How many vans or cars are owned or are available to members of your household?

one	
two	
three	
four	
five	

Does your household have central heating in some or all rooms?

Yes ☐

No ☐

Appendix 15

Semi-structured interview, example of Stage 1 of analysis pg. 1/21

RHS Interviewing PPS-20

Mon. 21st Dec. 2015
1:30-2:30pm 50m20s

I = Interviewer R = Response

I = First of all if you can just outline for me, or describe to me where you do most of your food shopping.

R – Tesco's.

I – Is that the Tesco's that's in your neighbourhood?

R – Yeah, in Torry.

I – And why do you choose Tesco's?

R – B/c it's closer and has the best stuff.

I - ..Best stuff, ...is that the big Tesco's?

R – No it's smaller than the big Tesco's but it's got everything you need.

I – Okey, and how often do you go there?

R – Whenever my Mum wants to go shopping.

I – Oh okey, so you go with Mum?

R – Yeah, most of the time, or she will go; once a week normally.

I – Okey, so do you do big shops once a week, buying for the whole week, or do you..?

R – Yeah, mostly just get fresh stuff, if we need other fresh stuff we'll just nip in before or after work, but it's normally just get everything on a Saturday when we're both off.

I – Okey, so you go Saturday. And do you go morning, noon, night..?

R – Normally afternoon, can't think, we haven't been shopping in a week. (or in awhile)

I – Yeah, well that's normal, that's okey

R – Yeah, we've been on holiday. Normally... it used to be just before afternoon, around half 11ish.

I – Okey, and then you guys drive there b/c you go with Mum?

R – Yeah.

I – Okey, and do you, does Tesco's have on Saturday's, do they have the reduced prices on foods?

R – Some, yeah.

I – Okey, and do you guys, do you look for those reduced prices? Or do you not really pay that much attention?

R – We'll have a look, but we normally just get like fresh, b/c we always get our vegetables and on a Saturday it's good b/c they've just had a delivery so it's all fresh, so you know you're getting fresh stuff.

I – Okey. So is that also why you've chosen Saturday or is it mainly b/c you guys are both off..?

R – It's when we're free.

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 2/21

I – Right. Okey, so you said about once a week and you do your shop for the week. If there is anything you need do you stop.... Do you drive here? (to work @ RGU).

R – Yeah.

I – Okey, so would you stop off at say maybe Sainsbury's or ASDA if you had to pick up milk or something?

R – On my way home from work, I normally go in and pick up any last minute stuff if I've forgotten.

I - ...and that would probably be ASDA? B/c they're 24 hours..

R – ASDA yeah, 24 hours, Sainsbury's finishes at 11.

I - ..and then, describe for me, do you enjoy shopping?

R – Sometimes.

I – Does Mum enjoy shopping?

R – Not really.

I – So if you are with Mum is it just to get in and get out?

R – We do have a look and see what there is, see if there is anything different that we fancy. But it's not our favourite hobby, but no it doesn't bother us, we'll just go in and have a look around.

I – Okey, and so it's not really something you enjoy?

R – No.

I – No, okey. And do you ever meet friends there or neighbours?

R – Sometimes.

I – And is that fun or does that just prolong the agony of shopping (chortling)?

R – It depends, if they keep speaking it just... (frustration expressing)... and then I just want home.

I – Fair enough, okey. And then when you and Mum go shopping, what sort of things influence what you buy, do you guys go with a list?

R – No.

I – So you just...

R - ..what we think we need.

I – Okey. And, do you ever make recipes at home, write down recipes and maybe have that as something you might try?

R – If we think of something during the week that we fancy, then one of us will remember and pick it up at the weekend.

I – Okey, from a recipe, or just something that you thought of..?

R – Just something that we thought of.

I – And so what influences what you buy, is it the cost of the food, the quality? ...you were saying fresh is important.

R – Just, I just buy what I like, and if it's fresh then it's even better.

2

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 3/21

I – Okey, and what's your main concern when you go shopping for food is it, would it be your value for money... Freshness is number one? Would it be, do you guys shop for value for money?

R – In a way, yeah.

I – So would that be when you're buying just anything? Like, do you go for the 2 for 1 deals?

R – Sometimes, but it just depends really, if we think it's going to be wasted, no. If we're going to have too much, then we won't buy the 2 for 1 b/c there's no point in buying something that's going in the bin, but if it's something that we do like eating then yeah.

I – Would you buy, say if they have meat on special would you buy it and then put one in the freezer?

R – Yeah.

I – Would you buy things based on say, nutrition or the balance of food; balance meaning if you... if it's a balanced diet.

R – Not really, no.

I – Okey. What about convenience, say like fast to cook?

R – sometimes, like for work, yeah, if we haven't had time to make meals for supper at night I would just take a ready meal to work; if I haven't got time or we've been busy and haven't made sandwiches I'll just go in and get a ready meal, but not all the time; mainly, Mum will cook a meal and then I eat that meal for my supper at work, I'll have that for lunch and a sandwich for my supper...

I - ...and is the ready meal something you put in the microwave?

R – Yeah.

I – Okey, is it... is that also frozen food?

R – You can get them, but normally it's like, they're not fresh, but the fridge one.

I – Yeah, okey, I think I know what you're talking about. And then do you shop for variety, say variety of, I guess that comes with the sort of balanced to also have a variety of foods, or do you guys pretty much stick with what you know you like?

R – No, I do buy like different stuff and that, when we go shopping we normally try and get meat, veg that we like with the meat, like tatties or whatever, but then sometimes we're like no, we're just going to have that. But normally we do try and have a proper meal like meat, veg and tatties, it just depends on what there is.

I – Okey, and so what sort of vegetables do you guys buy?

R – Mum buys everything. I don't eat everything, I'm a fussy eater, but Mum buys all different vegetables. Courgettes is my favourite.

I - ..and like what vegetables don't you like?

R – Now I can't think of anything (smiling)

I – (chortling).. yeah, I know...

R – I like most vegetables, I don't like a big amount of it. Like with roast beef I like heaps of onions, but just a little bit of carrot; but then next time I might have heaps of carrot, but it just depends..

I – Fair enough (chortling). But you're mostly eating what Mum makes? Or do you...

R - ...we like to cook together at the weekend when we're both off.

3

I – Okey. So is it just you and Mum, or...

R – Just me and Mum.

I – Okey. And do you two influence each other, say if you want to buy some sort of a snack, or a treat, or crisps or some sort of pudding?.

R – Yeah, we do sometimes, but Mum doesn't like buying snacks and all that, it's just sometimes I'll get to buy some, other times not.

I – Okey. When you guys shop, do you pay attention to... like in ready made meals, do you pay attention to the labelling? You know how they have the red, green and...?

R – Not really.

I – Or do you read any of the ingredients?

R – I sometimes read the labels but not all the time.

I – Would that be the labels for how much salt, sugar or fat; the stop sign labelling?

R – Yeah, it tells you like so much percentage for each thing, your daily allowance.

I – But you're not turning that over and reading all of the ingredients?

R – No.

I – And so then, what is sort of, what you can think of, what is in your shopping cart?

R – In a weekly shop?

I – Yeah. weekly shop

R – Veg, like onions, mushrooms, courgettes, carrots, turnips, a soup pack for fresh soup, and then it's normally like mince, chicken, steak, sometimes bacon; and then it's normally more frozen veg, like peas and sweet corn; juice, dog food, but we don't eat that (laughing)... I can't even think...

I – That's okey...

R - ....mayo, always mayonnaise every week.

I - ..and that's to make with the sandwiches?

R - ...for me to eat with everything.

I – For you to eat with everything..?

R – Yeah,

I - ..so then do you have mayonnaise with every meal then?

R – If it's roast beef and gravy no; but with most stuff, yeah.

I – Okey, not ketchup?

R – Sometimes, but no, mainly mayonnaise. Cooks from scratch

I – Okey, and then does Mum cook from scratch?

R – Normally, yeah, Mum's a good cook.

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 5/21

I – Okey, but you said she buys packaged soup mix.

R – Yeah, the packs of vegetables for soup mix.

I – Oh, the packs of vegetables..

R – Yeah, you get your turnip, carrots, onion... all that in a pack, all your vegetables, and then she'll go home and peel all that, and then add the chicken broth soup next to that, it's all like the fresh vegetable packs.

I – The chicken broth, is that homemade, or is that the tinned?

R – No, it's homemade.

(I should have asked if the chicken broth was store bought, not homemade; b/c stores can advertise something as being homemade...)

R – I won't eat tinned.

I – Okey, so then how often would you say that you bring in a ready made meal into work?

R – Once every few weeks, if that.

I – Okey, so most of the time you're bringing in stuff that's prepared?

R – Yeah, like sandwiches.

I – And just out of curiosity what kind of bread do you guys buy?

R – I hardly buy bread, it's the thins... Warburton's thins, the 50/50

I – Oh, Warburton's 50/50 fins or thins?

R – Thins, like you put the stuff in the middle and then you close it.

I – oh, is it like a pocket?

R – Yeah.

I – Yeah, okey, I think I know what you're talking about.

R – Yeah, we buy them.

I – And do those come... are they white or wholemeal?

R – We normally get 50/50 or wholemeal.. that's normally the two.

I – Okey, and then do you guys shop at say speciality food stores, such as, I know there are, there is a Chinese one, I think there's an Indian one..

R – No.

I – No. okey. And then do you order takeaway food?

R – Sometimes.

I – And how often would you say that is, once a week or once every other week?

R – Once every other week.

I – Okey, and then what kind is it? Is it Chinese, pizza, curry, fish 'n chips...?

5

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 6/21

R – A mixture we buy, it's never normally the same, it just really depends.

I – Okey, so it is a mix of Indian, Chinese, pizza...

R - ...pizza, Italian, and all them..

I – Fish and chips?

R - ...kebab, American

I – Okey. And do you consider fish and chips takeaway?

Takeaway

R – Yeah.

I – Yeah, okey, some people don't.

R – No, I do... (smiling), no that is takeaway.

I – (chortling)... And then, what reasons would you order takeaway, is it convenience, is it a treat?

R – A treat or convenience. Sometimes it is just b/c we're staying in so we'll treat ourselves, have a movie and that, but sometimes, like one of us will be busy and haven't had time to cook, so for convenience we'll just get something to eat.

I – And is that during a week night or weekend?

R – It's normally a weekend 'cuz I'm working until late.

I – Do you the 3 – 11 shift ...

R – It's just Monday through Friday, yeah.

I – But then if you're working a weekend, are you working a day shift?

R – It just depends on what shift I pick up for overtime, it can be morning or evening.

I – Okey. And then do you eat out, or go out to restaurants?

R – Once in a blue moon.

I – okey, once in a blue moon is like once every two or three months?

R – Yeah, probably, yeah. Probably like once every two months.

I – Okey, and what sort of restaurants do you go to?

R – It's normally like pub restaurants, normally like pub lunches that that sometimes.

I – Where they have specials on buffet lunches?

R – Like, Holburn bar, Weatherspoon's and that..

I – Yeah, I haven't been into Holburn bar, I've been wanting to go in but it always seems so jam-packed and it just turns me off...

R – Yeah, we normally go into the lounge bit.

I – Okey, and that's just the one down the road..?

R – Yeah, it's nice.

I – Yeah, I see guys out in the back smoking (laughing).

6

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 7/21

R – Yeah.

I – I'll have to stop in there, do they have good beers, b/c I've been looking for bars that have decent beers, not the regular stuff you get on tap...

R – I think they've got some new ones..

I – Yeah, I'll have to check that out.

R – Yeah, it's nice there and you get a nice meal as well. ... Sometimes I get bored of eating out b/c I think it's just the same frozen stuff, depending on where you go.

I – Yeah, so you prefer Mum's homemade cooking?

R – Yeah.

I – Yeah, Mum's are the best cooks, so is my Mom. And then, do you find that at the end of a meal, do you find that you're typically full, or do you find that you need to go back for seconds?

R – No, normally I'm full.

I – And do you guys normally have pudding after your meal?

R – No; once in a blue moon.

I – Okey, so it's a treat when you have it, like Christmas coming up..

R – Yeah, like she bought rice pudding for me last night, so that was a treat, but we don't normally buy puddings so that was a treat.

I – Okey, that's funny, I had rice pudding yesterday as a treat as well. (smiling)

R – Yeah, it was good, we had Marky's..

I – Marky's.. oh yeah, yeah.

R – Marks & Spencer's rice pudding, yeah it was good.

I – So then, you like Marks and Spencer, do you have an ideal food shopping place that you would like to go that you would..

R – Not really... Morrison's, I used to like going there, they've always got good stuff for your money and fresh as well for vegetables and fruit.

I – Okey, but do you ever think of what, say would be an ideal food shop?

R – No.

I – And do you ever think about what would be say, in your ideal food shopping basket? Like, if you could have anything you wanted..

R – Fillet steaks.

I – Fillet steak, okey, so Mum doesn't buy those?

R – No, we do, we've got for Christmas. But if I could eat fillet steak with veg all the time I would, I love it. It's like my favourite meal.

I – Yeah, steak is my favourite meal too, I could eat steak and eggs for breakfast probably 3 times a week.

R – Yeah, it's really good. I just like your fillet steak with onions, mushrooms and courgettes, it's so nice, it's so good. Christmas day is coming up, so that's good (smiling). I don't have to (dream?) much longer.

I – Are you off Christmas day?

R – Yeah.

I – Yay ☺ the building is going to be completely closed, isn't it. Yay!

R – (smiling, chortling)

I – Okey, so then describe for me how you... well Mum does most of the cooking, but do you help her in preparing your main meal?

R – sometimes I help, but mainly Mum.

I – What would be your main meal? Do you guys eat together during the week?

R – No, Mum works 7 'til half 2, and I work 3 till 11. So basically she's finishing as I'm getting ready to start, and then she's in her bed by the time I get home.

I – Right, so then if you guys eat a main meal together that would be Saturday and Sunday?

R – Yeah, or she will make something and I'll just have it on my own the next day for lunch.

I – Okey then, so for your main meal, would it be late afternoon, would it be like a roast, a Sunday roast?

R – Yeah, sometimes I'll have my main meal that Mum has cooked at like 1 o'clock..

I - ...During the weekday?

R – Yeah, at the weekday, and then at night I'll just have a sandwich, or like a bowl of cereal or something, 'cuz I've eaten my main meal, so I'm not hungry, but I'm hungry at supper time.

I – Okey, so is this when you get home from work?

R – No, it's at work, normally at half 7 on my break. I'll have like a sandwich or something and then that's me.

I – Okey, but you also said you'll have a bowl of cereal..

R – Soup or cereal. No, sandwich or cereal. So if I don't have a sandwich at work, I might have a bowl of cereal at work.

I – And what's the cereal?

R – Normally it's Special K.

I – Okey, and that's just cereal and milk then that you're eating?

R – Yeah, cereal and milk,

I – Okey, and when you and Mum prepare the meal on the weekend, is that time you enjoy spending together?

R – Yeah, sometimes, but it depends, b/c sometimes Mum just likes to prepare it on her own. But yeah, depending on what it is, I'll sort of help her as well.

I – okey, and then once you got the meal together... well, Mum makes everything from scratch..

R – Pretty much..

I - ...and once you guys sit down, or once you're ready to eat, do you guys sit down together?

8

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 9/21

R – Yeah, at the weekend.

I – Do you sit at the table, do you sit in front of a TV or a computer?

R – TV.

I – And then you have your meal there?

R – Yeah.

I – And is that something you enjoy? Dinner with Mum.

R – Yeah.

I – Okey, and then so after you have that meal, would you go back and get seconds, or would that be it?

R – No, that's it.

I – Okey, that's it. So what time of the day would that be on the weekend?

R – Normally 8, 9.

I - ..in the evening?

R – Yeah.

I – Yeah, okey. I don't know why I envisioned like 3 or 5..

R – Yeah, no normally, b/c Mum catches(gets up?) up with the family on a Saturday, so when she comes home from them, it's normally like anytime between 7 or 8, and then we start preparing it, between half 7 and 8 and then eat it by 9.

I – Okey, so it takes like an hour for the food preparation?

R – Sometimes yeah, and the time it cooks as well.

I – Okey. Is that like what your ideal is, or do you have an ideal in your head for how you'd like your food.

R – I'm just used to that. (smiling)

I – (chortling)... yeah, okey. And so how do you feel about the way Mum cooks, and the way you eat, b/c it sounds like she knows what you like and...

R – I'm happy with it. Even if I'm not there and she's making something, she'll always ask if I want that before she makes it. So she always gives me a choice first, so it's good (smiling).

I – Yeah, (smiling), and do you find or do you feel that there are any foods in particular that you go out of your way to find, and it can be any food that you actually like, or crave.

R – No, can't think of anything.

I – Do you feel that there are any foods in particular that you maybe try to avoid?

R – Fish.

I – Fish... b/c you just don't like the taste or the smell..?

R – No, I've gone off it since I was young, I just usually eat like scampi now.

I – Okey, scampi is... what is that, is that deep fried?

9

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 10/21

R – It can be, or battered or breaded.

I – And is that...

R – I don't like it deep fried. I don't like it in the fryer, I like it in the air fryer so it's not full of oil.

I – But I always forget what scampi is..

R – Scampi is prawns and like the crispy outside..

I – And they cut it down the middle?

R – Yeah, they can.

I – And you like it in the air fryer?

R – Yeah.

I – Is that breaded or is that... I don't know, I will have to look it up b/c I don't know sure.

R – I'm not sure, my Mum gets it from a fish place, she gets all the scampi fresh from the shop ...

I - ...a fishmonger?

R – Yeah,

I – And is that in your neighbourhood, or..

R – No, somebody comes, and she'll say how much she wants, and he'll go get it, b/c he works there, and Mum gives him the money to go get it for her. So that's good.

I – Okey, that's good, so that's the only fish you eat then..

R - ..that and scampi... (confused), No, I just said scampi. Scampi and prawns. (smiling) I eat a lot of prawns, baby prawns. I don't like big prawns.

I – (chortling). Okey, no. I love big prawns. So no mussels or any other kind of like... but you like fish 'n chips?

R – Sometimes. But I'm scared for bones so not all of the time.

I – Okey, alright, fair enough, and do you feel there are say, certain food groups that you try to avoid? And the examples here would be like sugar, soda, puddings, fats or meats.

R – I drink a lot of fizzy juice.

I – Okey.

R - ...that's probably my worst habit is fizzy juice.

I – Okey, so how much would you say you drink a day?

R – Quite a lot.

I - ...like a litre? ..or more?

R – Probably about a litre.

I – Okey, and do you eat five a day, fruits and vegetables?

R – Not really. No.

10

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 11/21

I – It's okey, I don't believe in five a day... And do you feel that... some of these questions are going to sound strange, and there is no right or wrong answer, it's just trying to understand what the public, what people eat, so do you feel you eat a high carbohydrate diet, and if you need me to describe anything..

R – Not high, no, I wouldn't say so.

I – Okey, yeah, it's just what your perception is..

R – No, I wouldn't say so,no.

I – Okey, and do you feel you eat a high fat diet?

R – Not particularly, no.

I - ..and do you feel you get enough protein?

R – Sometimes.

I – Do you guys have meat everyday? Like once a day?

R – Normally, we try.

I – What kind of sandwiches do you bring to work?

R – Tonight I have roast beef, it's normally like ham, or tuna..

I - ...I was just gonna say, if you don't like fish, do you eat tuna?

R – Yeah, tuna or egg.

I - ...tuna with mayo.. (chortling)

R – (smiling)...egg and mayonnaise, tonight it's roast beef and mayonnaise (chortling)..

I – (chortling), yeah okey, so you love mayo and fizzy drink... (smiling)

R - ...yeah

I – Yeah, I love mayo too actually, actually I really love it with mustard stirred in.

R – Yeah, that's nice. It's good.

I – Yeah, okey, and are there times when you might get the munchies or you might eat mindlessly, say when you're watching a film or watching TV?

R – Sometimes, yeah

I – Okey, and so .. sometimes, is that once a week?

R – Well it can be once a week, or sometimes it could be once every two weeks.

I – Yeah, okey..

R - ..it just depends.... My mood is also a big (thing / sign off?) when I eat like a lot sometimes..

I - ...wait, say that again..

R – Like if my mood gets low, I can see myself eating more sometimes. Or other times I won't eat.

I – Even if your mood is low? Sometimes that can cause you not to eat?

11

R – Yeah, sometimes I just don't want to eat. Or I won't … like I'll have something to eat, but nothing big or the next time I might eat like crisps and chocolate. - I should have asked if this was eating so snacks or a meal...

I – Okey. So then you eat.. well you eat with your Mum like two days a week b/c that's the weekends. And do you go out, do you meet up with friends outside, to like go out to eat? Tea - neighbours

R – Not really, no. I sometimes go around to my neighbours for like tea and that but I don't really go out much.

I – Okey, when you say tea, is that a meal? Or is that just like tea and a biscuit?

R – NO, it could be like a sandwich or..

I – Yeah, I still get confused sometimes.. what tea is..

R – Yeah, sometimes I might go around for supper at night, but other times I might go around at lunch time and have a sandwich and a coffee.

I – Okey, and so would you say that you do that once a week, once every other week, once a month?

R – Once a month. to visit his neighbour

I – Okey. And do you have an ideal in your mind, maybe going out with friends ?

R – Sometimes. Ideal - going out

I – Like, would you like to go out more with friends.. b/c I know your working schedule makes it really difficult.

R – I suppose yeah, I would. But it's good that I don't b/c then I save money. But yeah, I suppose it would be good to go out more often.

I – Yeah, like what, maybe once a week, once every other week?

R – Once every other week to once a month.

I – I remember once when I had three jobs, and I thought 'well it's good b/c all my money is going in the bank, (smiling). I can't spend any of it, b/c I'm working all of the time..' (chortling)

R - …that's it (smiling) Summer & Winter

I – Yeah. Okey, and would you say that you eat the same, or would you say that you eat differently between summer and winter time?

R – Never really noticed. Same probably. Except for when it comes to winter it's more soup for supper.

I – Yeah, okey. And are the soups meat based?

R – Not all of the times, no.

I – Some of them are vegetable.

R – Vegetable soup and that, yeah..

I - ..or cream soup.

R – Not really, no Lives to Eat or Eats to Live

I – Okey. And, I love this question, 'are you a person that lives to eat, or who eats to live? So I think the difference is a person who eats to live is somebody who eats food just b/c they have to, in order to sustain life; or a person who lives to eat is someone who loves to eat food and enjoys the pleasure of it and enjoys cooking ..

P. 12

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 13/21

R - ...probably that one.. yeah. Describe your diet

I – Yeah, okey, so lives to eat. Okey then, and how would you describe your diet?

R – All to pot. (chortling)

I – All to pot.. (smiling, chortling), why would you say that? B/c it sounds like Mum does so much of fresh cooking..

R - ..at the moment we haven't done a lot of fresh, fresh cooking.

I - ..well b/c you guys got back from holiday..

R – Yeah, but like normally, it's alright, but my diet now is just eat when I eat.

I – Okey, and so what is that, 'eat when you can eat?' Is that just, is it ready made meals or is it..

R – Sometimes I just don't eat, at the moment, just now my body clock and all that, or I won't be hungry during the day, but when I finish at 11, that's when I get a wee bit hungry and I'll go home and have something.

I – Okey, and after, do you go straight to bed after..

R – No. No BkFast

I – Okey. So then let me just back up a little then, so what time do you have breakfast, and what do you have..

R – I don't have breakfast.

I – You don't have breakfast, okey, and so then what's your first meal of the day?

R – Lunch.

I – And what times is that?

R – Between 12 and half 1, anytime between then.

I – Okey, and what would you have?

R – Whatever is in the fridge.

I – Is that anything left over that Mum's cooked

R – No, if Mum has made something, I'll have that, it might just be a sandwich, a cup of soup, or like beans on toast.

I – Okey. Fair enough, I mean that's... it's like breakfast, but not.

R – Yeah (smiling), the wrong time.

I – But what time do you wake up?

R – Between 10 and 11.

I – Okey, and then you're first meal is, you said is half 11...?

R - ..between half 12, half 1.

I – (repeats), half 12, half 1..

R – Yeah, I'm saying 12 but like, no it's normally like half 12 half 1.

13

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 14/21

I – Okey, so it's couple hours to a few hours after you wake? And then, well then do you come to work and then have your next meal at work?

R – Yeah.

I – Okey and that time is..?

R – Half 7, 8.

I – Okey, and if you're a bit peckish at home..

R – That's if I haven't eaten at work.

I – Okey, otherwise when you get home you don't normally...

R - ..Not normally, but sometimes I'll have a packet of crisps, but not often.

I – Okey, and you get home from work at like 11:30?

R - ..a quarter past 11. Ten past, a quarter past.

I – okey, so you drive a car?

R – yeah.

I – Ah, that's pretty good. Okey, so when I asked you to describe your diet and you said it's all to pot, what does that mean?

R – Like all over the place.

I – Okey, b/c nothing is..

R – It's just... I don't know..

I – Well probably b/c the...

R – Well, what happened before our holiday and that... (there was a death in the family and then the whole family went on a 9 or 10 day holiday to Las Vegas, but I felt like it wouldn't be proper to state this in the interview).

R – We've just not, properly been...

I – Yeah, and then the holidays coming up.. so things are..

R – Yeah, we've been on holiday and now we're away, going off for Christmas.

I – Yeah, and things won't get back to normal maybe 'til maybe the first week of January...

R – Yeah, after Christmas and New Year.

I – Yeah, I know, this is always a very odd time of year, so it's probably not the best time to be asking these questions (chortling).

R – Yeah, it is...

I – Okey, and, so do you think in general, so think back to earlier months, do you think you have a healthy diet?

R – Not the healthiest, but not too bad.

I – Okey, and so in your mind, what's a healthy diet?

14

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 15/21

I = interviewer

R – Fruit and veg and not overeating.

I – Okey, so do you feel you overeat?

R – Sometimes. Sometimes, or sometimes I will have like my lunch and then I will have my supper, and then like when I finish work, I might have a packet of crisps, or a biscuit. Whereas, I don't really need that after work, b/c I've already eaten.

I – Yeah okey. And do you eat it though b/c you're peckish or you just feel..

R - ...peckish, or just b/c it's there sometimes.

I – Yeah, I know some people eat when they're bored.

R – Yeah, If I'm watching TV or a movie.

I – Yeah, okey; so then if you were to then try to.. well, you just said a healthy diet would be to maybe not eat as much or maybe not eat the crisps after work, or get the munchies when you're watching TV (smiling)

R – Yeah.

I – Okey. So it would just be sort of eliminating those feed times?

R – (Nodding head yes)

I – So then, do you pay attention to information that exists out there on food, like what the media says when they talk about...

R – Not really, no.

I – Do you, okey you just said not really, but now I'm going to ask, probably what will sound like a stupid question (smiling), do you find it useful, or not useful? Which is maybe why you don't pay attention.. Or do you just Not pay attention.

R – I just don't pay attention.

I – If you wanted to... Have you ever done researching on food, or dieting or exercise?

R - ..Yeah, through a dietician..

I – Dietician?

R – Yeah, through one of them.

I – Okey, so you get your information through a ...

R – Not now, but I did.

I – Okey not now, but has there ever been a time, say when you've done a google search on what healthy eating is, or what should I be eating..?

R – No, not really, no.

I – Just, so you've really just gotten your information through the dietician, when you were seeing that person?

R – Yeah.

I – Okey. And was that just through a website, through googling?

R – No, it was in person.

15

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 16/21

I – Did you know the person, or was it like a reference from somebody?

Food Not imp.

R – Yeah, I got a ref.... like somebody set up an appointment for me.

I – Okey. And then how important would you say food is in your life?

R – Not too important, like obviously you need to eat, like keep my energy up and that, but it's not the main importance in my life.

I – Okey, now sort of moving away from food, and if you feel uncomfortable about any of the questions you can say I don't want to answer that.

R – Yeah, okey.

Body Image

I – It's on your body image. How do you feel about your body shape?

R – Not good, I don't like it.

I – Yeah, and what do you.. do you think you have a healthy body shape?

R – No.

I – Okey, what do you think a healthy body shape is?

R – A good weight, that's not too thin, but not too big either.

I – Okey, and so would you like to lose weight?

R – Yep

I – okey, and do you think that if you were to go on some journey to lose weight, do you think that would be more expensive or is there a reason ... if you were to lose weight, do you think that would be expensive to try to do?

R – No.

I – And what do you think... do you have in your mind's eye what you would do to try to lose weight?

R – More exercise...

I – Okey, and would that be going to the gym or just walking more?

R – Walking more, and not eating snacks, watching what I'm actually eating.

I – Okey, so would that be mindfulness, watching what you're eating?

R – Yeah.

I – And how important is, the choices you make in food, how important is that with respect to body image, to the shape of your body?

R - ...

I – In other words, do you think that the foods you eat affect the shape of your body?

R - ...probably, yeah.

I – Okey. We don't have much longer... So if you knew there was a strategy that worked, to lose weight, but that would involve giving up some of the bad foods, say 5 or 6 days a week, is that something you'd be willing to do? Or..

R – Maybe.

16

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 17/21

I - ...I was going to say, or do you think that might be too hard?

R – I don't know, it depends.

I – Yeah, that's fair enough, some people say no, b/c they want to be able to go out with their friends and have what they want.

R – Yeah, no, it just depends.. Desk job

I – Yeah, I think it also depends on the time of year, b/c who would want to go on a diet at Christmas (chortling).

Okey and then the type of work you do now, it's at the front desk ~~(of NCC)~~ ?

R – Yeah.

I – Yeah, I'm just saying that b/c I get everybody's pattern of work, and it's just to streamline, I know it might sound silly b/c you might be thinking, 'well you already know what I do.'

R – No it's fine.

I – So do you think that the work you're doing now, do you think that influences the way you eat?

R – Yeah, sometimes.

I - ...with the choices that you have?

R – Well just like if me and the other person who works at the front desk is having a cup of tea or coffee, we'll have like maybe a biscuit or like a fine piece.

I – What's a fine piece?

R – Like a cake. So sometimes that's not exactly maybe the best when you're just sitting there.

I – Well if he's eating something that you know is not really good for you, like he's eating chocolate, does that influence you to want to eat something.

R – Sometimes, but not all the time. It just depends.

I – Yeah, cuz if he's eating a lot of chocolate then that's not so interesting (before recording, the participant and I had just had a discussion about not liking loads of chocolate).

R – No.

I – Yeah, cuz my school.. the person who sits next to me is always offering me chocolate and that's just not interesting...

R – No, I can't eat a lot of chocolate at all.

I – Yeah. So then do you ever buy the foods here, at the school, in the cafeteria?

R - Sometimes

I – Do you think that the choices they have in the food here... What do you think of the food choices?

R – Limited.

I – (repeating) limited. Yeah, do you think they're healthy choices?

R – Not entirely, no.

I – And, this may seem a bit redundant, but the work-shift that you work, do you think that allows for good eating?

17

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 18/21

R – No.

I – No, do you think it allows for good sleeping patterns?

R – No.

I – No. And then, so if ideally, what kind work, what hours of the day would you be working?

R – Eight 'til five, or nine to five.

I – Yeah, b/c then it would be more normal.. 'cuz like what Mum is doing, and you guys would be able to spend your meals together..

R – That's it, yeah. We'd be able to go to sleep at a decent time.

I – So actually that's what would be your ideal meal, would be able to have a normal meal time.

R – Yeah.

I – And then, again, this might sound strange, outside of working hours, do you attach importance to your diet?

R – Ummm... I don't know.

I – Do you really think about your diet or what.... When I say diet, I just mean the foods you eat?

R – Not all the time, no.

I – Okey. And then, questions about where you live. Do you like where you live?

R – It's okey.

I – And, well you just said you like the food shopping there, the Tesco's, are there any other shops there you'd like to see? ...As in, some people say yeah, a Marks & Spencer's, some people say yeah, I would love to have a butcher or a baker...

R – We have a butcher, so not really.

I – Okey. There is no food shop that you'd just say, 'Oh, I want to go there!' (chortling)

R – Iceland sometimes.

I – Okey, where is the closest Iceland to you?

R – Holburn or the beach.

I – Okey, yes, I know which two you are talking about. Is there anything you could say, or would like to see to improve the area?

STRESS

R – Not really.

I – Okey, then sort of moving away from where you live and body image. Is there, would you describe the level of stress in your life as, would you describe yourself as being under stress? Or would you, do you think that you're not under stress?

R – I'm always under stress.

I – (repeating) you're always stressed.

R – Yeah.

18

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 19/21

I – And, ...can I ask why that is? Is that just your personality or..

R – Probably yeah..

I – Yeah, I think that's mine too (chortling)

R – (smiling) yeah, I always get stressed.

I – And do you, ...well earlier you were saying depending on how you're feeling, you either will more or...

R - ...not eat as much..

I - ...yeah, so the question was, 'do you feel that affects your choices in the foods you eat?'

R – Sometimes, yeah.

I – Yeah, so either more or less, yeah, just depending... I guess it just depending on what the source of that stress is...?

R - ...(nods her head yes)

SELF ESTEEM

I – And then, can you describe for me the level of your self esteem, the level of confidence you feel in yourself, would you say you have a high confidence level?

R – No.

I – (repeating) No. Okey. And do you feel that that will affect your choices in food?

R – Sometimes yeah..

I – (repeating) yeah. Sort of the same way the stress would?

R – Yeah.

I – Okey, and do you consider yourself to be financially well of, comfortable, just making ends meet, not making..

R - ...comfortable.

I – (repeating) comfortable. Okey, it allows you to purchase the things you want.

R – Yeah, yeah...

I – You pay for what you want

R – Pay for what I've got to pay for...

I – Yeah, the foods that both you and Mum... yeah, to purchase the foods you want and then maybe whatever luxury items you want in the home.

R – (nodding yeah)

I – And right, so then being comfortable, yeah.. well I was just going to ask, 'As a result of this, do you think that the choices that you make in the quality of food are affected, by being comfortably financially well-off, or financial comfortable..?

R - ...what was that again, sorry?

I - ...well, we sort of already said it, it was, 'As a result of being comfortable do you think the choices you make in the food are affected?'

P.19

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 20/21

R – I don't know. I just get what I want and.. I'm always like if I need to get something I'll always get it, no matter what, and then if I want something that is over expensive or ...and I see what money I've got, you just don't get it..

I – Yeah, or maybe save up?

R – Yeah.

I – Okey, and really the last question is, do you feel you have a support network of family and friends that are there for you when you need them?

R – Yeah.

I – And that is the last question, but I just want to say, is there anything that you would like to add with respect to food or whatever, or anything else that affects the way you eat, maybe something I haven't mentioned...

R – Just when my mood is low, and I'm like depressed or whatever, that can sometimes make me put on a lot of weight, b/c I just want to be on my own and that's when I comfort eat, so that affects me quite bad if I'm eating.

I – Yeah, is... does Mum go away? Is she around all the time or does she go away sometimes and your mood will drop?

R – Um.. Mum's normally always there

I – Okey, and so your mood will... Do you know what affects your mood? Are there, like are there precursors that you know something that might trigger...

R - ...not sleeping properly or just ... I don't know, if I get stressed then my mood goes down.

I – Yeah, yeah.. and that's something... I understand it, but I'm trying to understand it better from somebody I know who suffers from it more, 'cuz I know people who do and in myself, I know when, sometimes I know what the trigger is, and other times I just don't.

R – I eat like... the trigger can be a lot of things, sometimes there doesn't even have to be a trigger for my mood to go down, it's with 'psychotic depression', so like that's basically like my mood just goes right down to the bottom, and then they have got to try and get it up, so like it will go down a wee bit, but normally when my mood goes down, it hits the bottom.

I – Yeah. And then is that when sometimes you are just eating comfort foods?

R – Yeah, I like to be on my own and just... like I'll sit, and if I eat like chocolate crisps, stuff like that, yeah...

I – Is that comfort food, chocolate crisps?

R – Yeah, comfort food.

I – Would you consider like macaroni and cheese comfort food?

R – No.

I – (repeating) No. Um.. those meat pies?

R – Not really, no.

I (interviewer) - ...everybody has a different idea of comfort food, but it's mostly...

R - ...for me it's chocolate or crisps (this is interesting that she says choc. is a comfort food b/c earlier she said it's not very interesting – but that might be when she's in the presence of people she doesn't find it interesting.)

I – Okey, would it also be the bubbly drink... the fizzy drink.?

R – No, I drink that anyway.

20

Appendix 15 cont'd: Semi-structured interview, example of Stage 1 of analysis pg. 21/21

I – Yeah okey

R – Yeah, no I drink that anyway.

I – Alright. Well thank you so much for your time, I really appreciate it.

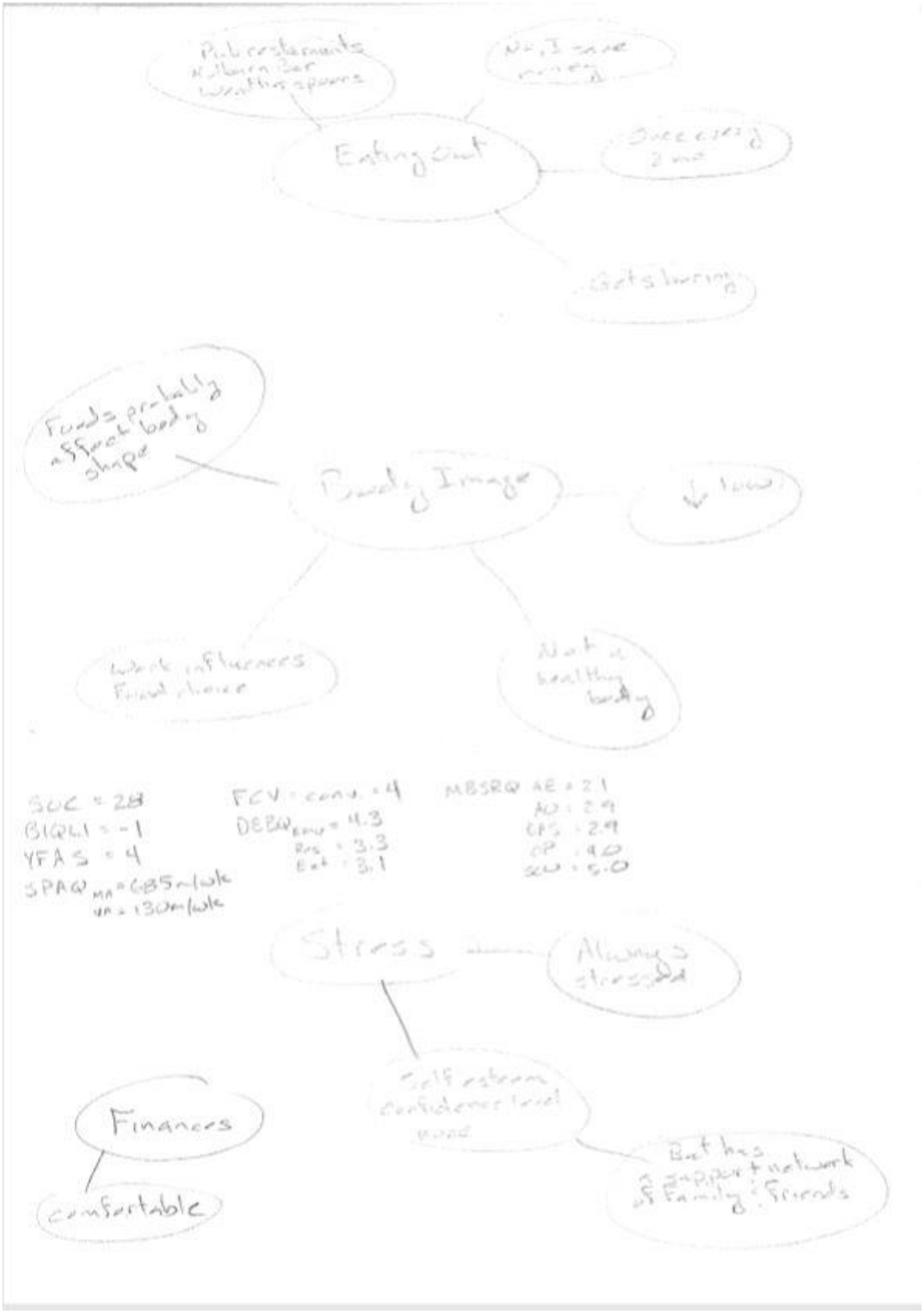
R – That's no problem at all (smiling).

Tape stopped at 50m20s.

Appendix 16

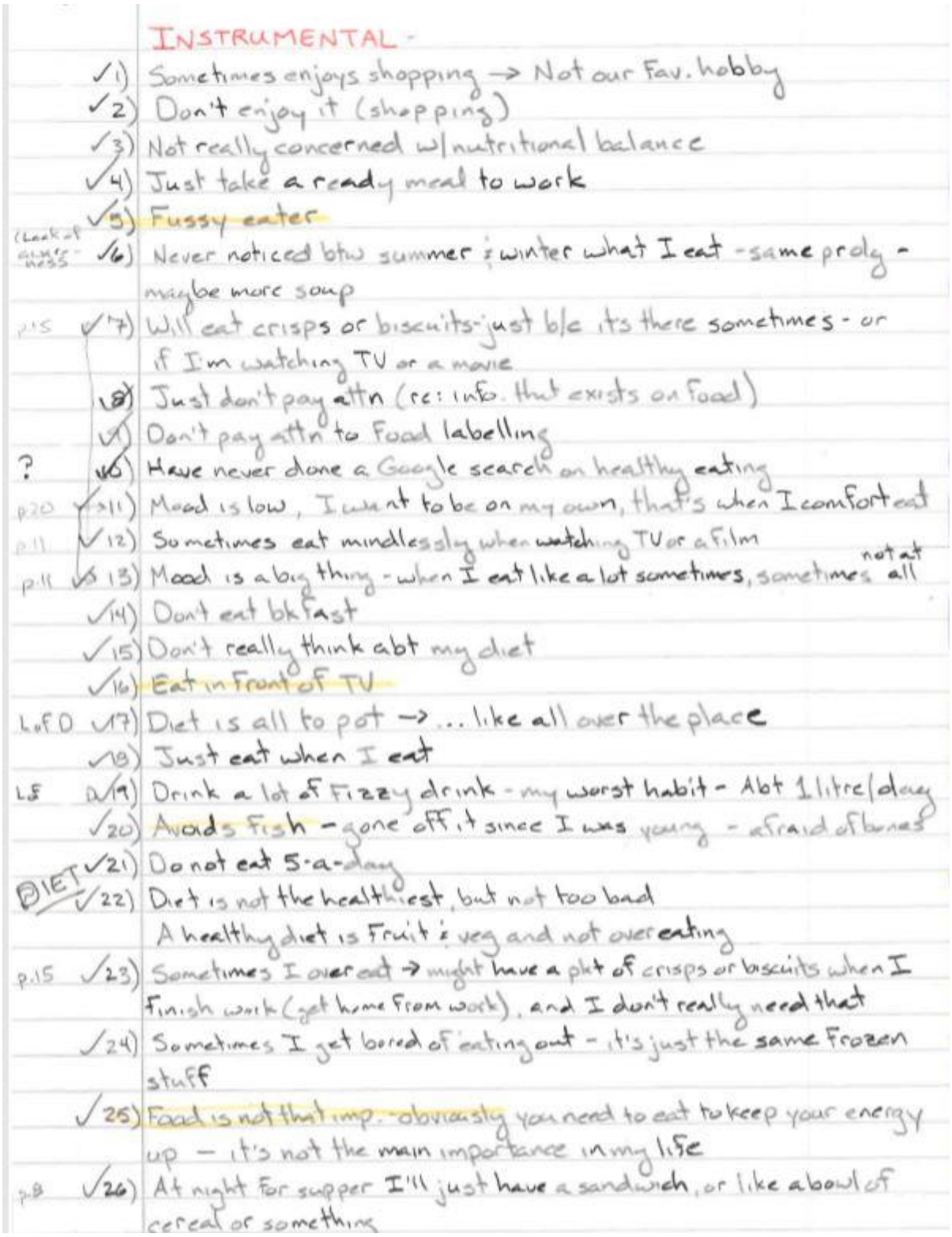
SSi, example of second stage of analysis- Flow diagram, p. 1 of 2

Appendix 16 continued: SSi, example of second stage of analysis- Flow diagram, p. 2 of 2



Appendix 17

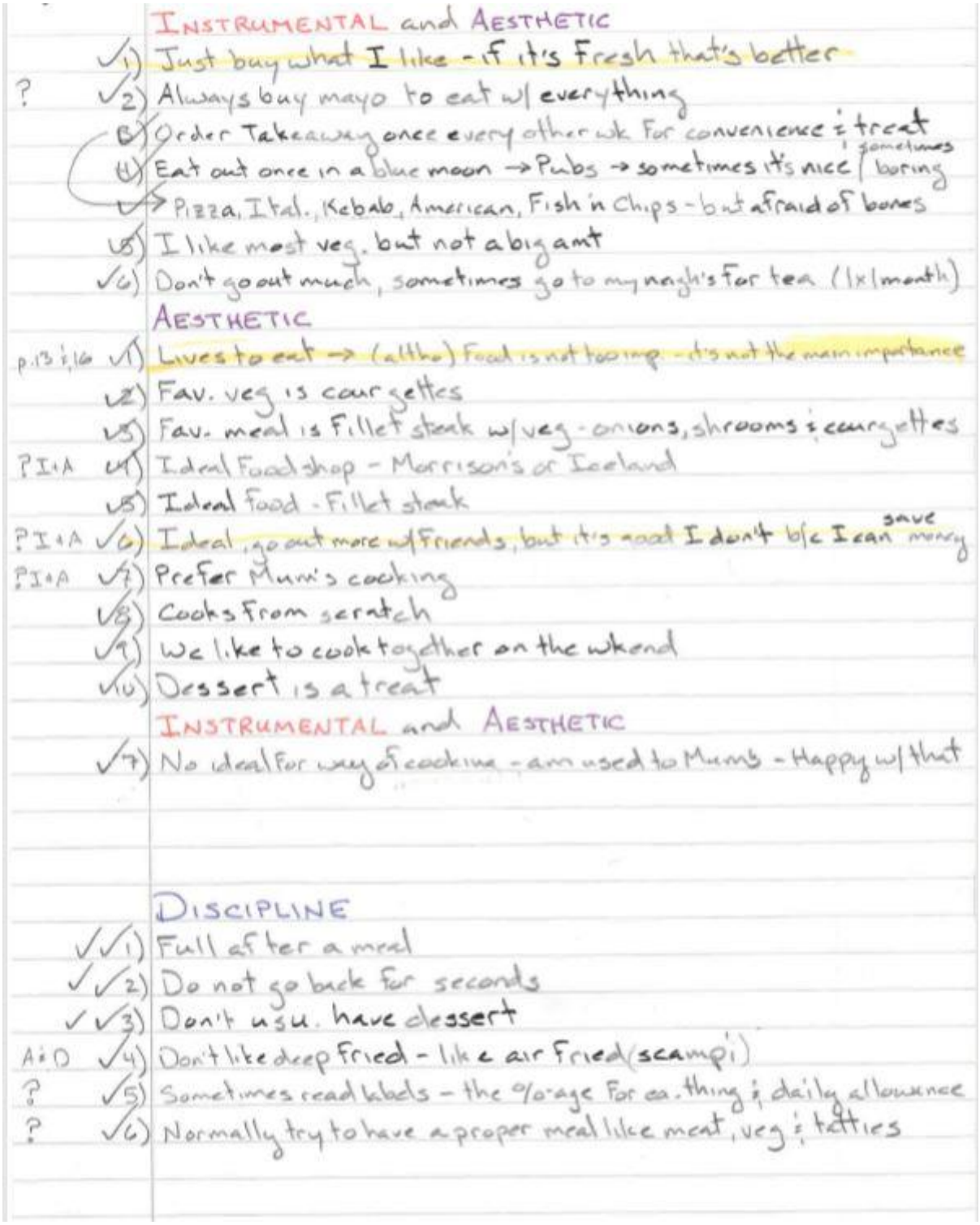
Semi-structured interview, example of third stage of analysis-List (page 1 of 4)



INSTRUMENTAL -

✓1) Sometimes enjoys shopping → Not our Fav. hobby
✓2) Don't enjoy it (shopping)
✓3) Not really concerned w/ nutritional balance
✓4) Just take a ready meal to work
✓5) Fussy eater
(Lack of ✓6) Never noticed btw summer & winter what I eat - same prolg - maybe more soup
p.15 ✓7) Will eat crisps or biscuits - just b/c its there sometimes - or if I'm watching TV or a movie
✓8) Just don't pay attn (re: info. that exists on food)
✓9) Don't pay attn to Food labelling
? ✓10) Have never done a Google search on healthy eating
p.20 ✓11) Mood is low, I want to be on my own, that's when I comfort eat
p.11 ✓12) Sometimes eat mindlessly when watching TV or a Film
p.11 ✓13) Mood is a big thing - when I eat like a lot sometimes, sometimes not at all
✓14) Don't eat bkfast
✓15) Don't really think abt my diet
✓16) Eat in Front of TV
LoFD ✓17) Diet is all to pot → ... like all over the place
✓18) Just eat when I eat
LF ✓19) Drink a lot of Fizzy drink - my worst habit - Abt 1 litre/day
✓20) Avoids fish - gone off it since I was young - afraid of bones
DIET ✓21) Do not eat 5-a-day
✓22) Diet is not the healthiest, but not too bad
A healthy diet is Fruit & veg and not over eating
p.15 ✓23) Sometimes I over eat → might have a pkt of crisps or biscuits when I finish work (get home from work), and I don't really need that
✓24) Sometimes I get bored of eating out - it's just the same Frozen stuff
✓25) Food is not that imp. - obviously you need to eat to keep your energy up - it's not the main importance in my life
p.8 ✓26) At night for supper I'll just have a sandwich, or like a bowl of cereal or something

Appendix 17 Semi-structured interview, example of third stage of analysis-List, (page 2 of 4)



INSTRUMENTAL and AESTHETIC

✓1) Just buy what I like - if it's fresh that's better

? ✓2) Always buy mayo to eat w/ everything

✓3) Order Takeaway once every other wk For convenience & treat

✓4) Eat out once in a blue moon → Pubs → sometimes it's nice / sometimes boring

✓5 → Pizza, Ital., Kebab, American, Fish 'n Chips - but afraid of bones

✓6) I like most veg. but not a big amt

✓6) Don't go out much, sometimes go to my neigh's for tea (1x/month)

AESTHETIC

p.13 & 16 ✓1) Lives to eat → (altho) Food is not too imp - it's not the main importance

✓2) Fav. veg is courgettes

✓3) Fav. meal is Fillet steak w/ veg - onions, shrooms & courgettes

?I+A ✓4) Ideal Food shop - Morrison's or Iceland

✓5) Ideal food - Fillet steak

?I+A ✓6) Ideal, go out more w/ Friends, but it's good I don't b/c I can save money

?I+A ✓7) Prefer Mum's cooking

✓8) Cooks from scratch

✓9) We like to cook together on the wkend

✓10) Dessert is a treat

INSTRUMENTAL and AESTHETIC

✓7) No ideal for way of cooking - am used to Mum's - Happy w/ that

DISCIPLINE

✓✓1) Full after a meal

✓✓2) Do not go back for seconds

✓✓3) Don't usu. have dessert

A+D ✓4) Don't like deep fried - like air fried (scampi)

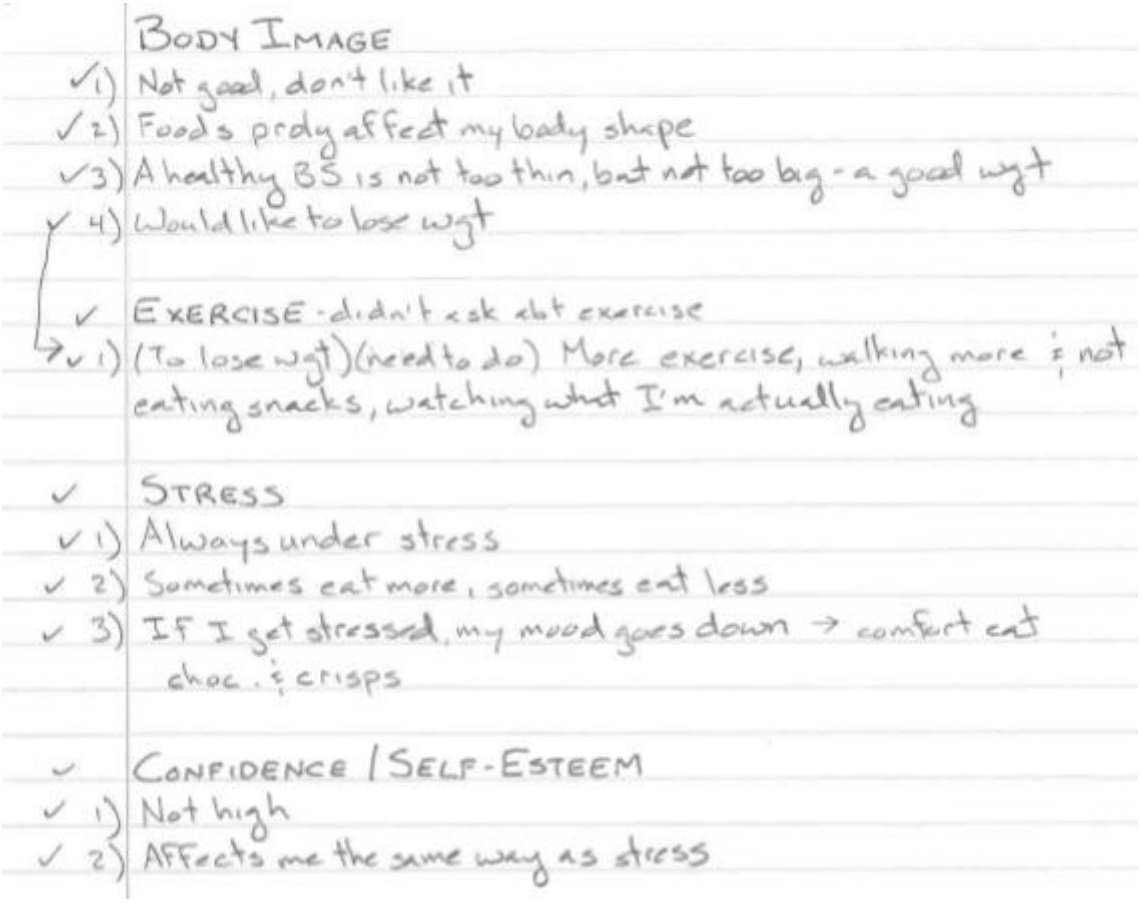
? ✓5) Sometimes read labels - the %-age For ea. thing & daily allowance

? ✓6) Normally try to have a proper meal like meat, veg & tatties

Appendix 17 Semi-structured interview, example of third stage of analysis-List, page 3 of 4)

Desk job (sitting) - influences the way I eat - biscuit or cake or choc.
✓ 1) Does not allow for good eating - would prefer a 9-5 job (or sleeping)
✓ 2) Ideal meal - to have a normal meal time
✓ 3) Food choices @ wk are ltd. - not entirely healthy
✓ 4) Sometimes buys meals @ work
✓ SHOPPING
✓ 1) Tesco's
✓ 2) It's closer and has the best stuff
✓ 3) Weekly
✓ 4) Just get what's fresh - Fresh veg
✓ 5) Will buy 2 F. I and Freeze ... (Value for money)
✓ 6) Don't shop @ Specialty Food stores
✓ 7) Shops w/ Mum - sometimes we influence ea. other - Mum doesn't like buying snacks, but sometimes I'll get to buy some
✓ 8) Drives
Basket Contents: Veg - onions, shrooms, courgettes, carrots, turnips, soup peck (veg) For Fresh soup. Meat - mince, ckn, steak, sometimes bacon. Frozen peas & sweet corn, juice, mayo. Fishmonger - sm. shrimp
✓ 9) No list, buy what we think we need
✓ FOOD LABELLING / MEDIA
✓ 1) Don't really pay attn to Food labels
✓ 2) Sometimes I read the labels - the %age of ea. thing & daily allowance
✓ 3) Re: Media - Don't pay attn to info abt Food or what the media says
✓ 4) Have never done a Google search on healthy eating
✓ 5) Learned abt dieting/exercise thru a dietician - she was a referral

Appendix 17 Semi-structured interview, example of third stage of analysis-List, (page 4 of 4)



BODY IMAGE
1) Not good, don't like it
2) Foods prdy affect my body shape
3) A healthy BS is not too thin, but not too big - a good wgt
4) Would like to lose wgt

EXERCISE - didn't ask abt exercise
1) (To lose wgt)(need to do) More exercise, walking more ; not eating snacks, watching what I'm actually eating

STRESS
1) Always under stress
2) Sometimes eat more, sometimes eat less
3) IF I get stressed, my mood goes down → comfort eat choc. ; crisps

CONFIDENCE / SELF-ESTEEM
1) Not high
2) Affects me the same way as stress

Appendix 18

RGU Bulletin and Gumtree advertisement

Food, health and contemporary living

This study seeks to gain a more comprehensive understanding of how living in an urban society influences biological and social aspects of body weight and wellbeing. Join us by volunteering and help us to understand the interactions between modern day living, food and health.

We are looking for volunteers, between the ages of 20-40, who are willing to give up about 2 hours of their time, answer some questionnaires, take part in a semi-structured interview, have a 3-D body scan and give a blood sample (and will be gifted a £15 gift voucher for your participation).

For further information, please contact: Rachael Sibson at r.h.sibson@rgu.ac.uk or you can phone at 07434 754 623.

Appendix 19

Power Point Poster for advertisement of recruitment

Appendix 20

Basic Measurements

Basic Measurements:

Subject ID: _____

Country: _____ Sex: _____ Sport: _____

Date of Measurement: _____/_____/_____ Measured by: _____

Age: _____

Consent Form: _____ (tick when recv'd) POST CODE: _____

	1st msr	2nd msr	
Body mass (kg):	_____	_____	
Stretch stature (cm):	_____	_____	
Sitting Height (cm):	_____	_____	
Waist gth min (cm):	_____	_____	
Gluteal gth max (cm):	_____	_____	
S.A.D. (cm):	_____	_____	
Arm span (cm):	_____	_____	
Full Body Scan:	_____	_____	Make 2 Landmarks |

Bod pod%: _____

Bio-electrical impedance%: _____

Blood pressure: Sys/Dia _____

Blood collection: _____ (tick when done)

Appendix 21

Example of SSi analysis of Study 2 IDA Motif/Headings itemisations (page 1 of 3)

DISCIPLINED with a strong aesthetic (and symbolic) attitude towards food and understanding its importance in her life, as she says herself when I asked her: How important is food in your life – "Very important.. I think it's first, because, I think in my family it's very important, I think it always has been something important I think it's not just about eating healthy, it's not only about health. Umm... for me it's also about, b/c my Mom is French and my Dad is Spanish, and my grandmother cooked a lot of Spanish meals for me, it's also a way of knowing my Spanish relatives" (It's a way of connecting to the Spanish side of your family) "Yeah, exactly, and I think it's very important about socialising" (L510-24). And also "I think it depends on the personality of.. b/c if the.. someone finds that (it is) important to eat healthy then it would be important for him or her to follow a healthy diet. But I think for some people, eating is important just to enjoy their life" (L535-55). Organic and local foods are important to her as well which is also reflected in her FCV Org = 5.0.

Very interesting however, although she has a symptom count score of 1, she is borderline for FA and a sym. Count score of 4. DEBQ Res = 1.8, Emo = 2.9, Ext = 4.3, DE = 3.8, CLE = 2.7 (the DE score is congruous with what she says during the interview that she mindlessly eats when she's bored)

(What is written in brackets is either a suggestion/question I've made, or it can also mean a clarification on some aspect of the participant's answer)

DISCIPLINE

-(Re: Do you go with a shopping list) Yeah (L51) (Always) Yeah, because I try to see how much I will spend, so I look on my list. Yeah I write beside the list how much money I spend (L53-4)

- I don't eat meat. I'm vegetarian.. (And I don't eat fish) No (L82-4) … I eat eggs and dairy sometimes, but I try to reduce dairy (L82-88)

- (Re: are you vegetarian b/c you think it's healthier) it's first for the animals, umm.. yeah, and it's also.. I try to reduce dairies because I think that it is the lactose that makes me itchy, scaly (L94-5)

- (Re: Influencers) - Yeah, sometimes I look at the ingredients, if it's something I don't know. It's because I have a list, I usually follow my list (L106-7)

- (Re: when you are shopping with your boyfriend, how does that differ; does it change what you have written on the list) - no, b/c I do the list for what I will eat, and he does not do a list (L135)

- (Re: Food labelling/packaging) - Yeah, usually I look (to see) if there is lots of sugar in the food (L140)

- I buy the (raw) ingredients and then I cook them (from scratch) Yeah (L147-9)

- (Do you ever buy packaged food, packaged meals) - rarely, very rarely (L151) ..I think once a month (L153)

- (Re: How do you prepare your main meal) - Usually, before I go shopping, I try think to think about what I eat during the week. Umm and after, I usually know what I do for the day and the next day (L263-4)

- I try to do a big dinner so that I can have for my lunch the next day (L266)

- (Re: Eating breakfast) Yeah.. around 8 .. I usually have eggs or.. I generally have eggs or I have fruit and yoghurt (L323-30)

Appendix 21 Example of SSi analysis of Study 2 IDA Motif/Headings itemisations (page 2 of 3)

- (Re: Do you eat lunch) - Yeah.. 12 or 1.. I bring my lunch (to school, something I made at home) .. It would be, yeah pasta with veg and beans or rice and lentils. It would be usually what I eat for dinner, I will make bigger and keep for my lunch (L332-39)
- (Re: How do you feel about the way you're eating) - I think that I eat healthy (L353)
- (Re: Are there any foods you try to avoid, you said sugar earlier) – Yeah, I do (L357) (what about fat) no. I try to, but it's not since a long time, I think that's it's in the last 6 months that I have really changed my diet. I try to replace butter by coconut oil or something else… I use mostly, a lot of olive oil and rapeseed oil and coconut for when I bake (L359-67)
- (You don't drink soda or bubbly drinks) No (L371)
- (Re: Eating 5-a-day) - I think so, I don't look if I eat how many (don't pay attention) No, 'cuz I think I eat enough (L375-77) (so some days it could be more than 5) Yeah (L379)
- (Re: How would you describe your diet) - I think it's very healthy (L453)
- (Re: A healthy diet consists of) - I think it's, it has to include fruit and veg and I think after, it's also good fats like olive oil and I think it depends on where you are from (L457-58) (would that mean buying local produce from where you are) Yeah, or the type of fruit or spices.. and I think it's a lot about the type of fat (L459-63) (do you buy any processed oils, processed fats) I try to buy virgin olive oil (extra virgin) Yeah (and extra virgin coconut and rapeseed) Yeah (L465-73)
- (Re: Do you eat food here on campus) - No, I always bring the lunch (L604)

AESTHETIC

- (You enjoy food and you enjoy exploring new foods) Yeah (L117) .. I enjoy cooking (L285) - Yeah, I do (enjoy shopping) (L69-70) ..Yeah, I like (going w/my boyfriend), but I prefer going on my own (L72) Yeah, if there is something new or unusual or that I don't know, I like to try (L112)
- (Re: Eats to live or Lives to eat) (Lives to eat) Yeah, I really enjoy food (L419)
- (Re: Do you attach importance to your diet whether you're a student, whether you're working.. or whether you're just outside of work or outside of school, food is important regardless of.. is that true) - it's true most of the time, but when I'm going out I don't think about eating healthy, I just think about enjoying the time with my friends (L614-5)

AESTHETIC/DISCIPLINED

- (Do you look for value for money) - Yeah, most of the time, sometimes I prefer choosing the quality or if something is organic (L56) (Organic and the quality of the food is important to you) Yeah (L58)
- (Re: what influences you to write down the foods you do on the list) - it's b/c I want to be healthy and b/c I like trying new recipes (L110)
- (Re: Restaurants) - No, very rarely (L180) I think like once every two months, or once a month (L182)- (go) With my boyfriend or with friends.. (as a social thing) Yeah (L184-6) . usually we go in a pub.. yeah, most of the time (L189-93)
- (Re: Ideal food in trolley) - (would be organic and local produce) Yeah (L246) (Or chocolate bars and wine) yeah, it would be both I think (smiling), yeah, b/c I really enjoy the very dark chocolate, and usually I buy some wine, the weak one (L248-9) I like very dark chocolate, the 70 – 80% (L252)

Appendix 21 Example of SSi analysis of Study 2 IDA Motif/Headings itemisations (page 3 of 3)

- (Re: You said you cook from scratch, you don't really do ready-made meals) – No (L287) (do you make your own pasta sauce or buy a jar of sauce) I buy tomatoes.. and then flavour it with herbs and spice (L288-94)
- (Re: Where do you eat the meal)- at the table. We don't have a TV.. I put music on my iPhone (L299-301)
- (Re: How important is food in your life) - Very important.. I think it's first, because, I think in my family it's very important, I think it always has been something important I think it's not just about eating healthy, it's not only about health. Umm... for me it's also about, b/c my Mom is French and my Dad is Spanish, and my grandmother cooked a lot of Spanish meals for me, it's also a way of knowing my Spanish relatives (It's a way of connecting to the Spanish side of your family) Yeah, exactly, and I think it's very important about socialising (L510-24) - (Do you think it's also important b/c it creates umm sort of a healthy mind set too) yes, I think that's true (L530)
- I think it depends on the personality of.. b/c if the.. someone finds that (it is) important to eat healthy then it would be important for him or her to follow a healthy diet. But I think for some people, eating is important just to enjoy their life.. ...or make our own choice I think.. b/c once we leave the home to eat what we really want (right, once you leave home, you've got to make your own decisions on what foods you're going to eat) Yeah (L535-55)

INSTRUMENTAL

- (Re: Mindless eating) - Yeah, usually it is more when I stay all day at home, that I eat more (L381) ... that will, aaa, chocolate yeah. Usually if I read or, if I watch a video every day, or if I read I'll have something (L389-90)

INSTRUMENTAL/AESTHETIC/DISCIPLINED

- (Re: Takeaway foods) -...Sometimes, we, I think around once a week, pizza.. it's mostly pizza (L169-71)- ...b/c it is convenient, and usually it is also to share the meal with our flatmate (L174) (like a friendly social thing) Yeah (L175-8)

SYMBOLIC

- (Re: Where you shop and why) - also with Cochran the veg bag at uni (L9-11) ...b/c it's organic and local producers (L15-9)
- (Re: Shopping for value for money) sometimes I prefer choosing the quality or if something is organic (L56) (Organic and the quality of the food is important to you) Yeah (L58)
- (Am willing to pay for organic) Yeah (L78-9) - In the eggs.. (am willing to pay more) (L82)
- (Re: are you vegetarian b/c you think it's healthier) it's first for the animals, umm.. yeah (L94-5)
- I prefer going to the market or going to LIDL (for vegetables) .. LIDL has like a sale where they have organic food or local food (L237-9)
- (Re: Ideal food in trolley) - (would be organic and local produce) Yeah (L246)
- (Re: How important is food in your life) - Very important.. I think it's first, because, I think in my family it's very important, I think it always has been something important I think it's not just about eating healthy, it's not only about health. Umm... for me it's also about, b/c my Mom is French and my Dad is Spanish, and my grandmother cooked a lot of Spanish meals for me, it's also a way of knowing my

Spanish relatives (It's a way of connecting to the Spanish side of your family) Yeah, exactly, and I think it's very important about socialising (L510-24)

Appendix 22

Appendix 22 - Study 2 BMI questionnaire analysis (approx. 46 pages)

Multidimensional Body-Self Relations questionnaire-Appearance Scale (MBSRQ-AS)

The MBSRQ-AS explored subjective aspects of body image through 5 different scales: appearance evaluation, appearance orientation, body area satisfaction, overweight preoccupation and self-classified weight. The data obtained from submitting this questionnaire to the participants in this study showed a non-normal distribution. Results for each scale are reported as median and interquartile range and shown for each BMI group in a radar diagram (Figure 1).

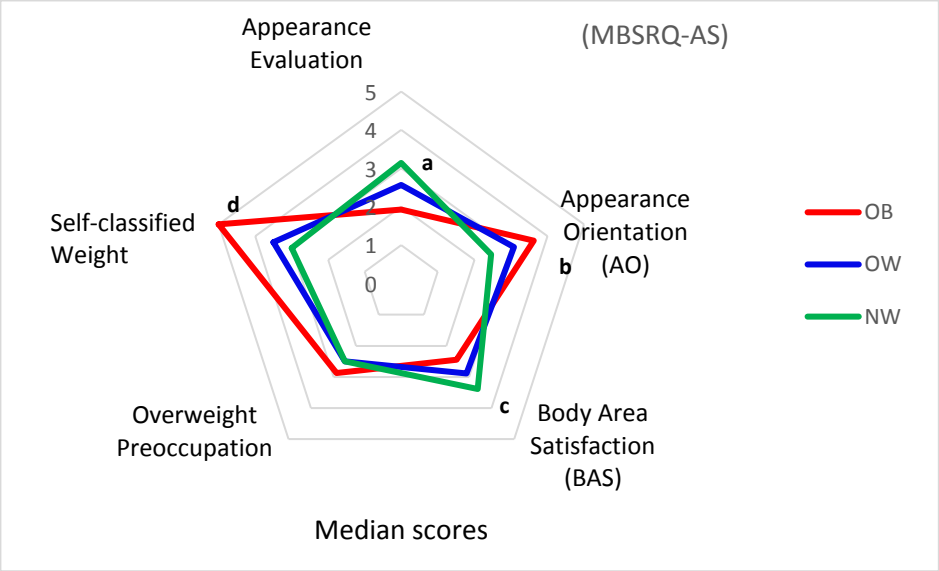


Figure 1 MBSRQ-AS median scores for each BMI group.
a: significant difference between the NW and OB (U = 28.00, z = -2.47, p = 0.014);
b: between the NW and OB (U = 36.00, z = -2.00, p = 0.05); **c**: between NW and OB (U = 21.50, z = -2.85, p = 0.004), and between the NW and OW (U = 39.50, z = -2.06, p = 0.04);
d: between NW and OB (U = 0.00, z = -4.30, p < 0.001), between the NW and OW, (U = 24.00, z = -3.14, p = 0.002), and between the OW and OB (U = 13.00, z = -3.05, p = 0.002).
Cronbach alpha for each scale was as follows: AE α = 0.94, AO α = 0.88, BAS α = 0.87, OP α =0.68 and SCW α = 0.91. Neutral scores for the following scales AE, AO, BAS (above 2.5 and below 3.5) are indicative of neither agreeing nor disagreeing with the questions pertaining to that scale.

Appearance evaluation scale (AE)

Regarding the AE scale the OB group had the lowest median score (1.93 ±1.68) compared to OW and NW groups (2.57 ±1.86, and 3.14 ±0.75, respectively). There was a significant difference in scores between the OB and NW (p = 0.01). Significance was not quite reached between the NW and OW (p = 0.07), and no difference was observed in scores between the OW and OB. Scores 3.5 and above indicate positive feelings and satisfaction with appearance. Scores 2.5 and below

indicates a general unhappiness with physical appearance. Scores greater than 2.5 and less than 3.5 are indicative of neutral feelings (i.e. neither agree nor disagree) about a particular aspect of body image, for all scales except for overweight preoccupation and self-classified weight.

These results differ slightly from the first study where the OW group had the highest score, followed by the NW group. Additionally, there was a significant difference observed between OW and OB, and NW and OB groups.

Appearance orientation scale (AO)

The AO scale: the NW group had a lower score (2.46 ±1.46) compared to the OW (3.08 ±1.67) and OB (3.63 ±0.60) groups. There was a significant difference between the NW and OB group's scores (p = 0.05). There were no significant differences between the NW and OW or between the OW and OB group's scores. Scores 2.5 and below are representative of individuals feeling indifferent about their appearance, and therefore would not spend much time or energy 'fixing' their appearance in front of a mirror. Scores above 3.5 are suggestive that these individuals invest time in their appearance through body-checking and looking in a mirror. Neutral score ranges are above 2.5 and below 3.5 and are suggestive of neutral feelings about one's appearance.

In study 1 there were no significant differences found between any of the BMI groups, however, there was an opposite trend among the OB and NW groups, where the OB group scored the lowest, and the NW group scored the highest value. However, the OW group had a similar score to those (OW) in the first study

Body area satisfaction scale (BAS)

Regarding the BAS scale, the NW group had a higher score (3.39 ±0.72) compared to the OW (2.89 ±1.33) and OB (2.44 ±0.83) groups. There was a significant difference between the NW and OB (p = 0.004), and between the NW and OW group (p = 0.04), but not between the OW and OB groups. Scores below 2.5 are suggestive that these individuals are somewhat dissatisfied with discrete aspects of their body, (such as height, weight, muscle tone, upper, mid and lower torso, hair, face and overall appearance), and that they experience a general unhappiness or discontent with their size and/or appearance. Scores of 3.5 and above indicate being generally pleased with most discrete aspects of the body. Although the NW group scored higher than the OW group, based on how these scores are interpreted, both group scores lay within the neutral range (i.e. above 2.5 and below 3.5) suggesting that both NW and OW participants experienced neutral feelings about discrete aspects of their body and overall appearance. In contrast, the OB group had a

significantly lower score, suggesting they experienced dissatisfaction with discrete aspects of their body and overall appearance.

Compared to the first study, study 2 results share a similar pattern where the NW and OW group both scored in the neutral range and the OB group scored below the cut-off value of 2.5.

Overweight preoccupation scale (OP)

Regarding the OP scale, the NW and OW scored identically (2.50 ±1.63 and 2.50 ±1.25, respectively) and OB scored similarly (2.88 ±1.81). No significant differences were observed between scores. Scores between 2 and 3 are suggestive that individuals 'rarely' to 'sometimes' experience feelings of fat anxiety (i.e. worrying about small changes in weight and/or fear of being fat or becoming fat). These individuals may also have rarely to sometimes employed eating restraint and vigilance and/or dieting in trying to maintain her/his weight.

The first study, the OB group scored significantly higher than the OW and NW group. However, between the OW and NW, scores were also very similar to the scores found in this second study.

Self-classified weight scale (SCW)

The OB group's score 5.00 (±0.5) is indicative that they see themselves as being very overweight and they believe that other people see them as being very overweight. The OW group scored 3.50 (±1.5), hence, they see themselves as being between normal weight and somewhat overweight and feel other people see them this way as well. The NW group scored 3.00 (0) which suggests that they all see themselves as normal weight and feel that other individuals also see them as normal weight. There were significant differences observed among all BMI groups' scores: between NW and OB ($p < 0.001$), the NW and OW ($p = 0.002$), and OW and OB ($p = 0.002$).

Similar results were found in study 1, however, in the first study no significant difference was observed between NW and OW groups' scores.

The overall scores for all 35 participants in this second study are lower compared to scores reported in a US study by Cash (2000), who explored body image salience in over 2000 US adults (15 to 74 years) (Table 1).

Table 1 MBSRQ-AS scores in a US population (adapted from Cash 2000).
US values reported as mean ±SD, compared with this current study's 35 participants' values as median ±IQR.

MBSRQ-AS scale	Male	Female	Current study, n = 35
AE	3.49 ±0.83	3.36 ±0.87	3.00 ±1.57
AO	3.60 ±0.68	3.91 ±0.60	3.25 ±1.50
BAS	3.50 ±0.63	3.23 ±0.74	3.11 ±1.22
OP	2.47 ±0.92	3.03 ±0.96	2.50 ±1.25
SCW	2.96 ±0.62	3.57 ±0.73	3.50 ±1.50

US population age range, 15-74 years. AE, AO and OP scales, n = 2066, of which F: n = 1070 M: n = 996. BAS and SCW scales, n = 1139 of which F: n = 804 and M: n = 335.

Higher scores by the American participants suggest that they experienced, overall, better body image feelings compared to the participants in our study. Whereas, the 35 participants in this study, overall, experienced more neutral feelings around body image aspects. (These comparisons and outcomes are nearly identical as the first study).

In comparison to European Americans [aged between 18 to 49 years, BMI ranged from 17.0 to 37.4 (23.6 ±3.8 kg/m^2)] (Miller et al. 2000), although they also had overall higher scores, suggesting they experienced a more positive body image salience, compared to our participants, scores from both studies lie in the neutral range (between 2.6 and 3.4). The only scale where the European Americans scored much higher (4.51 ±0.63), was the AO scale, compared to our participants' score (3.25 ±1.50). This higher score suggests that they engaged in more body checking and were more likely to fix themselves in front of a mirror 'often to very often' (Table 2).

Table 2 MBSRQ-AS scores in European Americans.
(adapted from Miller et al. 2000) US mean ±SD compared with current study's median ±IQR.

MBSRQ-AS scales	European American n = 40	Current study n = 35
AE	3.46 ±0.76	3.00 ±1.57
AO	4.51 ±0.63	3.25 ±1.50
BAS	3.42 ±0.70	3.11 ±1.22
OP	2.24 ±1.00	2.50 ±1.25
SCW	3.27 ±0.51	3.50 ±1.50

These results are identical to the results from the first study. Which suggests that overall, both studies (1), 29 and (2), 35 participants scored nearly the same as the European Americans on body image scales as measured by the MBSRQ-AS instrument. However, it is interesting that the European Americans scored higher for the appearance orientation scale, suggesting that

European Americans are a lot more concerned with their overall physical appearance because they were carrying out more body checking and investing more time in their appearance.

In a study by Hrabosky et al (2009) exploring body image salience in men and women (n = 17 and n = 39, respectively), who suffered from BDD (body dysmorphic disorder, n = 56), and eating disorder bulimia nervosa (BN, n = 26)., using 3 scales from the MBSRQ-AS questionnaire.

When we compared the OB group in our study to Hrabosky et al. (2009), we observed for the AE scale, the OB group had a lower score (1.93 ±1.68) compared to the BDD (2.23 ±0.85) and the BN (2.22 ±0.81) participants, suggesting that the OB group experienced a lower body image and more body dissatisfaction compared to individuals who suffered from body dysmorphia disorder or bulimia nervosa. However, for the BAS scale, the OB group scored similarly (2.44 ±0.83) to the BDD (2.05 ±1.09) and the BN (2.31 ±0.93) participants, which suggests that the OB group experienced similar body dissatisfaction with discrete aspects of their body in a similar manner as those who suffered from BDD or BN disorders. Regarding the OP scale, the OB group scored (2.88 ±1.81) similarly to the BDD (2.81 ±1.09) group, but not as high as the BN group (4.13 ±0.67). This suggests that the OB and BDD groups experienced similar, i.e. 'rarely to sometimes' fear around issues of weight, weight gain and/or fat anxiety. However, the BN group experienced these issues more often than the OB group in this study (Table 3). (This pattern is nearly identical to the first study).

Table 3 MBSRQ-AS scores body image in eating and body-dysmorphia, disorders.
(adapted from Hrabosky et al. 2009). Scales AE, BAS and OP. Values reported as mean ±SD, compared with current study median ±IQR values.

Participants	**BDD** F & M n = 56	**Bulimia N.** F: n=26	**Current Study** n = 35	**OB** n = 10	**OW** n = 11	**NW** n = 14
Age (years) 30.7 ±11.1	29.8 ±10.0	26.7 ±8.7	27.4 ±5.8	30.6 ±6.3	28.1 ±5.5	24.6 ±4.7
BMI (kg/m²)	22.4 ±3.2	22.4 ±3.0	28.8 ±7.5	39.3 ±4.2	27.4 ±1.8	22.3 ±1.5
AE scale	2.23 ±0.85	2.22 ±0.81	3.00 ±1.57	1.93 ±1.68	2.57 ±1.86	3.14 ±0.75
BAS scale	2.05 ±1.09	2.31 ±0.93	3.11 ±1.22	2.44 ±0.83	2.89 ±1.33	3.39 ±0.72
OP scale	2.81 ±1.09	4.13 ±0.67	2.50 ±1.25	2.88 ±1.81	2.50 ±1.25	2.50 ±1.63

Overall, this second study had very similar outcomes in terms of BMI groups and body image aspects as study 1, which further supports that in our study, individuals with obesity, compared to

the OW and NW group, scored lower on body image constructs which suggests that they, overall have a more negative evaluation of their body and physical appearance.

OW participants in this second study did not score as high on body image constructs as the OW participants in the first study, however, they still scored higher than participants with obesity. Additionally, the OW participants scored more similar to their NW counterparts. Therefore, reiterating what was expressed earlier in study 1, based on findings in literature, researchers would expect that overweight individuals would score as poorly or nearly as poor as individuals who suffer from being very overweight, because of how they are combined with obese individuals in the majority of studies in the literature (Public Health England 2017; Schafer & Ferraro 2011; Sturgeon & McColl 2010), yet this second study has not found that to be true, the overweight group consistently fare better than their obese counterparts, and nearly the same as their normal weight counterparts.

Appendix 22 continued - Study 2 BMI questionnaire analysis

Body Image Quality of Life Inventory (BIQLI)

This questionnaire assessed individuals' subjective feelings about their body image and how it impacted certain aspects of their quality of life, related to grooming, exercising, eating, and sexuality to emotional wellbeing, social functioning, and sense of self. The data obtained showed a normal distribution and the results, for each BMI group is shown in Figure 2. Values reported as mean ±SD.

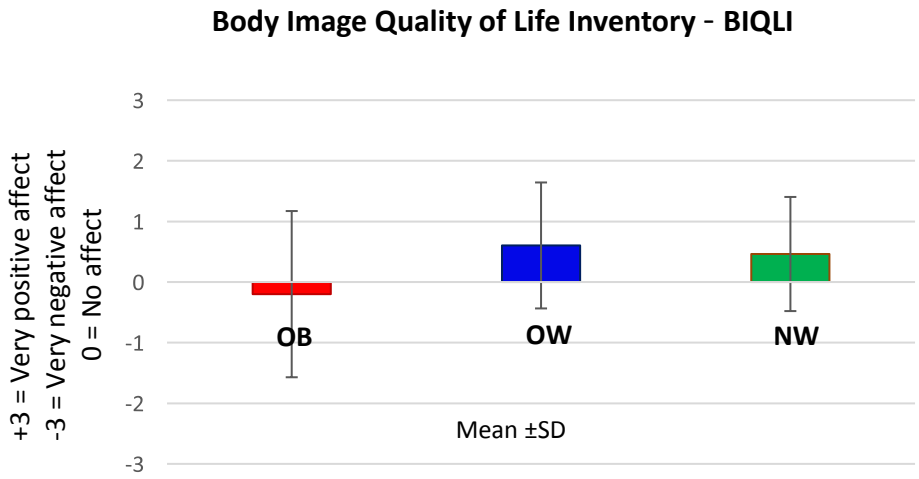


Figure 2 BIQLI scores for each BMI group.
Cronbach α = 0.95.

The OW group had the highest mean score (0.60 ±1.04) compared to the NW (0.46 ±0.94), and OB (-0.20 ±1.37). However, no difference was observed between group scores. Nevertheless, the higher a score is, the more, overall, positive impact regarding body image has on psychosocial wellbeing and everyday quality of life. Whereas, lower scores, and those approaching negative regions, suggest that overall body image, related to quality of life, has a negative impact on psychosocial wellbeing and everyday quality of life. Everyday life including self-esteem, emotions, social interests and/or avoidance, relationship with self, grooming habits, sexuality, exercise and eating behaviour, and general overall satisfaction.

In the first study we observed a significant difference between the NW and OB, and the OW and OB groups. However, this second study follows a similar trend in scores between each of the BMI groups, where the OW group scored slightly better overall.

Friedman et al. (2002) previously reported that body mass could influence body image evaluation; however, in this study a weak to moderate, negative association was observed between BMI and BIQLI scores, but was not significant (Spearman test, r_s = -0.27, p = 0.12). This may be due to the broad score ranges in each of the BMI groups (NW: 1.40 to -0.48, and OW: 1.64 to -0.44, and OB: 1.17 to -1.57). This is very similar to the first study's findings.

Friedman et al. (2002) also reported that body mass can influence body image evaluation, we investigated the association between the appearance evaluation (AE) scale and BMI. We observed a strong, negative association which was significant (Spearman test: r_s = -0.52, p = 0.001).

Moreover, we also found a strong, negative association between BMI and the body appearance satisfaction scale (BAS), (Spearman test: r_s = -0.58, p < 0.0001). (Both correlations are similar to the first study's findings). This suggests that level of BMI does have an effect on an individual's appearance evaluation and discrete aspects of her/his body, specifically as BMI increased, satisfaction with one's body, and feelings of physical attractiveness decreased, in addition to feelings about discrete aspects of one's body decreased. However, this dissatisfaction appears to not necessarily have as great of a negative impact on these particular individuals' psychosocial wellbeing and everyday quality of life (as measured by the BIQLI), specifically because no significant association was found (between BMI and BIQLI). Lastly, we explored if there was an association between BMI and the OP scale, where a moderate association was found but did not reach significance (Spearman correlation: r_s = 0.29, p = 0.09. (Similar to the first study's findings). This suggests that the participants in study 2, overall did not experience fear and/or anxiety of being fat or becoming fat. However, it may also be possible that our study is too small to detect associations.

Cash, Jakatdar & Williams (2004) previously suggested that lower scores on the BIQLI construct, regardless of sex, suggest that the individual experiences more body image disturbance and distress, and overall body dissatisfaction. The individual may engage in more cognitive and behavioural investment into her/his physical appearance, and may experience lower psychosocial functioning, which includes social support, self-esteem, optimism and eating attitudes, and this may relate to having a poorer body image quality of life. Therefore, we investigated if the BIQLI construct was related to more engagement in behavioural and cognitive investment into physical appearance (as measured by the AO scale of the MBSRQ-AS). However, we observed only a weak, non-significant association between these two scales (Spearman test, r_s = 0.16, p = 0.35). (This is similar to what the first study found).

The overall BIQLI finding from our 35 participants was lower (0.32 ±1.13) compared with American female (0.97 ±1.12) and male (1.10 ±1.05) students' scores. Where Cash & Grasso (2005) were exploring body-image related to quality of life in this population. This difference in scores suggests that the American students experienced a more positive impact from body image aspects related to everyday quality of life, which had a more positive impact on their psychosocial functioning and wellbeing. However, because Cash & Grasso (2005) did not report age or BMI values, we cannot draw any further conclusions. (These findings are identical with study 1).

Hrabosky et al. (2009) who previously explored body image attitudes in eating disorder bulimia nervosa (BN), and in body dysmorphia disorder (BDD) also explored body image-related to quality

of life. The OB group in our study did not score as low as the BN group (-0.20 ±1.37 vs -1.15 ±1.07, respectively) or the BDD group (-1.81 ±0.68). This suggests that the OB participants in this study their perceived body image did not have as negative of an impact on their quality of life, psychosocial functioning and wellbeing as it appeared to have for the individuals with bulimia eating disorder or individuals who experienced body dysmorphia disorder (Table 4). (These findings are slightly different from the first study where the OB participants had scored similarly to the BN group).

Table 4 BIQLI scores in BDD and BN groups (adapted from Hrabosky et al. 2009).
BDD: body dysmorphia disorder; BN: bulimia nervosa. Values: mean ±SD.

Participants	**BN** F: n = 26	**BDD** F: n = 34 M: n = 36	**Current study** n = 35	**OB** n = 10	**OW** n = 11	**NW** n = 14
BIQLI scores	-1.15 ±1.07	-1.81 ±0.68	0.32 ±1.13	-0.20 ±1.37	0.60 ±1.04	0.46 ±0.94

Giovannelli et al. (2008) previously suggested that individuals who score low on the BAS scale (of the MBSRQ) may also score low on the BIQLI construct. The findings from this second study are consistent with this theory. Specifically, the NW and OW groups scored in the neutral range on the BAS scale, (i.e. 3.39 and 2.89 respectively) which complemented their somewhat slightly positive scores on the BIQLI scale (0.46 and 0.60, respectively). The BAS score for the OB group was just below the neutral range (2.44), and their BIQLI score was also only slightly negative (-0.20) which is suggestive of no effect to a small negative effect of body image on quality of life and wellbeing. Moreover, a moderate, significant association was observed between the BAS scale and BIQLI (Spearman test, $r_s = 0.42$, $p = 0.01$). (These findings are congruent with the first study where a strong significant correlation was also found).

Ghai et al (2014) who previously explored body image concerns (using the MBSRQ-AS) in obese individuals seeking bariatric surgery, sought to relate the AE scale to the BIQLI construct. The OB participants in our study scored nearly identically to the individuals seeking bariatric surgery. BIQLI scores for our OB group was -0.20 (±1.37) vs the bariatric group, -0.27 (±1.21). Scores for the AE scale, OB group, 1.93 (±1.68) vs the bariatric group, 2.02 (±0.59). This suggests that both groups experienced a slight negative impact on their quality of life, psychosocial functioning and wellbeing. In addition, both groups experienced less satisfaction with their bodily appearance and physical attractiveness (Table 5).

Table 5 BIQLI and AE scale scores in OB women seeking bariatric surgery.
(adapted from Ghai et al. 2014). Compared with the OB group in this current study. Values mean ±SD.

Participants	**Bariatric patients** n = 148	**OB** n = 10	**OW** n = 11	**NW** n = 14
BIQLI score	-0.27 ±1.21	-0.20 ±1.37	0.60 ±1.04	0.46 ±1.13
MBSRQ AE scale	2.02 ±0.59	1.93 ±1.68	2.57 ±1.86	3.14 ±0.75

MBSRQ-AS AE scale in BMI group, values are median ±IQR.

Ghai et al. (2014) previously explained that compared to female normative samples (i.e. Hrabosky et al. 2009; Cash & Fleming 2002), their female participants seeking bariatric surgery experienced more negative image quality of life, more body image dysphoria and more dissatisfaction with their physical appearance. It is interesting that the OB participants in our study had similar scores as the women seeking bariatric surgery; Ghai et al. had expressed that for individuals seeking surgery, their body image constructs may be higher (i.e. compared to Hrabosky's BN and BDD participants) because these individuals were seeking help and were attempting to do something about their weight and/or their looks, which makes them a unique population. (In our first study, the OB participants had a much lower BIQLI score, and their AE score was also lower. It is possible that our participants in this second study, because it comprises a larger student population, and it is possible these participants feel better about themselves because they are doing something for themselves, by going out and getting an education).

Appendix 22 continued - Study 2 BMI questionnaire analysis

Sense of Coherence-13 (SOC-13)

This questionnaire assessed individuals' salutogenic approach towards life; it explored aspects of meaningfulness, comprehensibility, and manageability of life, and is reported as a combined total score. The data showed a normal distribution, mean and standard deviation for each BMI group is shown in a bar chart, Figure 3.

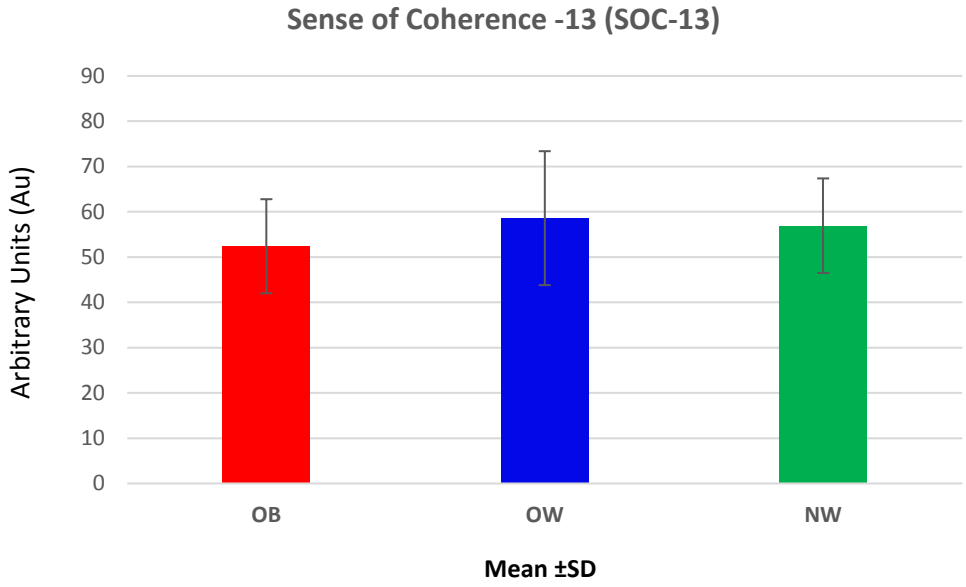


Figure 3 SOC-13 mean ±SD for each BMI group.
No significant difference was found between BMI groups. Score range is 13 to 91, high scores indicate strong salutogenic outlook. Cronbach alpha for meaningfulness: α = 0.73, comprehensibility: α = 0.59, manageability α = 0.75.

The OW and NW groups had similar scores (58.6 ±14.8 and 56.9 ±10.4, respectively), whereas the OB group had a lower mean score (52.4 ±10.4). However, no significant difference was observed between the three groups. Because no difference was found in scores, this suggests that overall, the participants held similar views to life.

Score range for this questionnaire can be as low as 13 to as high as 91. Higher scores are associated to individuals having a stronger salutogenic outlook on life, specifically a more positive approach to life makes dealing with life's stressors more comprehensible and manageable, and life has more meaning. In contrast, individuals with lower scores may experience a lower salutogenesis. It is possible that they may experience more difficulties in finding the resources within themselves to face challenging situations in life and in dealing with and/or managing stress. Life is less comprehensible and has less meaning. In this study, the OW and NW had upper middle range scores (i.e. upper 50s), whereas the OB group had a lower middle range score (lower 50s). However, if we inspect the score ranges further, the NW group had a score range from 37 to 76. Score range for the OW was 30 to 78. Score range for the OB was 35 to 69. Of which, 7 NW (50%), 7 OW (64%), and 3 OB participants (36%) had a score of 58 or higher (58 corresponds to the highest mean score).

This second study did not observe a significant association between age and SOC (Spearman test, $r_s = 0.17$, $p = 0.33$). However, in our previous study, there was borderline significance observed

between the OW and NW groups' age (p = 0.055) where the OW group were older compared to the NW group, and the OW also scored higher on the SOC compared to the NW, but this difference between scores did not quite reach significance (p = 0.059). This current study, only a weak association was observed between BMI groups' age, and SOC scores. However, this may make intuitive sense because this current study's age range was limited, i.e. 20 to 41 years. It is possible that a significant association was not observed because each study sample may have been too small to detect an association.

Antonovsky had theorised that SOC increases with age. This would appear to make intuitive sense because as an individual matures and experiences more challenges and comes through those challenges, this is affirmation to the individual that s/he is able to survive difficulty. Although Antonovsky did not exclude that one's SOC could change in the face of radical and lasting changes in one's life situation, if an individual came through a 'rough patch' or a very challenging life situation, Antonovsky believed that this was possible because s/he had 'general resistance resources' which give rise to reinforce this individual's strong SOC.

Furthermore, as in the first study, we investigated the association between SOC and the BIQLI constructs and found a very strong, significant association (Pearson test, r = 0.65, p < 0.0001). This finding is similar to the moderate, significant association we found in the first study. Thus, this supports the concept that a positive body image relates to higher emotional wellbeing and psychosocial functioning and in turn renders a positive outlook on life, or vice versa.

Moreover, in the first study we observed a very weak negative association between BMI and SOC-13 scores, and found similar results in this second study, where we observed a weak negative association between these two constructs (r_s = -0.21, p = 0.24), but was not significant. However, when we investigated if bodyfat percent (BOD POD) was associated with SOC we found a moderate inverse association which was significant (r_s =-0.39, p = 0.02). This suggests that salutogenesis may be related to health, as Antonovsky theorised that it was (Antonovsky 1988). This also, further suggests that BMI is not necessarily an indicator of overall health.

Previously, Nilsson et al. (2010) investigated SOC in relation to age, in a Swedish study comprising over 43,000 volunteers. The researchers found nearly a ten-point difference in age and SOC-13 scores, where the younger age group (18 to 24 years) had a lower SOC score (62.23 ±13.71) compared to the oldest age group (80 to 85 years) who had a significantly higher score (72.20 ±13.02) (p < 0.001). Our 35 participants, whose mean age was 27.4 (±5.8 years) had a mean SOC-

13 score of 56.16 (±11.86), which was 6 to 10 points lower compared to the Swedish age groups from 18 up to 44 years, where their mean score ranges were from 62.23 to 66.65 (Table 6).

Table 6 SOC-13 scores in Swedish study (Nilsson et al. 2010).
Compared with this study's 35 participants. All values reported as mean ± SD.

Age group years	**SOC-13 score**	**Current study** (n=35)
18-24	62.23 ±13.71	56.16 ±11.86 (27.4 ±5.8 yrs)
25-29	63.70 ±13.25	
30-34	66.32 ±12.51	
35-39	66.38 ±12.83	
40-44	66.65 ±12.62	

These differences in scores suggest that the Swedish participants overall, experienced a higher salutogenesis compared to this study's 35 participants. It is possible that this study's participants overall, scored lower on SOC for two reasons: firstly, the majority of participants in this study are full-time students (i.e. n = 20). It is known that university students experience numerous and varied sources of stress, from an increased class workload to personal challenges, including changes in friends and social networks, and self-confidence. The psychological and behavioral strains on students have been well recognised as consequences of stress (Davidson, Feldman & Margalit 2012). Furthermore, six of these participants were also in part-time employment, which can further add to perceived stress levels. Secondly, the weather in Scotland (i.e. more frequent rain and cloud cover) may contribute to an overall, lower salutogenesis. Specifically, Sweden may experience more days of sunshine, which may explain their overall higher SOC scores. Particularly, some researchers have attributed cloudy weather to having similar effects on mood as Seasonal Affective Disorder (SAD_2), which can negatively affect an individual, resulting in sadness, anxiety, irritability, lethargy, in addition to increased appetite, cravings for carbohydrates and hypersomnia (i.e. excessive sleepiness) (Beute & de Kort 2014). However, the participant overall scores in the first study were more similar to those in the Swedish study, and there were fewer students in the first study, therefore the lower score by the participants in this second study, because it comprises of more students, may explain why their score is overall lower.

Furthermore, the participants in our study also had a lower score (56.16 ±11.86) compared to a non-clinical Australian community, where Pallant & Lae (2002) were investigating the difference in SOC scores between men (61.37 ±11.23) and women (60.40 ±12.05) [aged 18 to 82 years, mean (±SD) 37 (±13) years]. Overall, the participants in our study had a 4 to 5-point lower score compared to the Australian sample. This difference may possibly be explained by the fact that the

Australian participants are slightly older compared to the participants in this study, and this agrees with Antonovsky's theorisation that SOC increases with age (Table 7).

Table 7 SOC-13 in Australian female and male participants (adapted from Pallant & Lae, 2002).
Compared with this study's 35 participants and BMI groups. All values reported as mean ±SD.

Participants	**Men** n = 184	**Women** n = 255	**Current study** n = 35	**OB** n = 10	**OW** n = 11	**NW** n = 14
Age (years) (age range)	37 ±13 (18-82)	37 ±13 (18-82)	27 ±6 (20-41)	31 ±6 (22-41)	28 ±6 (20-38)	25 ±5 (20-33)
SOC-13 score	61.37 ±11.23	60.40 ±12.05	56.16 ±11.86	52.40 ±10.44	58.59 ±14.79	56.93 ±10.38

However, in a Texas study by Adams et al. (2000) exploring salutogenesis in approximately 100 university students, (aged 16 to 58 years, mean (±SD) 23.2 ±5.5 years), our study's participants still score lower (56.2 ±11.9) compared to the Texas students' SOC-13 mean score (62.4 ±10.9).

These findings between our 35 participants in this study scoring overall lower compared to the Swedish, Australian and Texas participants, differs from the results of our first study, where overall, the 29 participants had a score more similar to each of these different countries participants' scores. This might suggest that overall, age may be a factor in the difference in scores, and/or the weather may also play a role in salutogenic outlook.

When exploring salutogenesis in a Norwegian study by Karlsen, Søhagen & Hjelmesæth (2013) with approximately 200 obese participants seeking treatment for their obesity, our OB participants had a lower SOC-13 score (52.4 ±10.4) compared to the morbidly obese male (60.5 ±10.6) and female (59.9 ±13.5) participants. This suggests that the obese participants in our study experienced a lower salutogenesis compared to the Norwegian participants. The Norwegian sample although they experienced morbid obesity, the researchers suggested that their participants may be different from other individuals because they were seeking treatment. Therefore, because they actively engaged, or felt they were engaging in doing something about their weight, they may find their lives to be more comprehensible, manageable and meaningful, compared to individuals with obesity who may experience either hopelessness or not knowing what to do about their weight. And, as previously mentioned, Antonovsky proposed that a stronger salutogenic outlook was more closely linked to health, because a stronger SOC motivates the individual to improve or maintain her/his health (Becker, Glascoff & Felts 2010).

Overall, the scores among the BMI groups from study 1 and study 2 followed similar trends, where the OW group scored higher on the SOC and the OB group scored lower. The difference in SOC scores between the two studies (i.e. 29 vs 35 participants) was nearly a 10-point difference

[study 1 SOC score was 65.0 (±22.5), and study 2 SOC score was 56.2 (±11.9)], which suggests that the participants in the first study experienced a stronger salutogenesis, however, they did have a very large interquartile range (which was due to the OB group's very large IQR in study 1). Additionally, however, study 1 comprised older participants, where the mean age was 41.4 (±14.7) years compared to study 2, which had a mean age of 27.4 (±5.9) years. This difference in age may explain why study 1 had overall, higher SOC scores. In addition, however, study 1 comprised fewer university students (31%) compared to study 2 which comprised nearly double that percentage (60%).

Appendix 22 continued - Study 2 BMI questionnaire analysis

Dutch Eating Behaviour Questionnaire (DEBQ)

This questionnaire assessed psychological eating behaviours related to emotional, external and restrained eating traits. The data obtained showed a normal distribution and a visual representation of each BMI groups' mean score for each trait is shown in Figure 4.

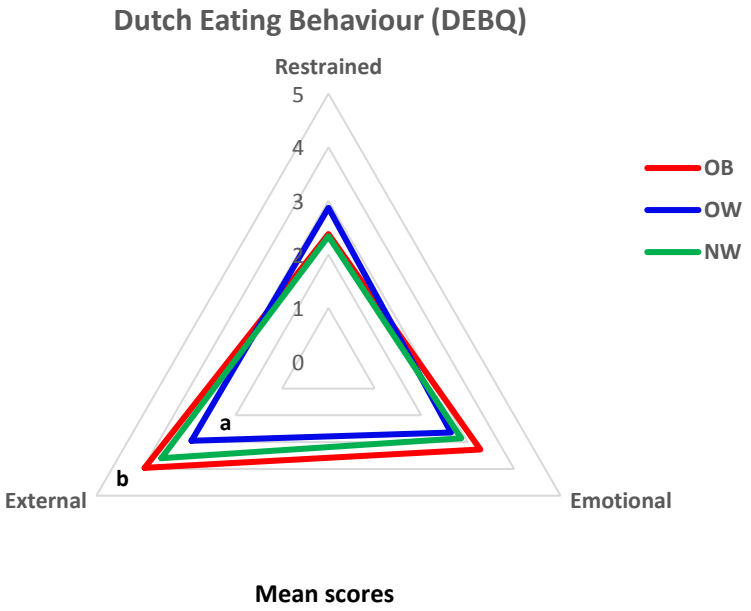


Figure 4 DEBQ eating traits among Study 2 BMI groups.
a: significant difference between OW and NW groups, (F = 7.36, p = 0.039); **b**: between OW and OB groups, (F = 7.36, p = 0.002). Cronbach α restrained eating = 0.88, emotional eating = 0.95, and external eating = 0.86.

Regarding the restrained eating scale, the NW and OB groups had similar scores (2.34 ±0.77 and 2.38 ±0.77, respectively), whereas the OW group had a higher mean score (2.87 ±0.89). However, no significant differences were found between scores. All group scores suggest that the participants employed restraint 'rarely to sometimes' when eating or choosing foods in an attempt to 'watch' one's weight, or that would minimise weight gain. Higher scores suggest employing more restraint, whereas lower scores suggest employing less restraint. (These are the same score ranges found in the first study).

Regarding the external eating scale, the OB group had a significantly higher score (3.96 ±0.73) compared to the OW group (2.95 ±0.64) (p = 0.002). Additionally, the NW group also had a significantly higher score (3.60 ±0.68) compared to the OW group (p = 0.04). The NW and OB participants' scores suggest that these individuals 'sometimes-to-often' ate food because it smelled or looked good, or they found food hard to resist when passing a bakery or when someone else was eating tempting food, additionally, these individuals were more likely to eat regardless of state of hunger. In contrast, the OW group ate under these same conditions 'rarely to sometimes'. Higher scores on this scale indicate that an individual will eat more frequently in response to these external food cues. In contrast, lower scores indicate eating less frequently in response to these external food cues. (This finding is similar to the first study where the OB had the highest score, but the OW and NW had similar scores, and no difference was found in BMI groups' scores).

Regarding the emotional eating scale, the OW group had the lowest mean score (2.64 ±1.07) followed by the NW group who had a slightly higher mean score (2.86 ±1.07), whereas the OB group had the highest mean score (3.27 ±1.06). However, no significant difference was observed between scores. Scores between 2 and 3 suggest that 'rarely to sometimes' the OW and NW participants ate in response to negative emotions such as sadness or disappointment, in addition to emotions related to anxiety or irritation, or feeling bored. Whereas, the OB group ate 'sometimes-to-often' in response to these same emotions. Higher scores on this scale indicate that an individual will eat more frequently in response to these emotions. In contrast, lower scores indicate eating less frequently when experiencing these emotions. (In the first study, both the NW and OW groups also had similar scores and the OB had the highest score. There was a significant difference observed between the NW and OB, and between the OW and OB scores).

The 35 participants in this study, compared to a Dutch study carried out by van Strien et al. (1986) had a similar mean score for the restrained eating scale as the Dutch sample (2.52 ±0.77 vs 2.21 ±0.92). This suggests that overall both groups employed restraint 'rarely to sometimes' when

choosing foods that would either help to maintain weight, or that would not put on weight (Table 8). In an earlier study by van Strien et al. (1985, p. 337) they explored the association between restrained eating and BMI, but reported finding only a very weak relationship, which was not significant (Pearson correlation, $r = 0.09$). Our study found a weak, but non-significant association between BMI and restrained eating (Spearman test, $r_s = 0.23$, $p = 0.19$). (These results are similar to our first study where participants had a similar score in restrained eating as the Dutch participants. Moreover, study 1 also found only a weak, non-significant association between BMI and restrained eating).

Regarding the emotional scale, the 35 participants had a higher mean score (2.83 ±1.09) compared to the Dutch norm, who scored much lower (1.92 ±0.68). The higher score by our participants suggests that they ate more frequently, 'sometimes-to-often', in response to emotions related to feeling sad, bored, anxious or irritated. In contrast, the Dutch norm participants score suggests that they ate less frequently, 'never to rarely' in response to these same negative emotions. Van Strien et al. (1985) reported finding a strong, significant association between BMI and emotional eating ($r = 0.46$, $p < 0.01$). Our study found a weak, non-significant association between these two items ($r_s = 0.19$, $p = 0.27$). (Our first study agreed with van Strien et al. (1985) where we found a moderate, significant association between BMI and emotional eating. However, the 29 participants from the first study scored more similarly to the Dutch norms for emotional eating).

Table 8 DEBQ eating traits in Dutch norms.
(Adapted from van Strien et al. 1986). Compared to current study. Scores reported as mean ±SD.

DEBQ scales	Dutch participants n		Current study n = 35
Restrained	**1169**	2.21 ±0.92	2.52 ±0.77
Emotional	**1051**	1.92 ±0.68	2.83 ±1.09
External	**1163**	2.66 ±0.54	3.50 ±0.73

Regarding the external scale, our participants had a higher mean score (3.50 ±0.73) compared to the Dutch norm who had a lower score (2.66 ±0.54). The higher score by the 35 participants suggests that they ate more frequently, 'sometimes-to-often' in response to external food stimuli, regardless of state of hunger. Whereas, the Dutch participants ate less frequently, 'rarely-to-sometimes' in response to external food cues, regardless of hunger state. Van Strien et al. (1985) found a moderate, significant association between BMI and the external eating ($r = 0.38$, $p < 0.01$). However, our study found only a weak, non-significant association, (Spearman test, $r_s = 0.13$, $p =$

0.44). (Our first study also found a weak, non-significant association between BMI and external eating, However, the first study's participants scored similarly to the Dutch norm for the external scale).

In summary, overall the 35 participants from this current study scored higher on all DEBQ eating traits compared to the Dutch norm sample, suggesting that the participants in our study engaged in more emotional and external eating, while applying similar amounts of restrained eating as the individuals in the Dutch norm sample. Emotional and external eating can co-occur in individuals and is known as the 'Externality theory', which theorises that an individual who eats due to internal emotional states (i.e. sadness, boredom, anxiety, irritability) can precipitate an external eating event. Stunkard & Messick (1985) termed these types of individuals as 'disinhibited eaters' because they are less likely to employ restraint when experiencing internal, emotional cues when confronted with external food cues, therefore, are characterised by having stronger tendencies to overeat (Bryant, King & Blundell 2008).

In a more recent Dutch study, which desired to understand eating behaviour differences between NW and OW individuals, van Strien, Herman & Verheijden (2008), explored eating traits in over 1,300 women and men who had a similar age range [mean (±SD), 33.6 (±9.4) years] as our participants (Table 9).

Table 9 Dutch NW and OW groups (adapted from van Strien, Herman & Verheijden 2008).
Compared with BMI groups from this study. Values reported as mean ±SD.

DEBQ scales	**Dutch study**		**Current study**		
Participants	**NW** n = 717	**OW** n = 625	**NW** n = 14	**OW** n = 11	**OB** n = 10
Restrained	2.51 ±0.85	2.84 ±0.71	2.34 ±0.61	2.87 ±0.89	2.38 ±0.77
Emotional	2.26 ±0.81	2.61 ±0.87	2.86 ±1.07	2.66 ±1.07	3.27 ±1.06
External	2.79 ±0.57	2.84 ±0.60	3.60 ±0.68	2.95 ±0.64	3.96 ±0.49

Regarding the restrained eating scale, the NW group in our study had a similar score compared to the NW group in the Dutch study (2.34 ±0.61 and 2.51 ±0.85, respectively). Scores are interpreted that the participants in both groups employed similar amounts of restraint (i.e. sometimes-to-often) in eating foods that would help to maintain weight or that would not put weight on. Additionally, the OW group in our study scored nearly identically to the OW group in the Dutch study (2.87 ±0.89 and 2.84 ±0.71, respectively). Moreover, these scores are interpreted also as employing restraint sometimes to often when eating the same food types.

Regarding the emotional eating trait, the NW group in our study had a higher score compared to the NW group in the Dutch study who scored slightly lower (2.86 ±1.07 vs 2.26 ±0.81, respectively). And interestingly, the OW group in our study scored again, nearly identically to the OW group in the Dutch study (2.66 ±1.07 and 2.61 ±0.87, respectively). Moreover, all scores are interpreted the same way, which is that all participants ate 'rarely-to-sometimes' in response to negative emotions.

Regarding the external eating trait, the NW group in our study had higher scores compared to the NW group in the Dutch study (3.60 ±0.68 vs 2.79 ±0.57, respectively). This difference between the scores suggests that the NW participants in our study ate 'sometimes-to-often' in response to external food stimuli, whereas the NW participants in the Dutch study ate 'rarely-to-sometimes' in response to external food stimuli. And interestingly, again, the OW group in our study had a very similar score as the OW group in the Dutch study, (2.95 ±0.64 and 2.84 ±0.60, respectively). Scores between 2 and 3 indicate that these individuals ate 'rarely-to-sometimes' in response to external food stimuli.

Overall, the scores between each BMI group in each study scored very similarly, except the NW group in our study which had a higher score for the external eating trait. Interestingly, in the Dutch study there was no significant difference found between their NW and OW group external eating scores. However, in our study, there was a significant difference found between the NW and OW group' external eating scores, where the NW had a higher score. Van Strien, Herman & Verheijden (2008) stated that overall, their findings suggested that their OW participants experienced a higher degree of restraint and more emotional eating. Moreover, their support for these findings was supported because they found a significant difference between the NW and OW groups' scores for the restrained and emotional eating scales. This may very well be true, however, if a researcher inspects how these scores are to be interpreted, then the differences between these two group' scores is only slight, that is, a score of 2.5 and 2.8 (as was obtained for Dutch NW and OW restrained eating, respectively) are interpreted in a similar manner. The same interpretation can be made for the emotional eating trait (2.3 and 2.6, NW and OW respectively, in the Dutch sample)

Van Strien, Herman & Verheijden (2008) explored the associations between BMI and each eating trait. They found that BMI and restrained eating were weakly, but significantly associated (r = 0.22, $p < 0.01$). Both of our studies found a weak association, but not significant. This lack of significance may be due to the smaller sample size of each of our studies.

Regarding the association between BMI and emotional eating, the Dutch study found a weak, significant association ($r = 0.27$, $p < 0.01$). Our study found a weak, non-significant association, but results from our first study found a moderate, significant association.

Regarding the association between BMI and external eating, the Dutch study found a very weak, and non-significant correlation ($r = 0.05$). Previously, our study found a weak, non-significant association, which was in agreement with our first study.

The differences in correlation findings between BMI and eating traits may be explained by sample size, where our two studies may not have been large enough to detect a significant association. Therefore, to investigate further, if any associations may exist between BMI and eating scales, if we combine our two studies, where n = 64; then between BMI and restrained eating, we observed a weak, but borderline significance (Spearman test, $r_s = 0.23$, $p = 0.07$). Between BMI and emotional eating, we observed a moderate, significant association ($r_s = 0.30$, $p = 0.02$). Between BMI and external eating, we observed a weak, non-significant association ($r_s = 0.16$, $p = 0.21$). Thus, by combining the two studies, we found our correlation results to be more similar to van Strien, Herman & Verheijden's (2008) Dutch sample.

When comparing our results with a British study which comprised just under 200 participants, by Wardle (1987), our 35 participants scored more similarly (2.52 ±0.77) to the female group (2.75 ±0.79) in restrained eating, but higher than the male group (1.88 ±0.77). This suggests that the 35 participants used a similar amount of restraint as the female group (i.e. rarely-to-sometimes) eating foods that help to control weight or not put weight on, whereas, the male group employed restraint 'never-to-rarely' (Table 10). (This is nearly identical with what we found in the first study).

Table 10 DEBQ eating traits in a British population.
(Adapted from Wardle 1987). Compared with this study's 35 participants.

DEBQ Scales	**Control group** F: n = 102; M: n = 86		**Current study** n = 35
Restrained	2.75 ±0.79	1.88 ±0.77	2.52 ±0.77
Emotional	2.65 ±0.72	2.24 ±0.77	2.83 ±1.09
External	3.12 ±0.51	3.16 ±0.55	3.50 ±0.73

Regarding the emotional scale, the 35 participants had a similar score (2.83 ±1.09) as the female (2.65 ±0.72) and male (2.24 ±0.77) groups. Sores between 2 and 3 suggest that overall, a majority

of the participants from each study ate rarely-to-sometimes in response to negative emotions. (Our first study participants had lower scores compared to the two British groups).

Regarding the external eating scale, the 35 participants scored (3.50 ±0.73) similarly to the female (3.12 ±0.51) and male (3.15 ±0.55) groups. Scores between 3 and 4 suggest that individuals ate 'sometimes-to-often' in response to external food stimuli. (Our first study participants had lower scores compared to the two British groups).

Overall, scores were similar between our study and the British study (except for the male group in restrained eating). The mean age of participants in the British study was 22.3 (±6.3 years), which is similar to the age group in our second study, and might explain the similarity in findings between our second study and the British study. Moreover, it may explain why in the first study, where the average age of participants was older, they had lower scores for the emotional and external eating scales.

Wardle (1987) investigated the correlations between each of the eating traits and found moderate to strong, significant associations between the emotional and external eating traits in each of her groups. Table 11 below shows the correlations between eating traits found in the Wardle study and for comparison, the correlations found in each of our 2 studies. In our current study with 35 participants, we observed a moderate association, with borderline significance, (Pearson test, $r = 0.32$, $p = 0.058$), and our previous study found a strong, significant association (Spearman test, $r_s = 0.46$, $p = 0.01$), between the traits emotional and external eating. The results of each of these correlations supports the externality theory. Previously mentioned, which hypothesises that if an individual is susceptible to eating because of her/his emotions, particularly emotions associated with sadness, anxiety, irritability or boredom, then this can lead to an external eating event, where the individual will be more susceptible to external food stimuli (Stunkard & Messick 1985).

Table 11 DEBQ correlations between eating traits in British groups.
(Adapted from Wardle 1987), compared with our study 1 and study 2 participants.

DEBQ Traits	**Women** n = 102	**Men** n = 86	**Current study 1** n = 29	**Current study 2** n = 35
Restrained w/ Emotional	$r = 0.15$ NS	$r = 0.48$, $p < 0.001$	$r_s = 0.43$, $p = 0.02$	$r = 0.21$ $p = 0.23$
Restrained w/ External	$r = -0.05$ NS	$r = 0.08$ NS	$r_s = 0.28$, $p = 0.14$	$r = -0.07$ $p = 0.71$
Emotional w/ External	$r = 0.45$, $p < 0.001$	$r = 0.32$, $p < 0.005$	$r_s = 0.46$, $p = 0.01$	$r = 0.32$ $p = 0.058$

BN: bulimia nervosa; NS: non-significant.

Additionally, Wardle (1987) found a strong, significant association between restrained and emotional eating, but only in the male control group, $r = 0.48$, $p < 0.001$, which supports the restraint theory. Previously, the restraint theory hypothesises that an individual who eats due to internal emotional states, precipitating an external eating event, are also disinhibited eaters, and may find it difficult to engage in restrained eating and may have stronger tendencies to overeat (Stunkard & Messick 1985).

However, the Wardle study did not find a strong, nor significant association in either the male or female groups to support the restraint theory. Additionally, our current study with 35 participants, found only a weak and non-significant association between the restrained and emotional eating traits, ($r = 0.21$, $p = 0.23$), but our previous study with 29 participants found a moderate, significant association. Previously, Wardle had commented that the discrepancies among the groups (i.e. discrepancies in correlations) may be due to the differences in the way questions regarding restrained eating were phrased in Stunkard & Messick's (1985) original questionnaire on eating traits.

Regarding the correlation between restrained and external eating, Wardle found very weak and non-significant associations, in both female and male groups, which are consistent with both our studies' findings. These weak or very weak associations which were not significant agrees with the explanation Wardle (1987) had expressed, which was, that an individual may be able to employ restraint such that s/he would not engage in external eating. Alternatively, this lack of a correlation could also suggest that these individuals do not feel that it is necessary for them to employ restraint in their eating, and these same individuals engaged in more external eating, such that they are stimulated by the sight and/or smell of tempting food. Upon further inspection, both female and male groups (in the British study) and our two studies have lower scores for restrained eating, but higher scores in external eating, which confirms the weak, non-significant correlation.

Appendix 22 continued - Study 2 BMI questionnaire analysis

Modified Yale Food Addiction scale (mYFAS) (version 1)

This questionnaire explored possible food dependency and addiction (loss of control over food intake) among the participants. Previously discussed, this questionnaire comprises a symptom count score (SCS) which measures food dependency, and a 'suggested' food addiction diagnosis score (FAD). The data obtained from submitting this questionnaire showed a non-normal distribution and median scores and interquartile range for each BMI group are reported in Table 12.

Table 12 mYFAS Study 2 BMI groups' scores.
Values reported as median ±IQR, and score ranges.

mYFAS: Symptom Count score (SCS)	**OB n = 10**	**OW n = 11**	**NW n = 14**
Median ±IQR	4 ±3.0 *	1 ±2.0	1 ±2.3
Range	0 - 7	0 - 3	0 - 5
Food Addiction Diagnostic score (FAD) Median ±IQR	2.5 ±3.3 **	1 ±2.0	1 ±2.3
Range	0 - 9	0 - 3	0 - 3

SCS possible score range is 0 to 7, a median score of 1 meets criteria for 'food dependence'.
*Significant difference between NW and OB (U = 23.50, z = -2.78, p = 0.005), and between OW and OB (U = 16.00, z = -2.79, p = 0.005).
FAD possible score range is 0 to 9, a score of 4 or greater meets the threshold for food addiction.
**Significant difference NW and OB (U = 21.50, z = -2.92, p = 0.003), and between OW and OB (U = 19.50, z = -2.57, p = 0.01). SCS Cronbach α = 0.81; FAD Cronbach α = 0.85.

Regarding the SCS score, both the NW and OW group had very similar scores (1 ±2.3 and 1 ±2.0, respectively). However, the score range for both the NW and OW varied, (0 to 5 and 0 to 3, respectively) The OB group had the highest score (4 ±3.0) with a broader score range (0 to 7). These differences in scores between the NW and OB were significant, (p = 0.005), and between the OW and OB group (p = 0.005). Seven is the highest an individual can score on the SCS scale. A score of 1 already suggests food dependence. The SCS is used to measure behaviours that could conceivably occur occasionally in non-problem eaters (i.e. criteria associated with excess consumption, dieting, emotional eating). Previously discussed, the symptom count is a measure of the severity of addictive-like eating symptoms, such that, higher scores suggest a stronger food dependence. Therefore, according to this interpretation, the NW and OW group experienced a minimal level of food dependence compared to the OB group who experienced a significantly higher level of food dependence. Food dependence is specifically for food types high in sugar, fat, salt and/or starches.

We investigated whether BMI and SCS scale may be related, and found a strong, significant association between the two measures, (r_s = 0.51, p = 0.002). (The results from our previous study found a weak, non-significant association between BMI and the symptom count score). We also explored the relationship between the emotional eating trait and SCS scale and found a moderate, significant association (r_s = 0.49, p = 0.003). (In our first study we found only a weak, non-significant association).

Regarding the suggested FAD scores, the NW and OW group median and interquartile range scores were very similar, (1 ±2.3 and 1 ±2.0, respectively). The OB group had a higher score, (2.5 ±3.3). There was a significant difference observed between the NW and OB groups' scores (p = 0.003), and between the OW and OB (p = 0.01). A score of 4 is indicative of 'suggested' food addiction. Upon closer inspection of scores, the score range for both the NW and OW were identical, (i.e. 0 to 3), which is indicative that none of these participants suffered from food addiction. However, scores between 2 and 3 are suggestive of mild symptoms for food impairment and/or distress. The score range for the OB group was 0 to 9, and 40% of these individuals had a minimum score of 4 or higher. Scores between 4 and 5 are suggestive of experiencing problems with food addiction. Scores 6 and above are suggestive of severe food impairment and/or distress. FAD questions are considered more severe in terms of indicating an eating problem (such as, significant emotional and/or physical problems do not deter the overconsumption of food types high in sugar, fat, salt and/or starches). In addition, studies have found that elevated scores in FAD have been linked to more frequent binge-eating episodes (Flint et al., p. 578). We investigated if BMI and FAD score may be associated, and found a strong, significant correlation (r_s = 0.55, p = 0.001). (Our previous study found a weak, non-significant association between BMI and FAD scores). We explored the relationship between emotional eating and FAD scores, we observed a moderate, significant association (r_s = 0.48, p = 0.004). (Our first study observed a weak, non-significant association).

A US study by Gearhart, Corbin & Brownell (2009), found that among a student population (n = 233), there was an 11.4% prevalence of food dependence, which indicates that these students scored at least 1 or higher on the SCS scale. Among our participants we found that 24 (69%) participants had an SCS score of 1 or greater. Upon further inspection of our study, we found that the OB group comprised 90% of participants who had scored a value of 2 or greater. The OW group comprised 64% with a score of 1 or greater; and the NW group comprised 57% with a score of 1 or greater. [This is nearly one and a half times more than the result from our previous study which had 45% (13/29)]. Gearhardt, Corbin & Brownell (2009) did not discuss results for the FAD

portion of the questionnaire. However, the researchers did comment that their study comprised very few participants with obesity, which they expressed limited their ability to make conclusions about the existence of an addictive process within their sample population.

However, a much larger US study, by Flint et al. (2014), comprising 2 cohort samples from the Nurses' Health study (NHS I and II), specifically explored food addiction diagnosis (FAD scores) and found that with increasing age, FAD decreased, but food addiction prevalence increased with increasing BMI. Specifically, in women with a BMI $\geq$ 35.0 kg/m^2, between 45 to 49 years of age, food addiction prevalence was 25.5%. In contrast, women with a BMI between 18.5 and 23.0, aged 70 to 74 years, had a food addiction prevalence of just 0.3%. The food addiction prevalence ratio (PR) was two times higher in participants with a BMI between 23.0 and 24.9: PR = 2.01 (95% CI: 1.65 – 2.44). In contrast, for women with a greater BMI, $\geq$ 35.0 kg/m^2, the prevalence ratio was more than 15 times higher, PR = 15.83 (95% CI: 12.58 – 19.91). Comparing the results of our study, we found an 11% prevalence of food addiction, which is more than 4 times higher than the NHS I study, which had a 2.7% prevalence. (Our first study, which comprised older participants agrees with the NHS I finding). Additionally, all participants, in both our studies (1 and 2) who had a FAD score of 4 or above, were participants in the OB group. For this second study, we explored the relationship between age and FAD scores, but only observed a weak, non-significant association (r_s = 0.22, p = 0.22). Which contrasts with the first study which found a negative, moderate association, that was borderline significant (r_s = -0.37, p = 0.056). Which suggests that food addiction tendencies decrease with age. Both the first and second studies are in partial agreement with Flint et al.'s (2014) study.

Appendix 22 continued - Study 2 BMI questionnaire analysis

Food Choice Value questionnaire (FCV)

This questionnaire explored some factors which may have had an influence on individuals' choices when food shopping. These factors included concepts such as food safety, organic, accessibility, convenience, comfort, traditional, health and weight concern, and sensory appeal. The data obtained showed a non-normal distribution, Figure 5 shows a radar diagram of median scores for each BMI group, for each scale.

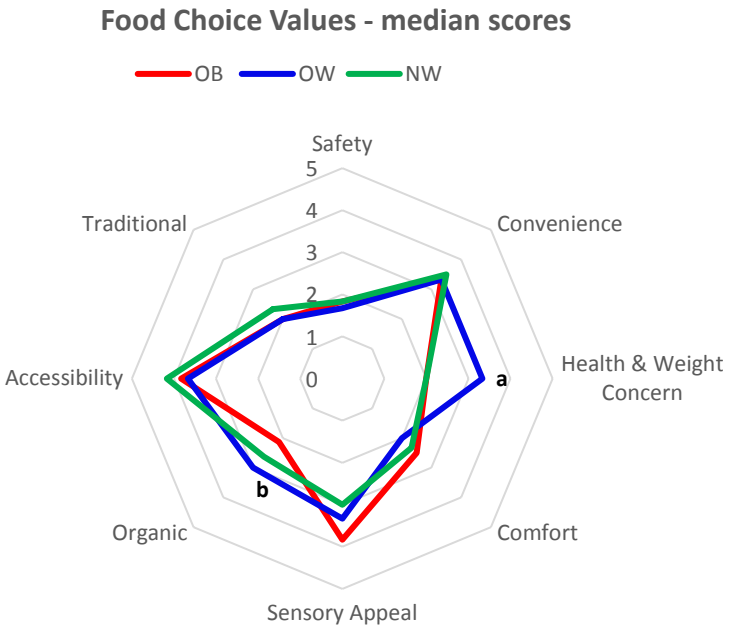


Figure 5 FCV Study 2 BMI group scores.
a: significant difference between OW and NW (U = 34.00, z = -2.36, p = 0.02).
b: significant difference between OW and OB, (U = 20.50, z = -2.44, p = 0.01).
A score of 1: 'not at all important'; 2: 'a little bit important'; 3: 'moderately important'; 4: 'quite a bit important'; 5: 'very important'. Cronbach α: safety = 0.71, convenience = 0.88, health & weight concern = 0.82, comfort = 0.81, sensory appeal = 0.35, organic = 0.75, accessibility = 0.56, traditional = 0.74

We observed significant differences in only two scales, therefore, these will be discussed first: organic, and health and weight concern scales.

For the organic scale, the OW group had the highest score (3.00 ±1.00), followed by the NW group (2.63 ±0.81), and the OB group had the lowest score (2.13 ±0.94). There was a significant difference between the OW and OB groups' scores (p = 0.01), but not between the OW and NW, or the NW and OB. The higher score by the OW group suggests that they placed moderate importance in buying and eating foods which had minimal impact on the environment and may also contain natural ingredients, vitamins and minerals. Whereas, both the NW and OB groups placed a little bit of importance in buying and eating these same food types. (Results from the previous study, the NW had the highest score, followed by the OW, and the OB had the lowest score. A significant difference was observed between the NW and OB, and the OW and OB).

Regarding the health and weight concern scale, the OW group had the highest score (3.33 ±2.00) compared to both the NW and OB groups who scored very similarly (2.00 ±1.58 and 2.00 ±2.17, respectively). There was a significant difference observed between the OW and NW groups'

scores (p = 0.02), but not between the OW and OB. The higher score from the OW group suggests that they placed 'moderate importance' into buying and eating foods that would help to either maintain weight, or to lose weight. Whereas, the scores from the NW and OB groups suggest that these individuals placed a little bit of importance in buying and eating these same food types. (The results from our previous study, the OB group had the highest score and the OW and NW scored similarly but no significant difference was observed between scores). We explored if there was an association between health and weight concern scale, and the DEBQ restrained eating scale, and found a very strong, significant correlation (r_s = 0.76, p < 0.001) (This was identical with our previous study). We also explored if there was an association between health and weight concern and overweight preoccupation (as measured by the MBSRQ), and found a strong, significant association (r_s = 0.45, p = 0.006). (This was nearly identical with our previous study).

Regarding the convenience scale, the NW group had the highest score (3.50 ±1.67), however, it was similar to the OW and OB groups, who scored nearly identically, (3.33 ±1.33 and 3.33 ±1.25, respectively). Scores between 3 and 4 suggests that overall, the participants in this study placed moderate-to-quite a bit importance in buying foods which could be easily prepared and eaten. (Results from the previous study OB scored higher, followed by the NW, with the OW having the lowest score, but no difference was observed in scores).

For the comfort scale, all groups had very similar scores, the OB had a slightly higher score (2.50 ±1.67) compared to the NW (2.33 ±2.08) and the OW (2.00 ±2.00), overall, these participants scores suggest that they placed a little bit to moderate importance in foods which elicit positive emotions or alleviates negative emotions. No significant difference was observed in scores. (The first study also found all BMI groups having similar low scores) We investigated if comfort eating was associated with emotional eating (as measured by the DEBQ) and found that there was a moderate, significant association (r_s = 0.42, p = 0.01) (Results from our previous study showed only a weak, non-significant relationship).

Regarding the sensory appeal scale, the OB group had a higher score (3.83 ±1.17), followed by the OW group (3.33 ±1.00), with the NW group having the lowest score (3.00 ±1.42). Scores between 3 and 4 suggest that these individuals placed moderate to quite a bit of importance in foods which were pleasing to the senses in smell and taste. We explored if this sensory appeal scale was associated with the YFAS SCS and found a very weak, non-significant association (r_s = 0.01, p = 0.95), and between this sensory appeal scale and the FAD, only a very weak, non- significant association was observed (r_s = 0.06, p = 0.74). (These outcomes are nearly identical to our previous study, with scores also very similar).

Regarding the accessibility scale, the NW group had the highest score (4.17 ±1.08), and both the OB and OW group had similar scores, (3.83 ±1.08 and 3.67 ±1.33, respectively). The OB and OW groups' scores suggest that, overall these participants felt that how accessible food was in terms of grocery stores proximity to their homes, and the cost, was moderately to quite a bit important, whereas for the NW group, overall these individuals felt that food accessibility was quite a bit to very important. (Scores from the previous study were very similar among groups, but a significant difference was observed between the NW and OW, where the OW had a lower score).

For the traditional scale, the NW group, although they had a slightly higher score (2.33 ±2.08), they still scored similarly to the OW group (2.00 ±2.67), and the OB group (2.00 ±1.00). These scores suggest that how recognisable or familiar food is with one's ethnic background or heritage was a little bit to moderately important to a majority of the participants. (In the first study, BMI groups had slightly lower scores, but were also similar to each other).

Lastly, the safety scale rendered the lowest scores, where all BMI groups had similar scores. The OW had only a slightly lower score (1.67 ±1.67), followed by the OB (1.83 ±1.08) and NW (1.83 ±2.00). These scores suggest that overall, a majority of the participants, the extent to which food had been prepared or processed, such that it would not cause illness, was not at all to a little bit important to them. (Results from the previous study were very similar to each other, and to this second study).

When we compared our 35 participants' score results with a US study by Lyerly & Reeve (2015) who were validating the newer version of the Food Choice questionnaire (originally designed by Steptoe, Pollard & Wardle, 1995), overall, the 35 participants had slightly lower scores on most of the scales. Only on two scales (i.e. comfort and accessibility) did the 35 participants have slightly higher scores. The only scale where there was a very large difference between the two groups was for the safety scale, where the 35 participants from this study scored much lower (1.67 ±1.67) compared to the US sample who scored higher (3.63 ±1.06). The lower score by the 35 participants suggests that food safety (i.e. the extent that food has been prepared/processed such that it will not cause illness) was not at all to a little bit important. Whereas, for the US sample food safety was moderately to quite a bit important (Table 13). (These results are very similar to our previous study).

Table 13 FCV in a US population (adapted from Lyerly & Reeve 2015).
US sample values' mean ±SD compared with Study 2 35 participant's Mdn ±IQR.

Food Choice Values scales	US sample n = 235	Current study n = 35
Safety	3.63 ±1.06	1.67 ±1.67
Convenience	3.50 ±0.97	3.33 ±1.33
Health and weight concern	2.81 ±1.12	2.33 ±1.67
Comfort	1.98 ±0.95	2.33 ±2.00
Sensory Appeal	4.04 ±0.71	3.67 ±1.00
Organic	3.13 ±1.14	2.50 ±1.00
Accessibility	3.62 ±0.95	4.00 ±1.00
Tradition	2.00 ±0.92	2.00 ±1.67

Score value: 5 = very important; 4 = quite a bit; 3 = moderately; 2 = a little; 1 = not at all important.

For the convenience scale, the 35 participants had a slightly lower score (3.33 ±1.33) compared to the US participant's score (3.50 ±0.97). However, scores between 3 and 4 suggest that overall, the participants from each study felt that how easily food was to prepare and/or could be eaten was moderately to quite a bit important. (Our first study participants had a slightly lower score, but larger IQR).

Regarding the health and weight concern scale, the 35 participants had a slightly lower score (2.33 ±1.67) compared to the US participants who scored higher (2.81 ±1.12). However, scores between 2 and 3 suggest that, overall, the participants from both studies felt that eating foods which could help to maintain weight or would help to lose weight was a little bit to moderately important. (These results are very similar to our previous study).

For the comfort scale, the 35 participants had a higher score and larger IQR (2.33 ±2.00), compared to the US participants (1.98 ±0.95). The 35 participants score suggests that overall, these individuals felt that eating foods which either alleviated negative emotions or would elicit positive emotions was a little bit, to moderately important to them. Whereas, for the US participants, overall, eating 'comfort' food was not at all to a little bit important to them. (Our previous study's participants scored lower than the US sample).

Regarding the sensory appeal scale, our participants had a slightly lower score (3.67 ±1.00) compared to the US participants (4.04 ±0.71). The lower score by the 35 participants suggests that these individuals, overall, eating food that was pleasing to their senses (sight and smell) was moderately to quite a bit important. For the US participants it was overall, quite a bit important to

eat foods which appealed to their senses. (These findings are similar to our previous study, where the 29 participants also had a lower score).

For the organic scale, the 35 participants had a lower score (2.50 ±1.00) compared to the US participants who had a slightly higher score (3.13 ±1.14). For the 35 participants, foods which contained natural ingredients, vitamins and minerals, and had minimal impact on the environment was a little bit to moderately important. Whereas, for the US participants, eating these foods, was moderately to quite a bit important. [This is very similar to our previous study, where our 29 participants also scored lower than the US sample].

Regarding the accessibility scale, our participants had a higher score (4.00 ±1.00) compared to the US participants score (3.62 ±0.95). The higher score suggests that the 35 participants felt that accessibility to food, in terms of proximity to the store, and the cost, was quite a bit important. Whereas, for the US participants, their score suggests that accessibility to food was moderately to quite a bit important for them. [Our previous study found that both groups (29 participants and the US participants) scored similarly.]

For the tradition scale, both the 35 participants from this study and the US participants, overall, scored nearly identically (i.e. 2.00 ±1.67 and 2.00 ±0.92, respectively). A score of 2 suggests that overall, for a majority of the participants, how recognisable or familiar food was to their heritage or background, was a little bit important. (This finding is similar to our previous study, although, the 29 participants scored only a little higher).

Overall, there were some differences, but mostly similarities between the US participants and this study's 35 participants. The two scales which stood out the most were food safety and the organic scale. the US participants had a higher score for the food safety scale and their score was indicative that food safety was moderately to quite a bit important, particularly when purchasing prepared or processed foods. One possible explanation for why Americans consider food safety to be important, is that, since the terrorist attacks of 9/11, Americans have become more distrustful about their food supply, feeling their food could be a potential area where terrorists could target. For this reason, Americans have become willing to purchase organic and locally grown foods. Which may be a reason why the US participants had higher scores for the organic scale. Additionally, Americans have also become distrustful about genetically modified (GM) foods being safe for consumption (Lang & Hallman 2005).

Previously, Lyerly & Reeve (2015) suggested that it would be useful to understand how individuals of varying phenotypes (i.e. body weight status) would respond to these 8 food choice value scales.

We now have two studies which contribute to this knowledge. This additional work now provides a basis for comparison for future researchers.

Appendix 22 continued - Study 2 BMI questionnaire analysis

Short Form – Health Survey version 1 (SF-36v1) Quality of Life

This questionnaire measured 8 core general health concepts about the presence and the extent of physical and emotional limitations that an individual has experienced in regard to her/his everyday quality of life. These general physical health concepts are comprised 4 general health subscales, which are physical functioning (PF), role physical (RP), bodily pain (BP) and general health (GH); in addition to 4 mental health subscales, which include vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). Each of these 8 subscales will be individually discussed. Following on, these 8 subscales then comprise two summary scales, which are the 'Physical Component Summary' (PCS) and the 'Mental Component Summary' (MCS), and will be discussed after the 8 subscales. The data followed a non-normal distribution and median scores for each BMI group is shown in a radar diagram, Figure 6.

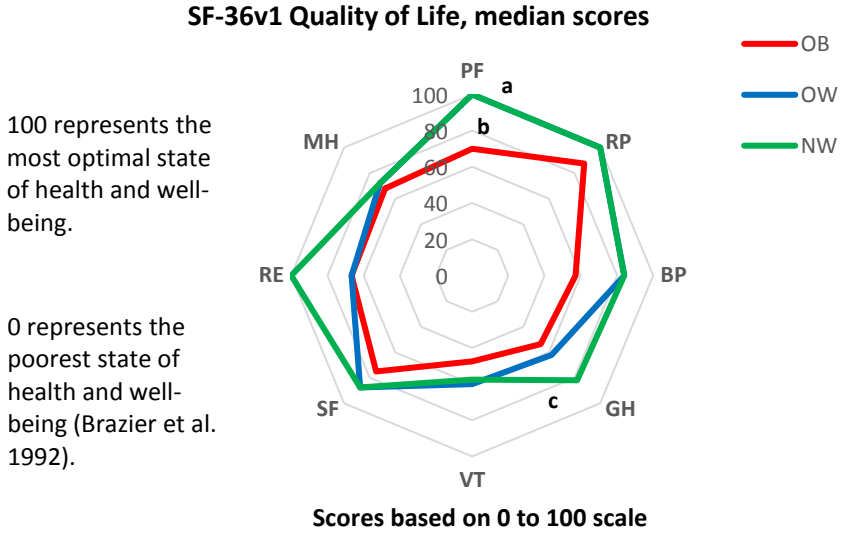


Figure 6 SF-36v1, Quality of Life scores in BMI groups.
a: significant difference between NW and OB (U = 15.50, z = -3.37, p = 0.001)
b: significant difference between OW and OB (U = 16.50, z = -2.77, p = 0.006)
c: significant difference between NW and OB (U = 21.50, z = -2.70, p = 0.007)
PF: physical functioning; RP: role physical; BP: bodily pain; GH: general health; VT: vitality; SF: social functioning; RE: role emotional; MH: mental health.

There were two subscales where the BMI groups had significant differences in scores, which were the PF and GH subscales, and will be discussed first. For the PF subscale, both the NW and OW group were characterised by nearly identical scores (100 ±5.0 and 100 ±10.0, respectively), and the OB group had a lower score but a very large IQR (70 ±46.3). The NW group scored significantly better than the OB group (p = 0.001), in addition, the OW group also scored significantly better than the OB group (p = 0.006). A score of 100 (for each of these subscales) represents the most optimal state of health and wellbeing, whereas a score of 0 indicates the poorest state of health and wellbeing. Therefore, the NW and OW groups' scores suggest that for PF, these participants overall, experienced no limitations in their general everyday physical activities, including the most vigorous ones, at home and/or work. Whereas, the OB group's score suggests that overall, they experienced some limitations in their general everyday activities. Everyday activities include dressing and bathing, climbing stairs, bending, kneeling or stooping, hoovering (vacuuming), walking or running, lifting and carrying groceries.

Regarding the GH subscale, the NW group had the highest score (82.0 ±25.0), followed by OW (62.0 ±40.0), and the OB group had the lowest score (53.5 ±31.5). The NW scored significantly better than the OB group (p = 0.007). However, between the NW and OW, and the OW and OB groups there were no significant differences observed in scores. The higher score by the NW group suggests that they believed they had good general health, the OW group's score suggests that they had poorer general health, but better compared to the OB group. The OB group's score suggests that they believed that their general health was not good and was likely to get worse, especially compared to the NW group.

Regarding the RP subscale, the NW and OW group had similar scores (100 ±0 and 100 ±25.0, respectively), and the OB group had a lower score, but a very large IQR (87.5, ±56.3). However, there were no significant differences found between scores. High scores are indicative that an individual experiences no physical health problems that interfere with her/his ability to perform daily activities and responsibilities, at home and at work. Low scores indicate having problems with daily activities as a result of physical health problems. The difference between scores suggests that overall, the OB group experienced some degree of physical limitation in their everyday activities because of a physical health problem. In contrast, overall, their NW and OW counterparts did not experience physical limitations in their everyday life.

Regarding the BP subscale, the NW and OW group had similar scores (84.0 ±25.3 and 84.0 ±39.0, respectively) and the OB group had a much lower score (57.0 ±39.5), but not significantly lower. The higher scores in the NW and OW group suggest that overall, these participants experienced

very little physical limitations or bodily pain. In contrast, the lower score by the OB group suggests that overall, these participants experienced more physical limitations and bodily pain compared to their NW and OW counterparts.

Regarding the VT subscale, both the NW and OW group had similar low scores (57.5 ±37.5 and 60.0 ±25.0, respectively), and the OB group had the lowest score (47.5 ±21.3), although not significantly lower. High scores are indicative of feeling energy and 'pep' (i.e. liveliness) all the time or most of the time. Whereas, low scores are suggestive of feeling tired and worn out all the time or most of the time. All BMI groups scored in the mid-range which suggests that overall, the participants in this study did not necessarily experience energy and pep, but nor did they always feel run down and worn out.

Regarding the SF subscale, the NW and OW groups' scores were identical (87.5 ±37.5) and the OB group had a lower score (75.0 ±40.6) but not significantly lower. High scores are indicative that an individual experiences no interference from physical and/or emotional problems so that s/he is able to perform normal social activities. Low scores indicate that an individual does experience physical and/or emotional problems such that they interfere with normal social activities. The IQRs are quite large among all BMI groups, but overall, the scores suggest that the participants may have experienced a small degree of physical and/or emotional problems such that these problems interfered slightly with their normal social activities.

Regarding the RE subscale, the NW group had the highest score (100.0 ±75.0), and the OW and OB group had lower scores and were identical (66.7 ±100.0). The high score by the NW group suggests that overall, these participants experienced no emotional problems at work or in their daily activities. Whereas the OW and OB groups' lower score suggests that overall, emotional problems (i.e. feeling depressed or anxious) interfered to some extent with their ability to function at work or in their daily activities. However, this subscale has only three questions pertaining to it, and the only possible answers to these questions are 'yes' or 'no'. There is no scope for 'some of the time' experiencing emotional problems. Most of the subscales allow for gradient answers (i.e. some of the time, a little bit of the time, etc.). All BMI groups had an enormous IQR (75 or 100) for this scale, which implies that not every OB participant experienced emotional problems that interfered with their daily lives. Moreover, not every NW participant was free of emotional problems that might interfere with their daily lives. Specifically, upon closer inspection 5 participants in the OB group scored 100, whereas the other 5 participants (50%) scored below 50. In the OW group, 5 individuals (45%) also scored 100, 2 scored above 50 (18%), and 4 individuals (36%) scored below 50. In the NW group, 8 individuals (57%) scored 100, 1 (7%)

scored above 50, and 5 individuals (36%) scored below 50. Based on these percentages, the OB group overall did score lower, and suggests that overall, individuals with obesity do suffer to some extent from emotional problems which interferes with daily activities at home and/or work. Whereas, NW and OW participants had an identical percentage of participants that scored below 50, suggesting that even among these groups there are individuals who experience emotional problems that interferes with daily activities at home and/or work.

Regarding the MH subscale, all BMI groups had similar scores the NW and OW groups scored nearly identically (72.0 ±24.0 and 72.0 ±36.0, respectively), and the OB group had a slightly lower score but larger IQR (68.0 ±43.0). High scores are indicative of feeling happy, calm and peaceful. Whereas, low scores are indicative of feeling lower psychological wellbeing such as depressed, nervous and/or anxious. The participants' scores, because there was no significant difference found, suggests that overall, they experienced feelings of happiness, calm and peacefulness more often than they experienced depression, nervousness or anxiety.

In summary of the 8 subscales, both the NW and OW groups had higher scores and/or were more similar to each other suggesting that these participants experienced better wellbeing and everyday quality of life. Whereas, the OB group had overall lower scores which suggests that they experienced lesser wellbeing with regard to everyday quality of life. Interestingly, all groups scored very similar in the MH subscale, where scores were not too high, nor did they reach too low, but midway just above the mid-range of scoring (i.e. around 70). It is possible that because the majority of participants in this study are full-time university students, they experienced slightly lower psychological/mental wellbeing and perhaps experienced nervousness and/or anxiety around coursework, exams and/or 'homework' projects due, in addition to possibly feeling depression some of the time around these same issues.

We will now explore the two summary health measures which are derived from the 8 subscales as described above. Each summary health measure showed a normal distribution, Figure 7 shows a bar chart for each BMI group's mean ±SD summary health measure scores.

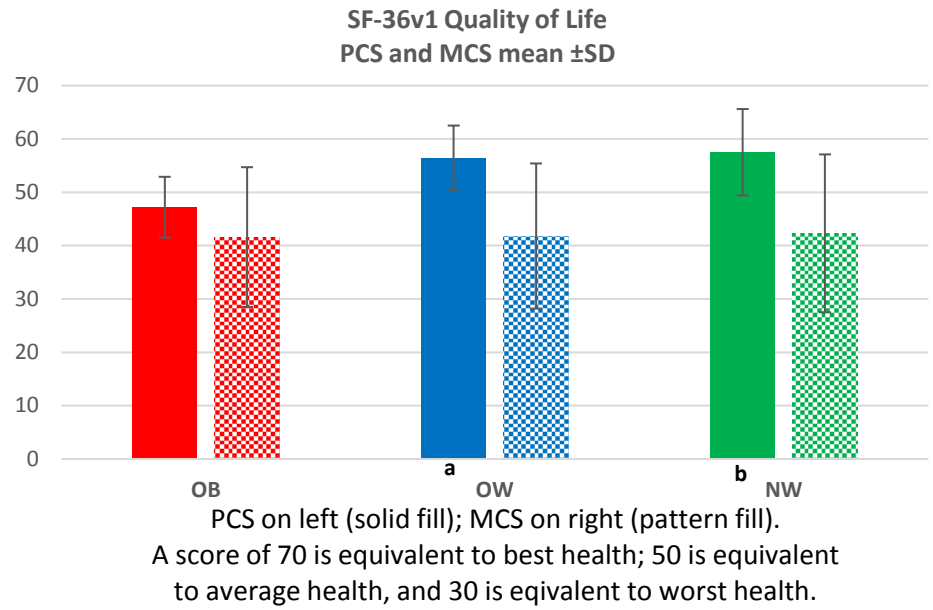


Figure 7 SF-36v1 Summary Health Measure scores in Study 2 BMI groups.
a: significant difference between OW and OB (F = 7.25, p = 0.01)
b: significant difference between NW and OB (F = 7.25, p = 0.004)
PCS: physical component summary (includes PF, RP, BP and GH subscales);
MCS mental component summary (includes VT, SF, RE and MH subscales).
PCS Cronbach α = 0.89 and MCS Cronbach α = 0.88.

Regarding the PCS summary measure, both the NW and OW group had similar scores (57.5 ±8.1 and 56.4 ±6.1, respectively), and the OB group had a lower score (47.2 ±5.7). A significant difference was observed between the NW and OB (p = 0.004) and between the OW and OB (p = 0.01). The scores for the NW and OW group suggest that they experienced above average health compared to the OB group who experienced below average health. Specifically, a score of 70 is equivalent to best health, a score of 50 is equivalent to average health, and a score of 30 is equivalent to worst health.

Regarding the MCS summary measure, all BMI groups had low scores for this scale, particularly, the NW had a score of 42.3 (±14.8), the OW had a score of 41.8 (±13.6) and the OB group had a score of 41.6 (±13.1). The similarity in these scores resulted in no difference found between the BMI groups' scores. All scores are suggestive that these individuals experienced less than average emotional wellbeing.

In summary, the NW and OW groups fared better in most of the quality of life subscales compared to their OB counterparts who had slightly worse scores, especially in the physical and body functioning aspects of this questionnaire. However, for the emotional (subscale) aspects, overall, each groups' scores were lower with very large IQRs, and is depicted by the lower than average

scores in the mental health summary measure. As was suggested previously, these lower mental health scores may be a result of student status, where the majority of participants may have been experiencing more pressure due to student workload and perhaps trying to balance their everyday life with this workload.

Previously, Pallant & Lae (2002) had found significant correlations between SOC and physical health and psychological wellbeing. This study also found strong, statistically significant correlations between most SF-36 subscales and SOC. In addition, because the BIQLI questionnaire also explores quality of life related to perceived body image, we explored the associations between the BIQLI and each SF-36 subscale and summary health measure, and found, overall, strong, significant associations between the subscales and summary health measures. Table 14 lists each of the Spearman correlation test results for the SOC-13 and BIQLI constructs with each of the SF-36 subscales and component summary scores.

Table 14 SF-36v1 subscales and summary health measures, correlation tests with SOC and BIQLI.
Spearman correlation tests among constructs, study 2 participants.

SF-36 v1 subscales	SOC-13	BIQLI
Physical functioning (PF)	$r_s = 0.44$, $p = 0.008$	$r_s = 0.51$, $p = 0.002$
Role physical (RP)	$r_s = 0.47$, $p = 0.004$	$r_s = 0.51$, $p = 0.002$
Bodily pain (BP)	$r_s = 0.27$, $p = 0.12$	$r_s = 0.36$, $p = 0.034$
General health (GH)	$r_s = 0.59$, $p < 0.0001$	$r_s = 0.49$, $p = 0.004$
Vitality (VT)	$r_s = 0.72$, $p < 0.0001$	$r_s = 0.66$, $p < 0.0001$
Social functioning (SF)	$r_s = 0.63$ $p < 0.0001$	$r_s = 0.53$, $p = 0.001$
Role emotional (RE)	$r_s = 0.62$, $p < 0.0001$	$r_s = 0.65$, $p < 0.0001$
Mental health (MH)	$r_s = 0.72$, $p < 0.0001$	$r_s = 0.70$, $p < 0.0001$
Physical component summary (PCS)	$r_s = 0.30$, $p = 0.088$	$r_s = 0.33$, $p = 0.058$
Mental component summery (MCS)	$r_s = 0.71$, $p < 0.0001$	$r_s = 0.66$, $p < 0.0001$

Only the BP subscale had a moderate, non-significant association with SOC-13 ($r_s = 0.27$, $p = 0.12$) which suggests that although there was a moderate association found between these two measures, the participants did not perhaps associate bodily pain with their salutogenic outlook on life. This suggests that perceived bodily pain was not constant (bodily pain). In other words, if an individual experienced bodily pain every day, perhaps related to disease, such as osteoarthritis, or low back pain, etc., then this could affect an individual's salutogenic outlook on life. However, because our sample comprises a younger age group, we would expect that these individuals would not yet be experiencing bodily pain that can result with age. However, between BP and BIQLI there was a moderate, significant association found ($r_s = 0.36$, $p = 0.034$), which suggests that if an individual experiences bodily pain, this would have an effect on her/his subjective

perception about her/his everyday quality of life, and vice versa, if the individual experiences no bodily pain, this has a positive impact on her/his subjective perception of her/his quality of life.

Additionally, there was a moderate association between the health summary, PCS and SOC-13 scores, but it did not reach significance (r_s = 0.30, p = 0.088). It is possible that a significant difference was not reached because the bodily pain subscale is encompassed within this health summary measure. However, the mental health summary MCS had a very strong association with SOC-13 and reached statistical significance (r_s = 0.71, p < 0.0001). This suggests that either, as an individual's salutogenesis increases so does her/his everyday self-perceived body image quality of life, alternatively an individual who has a positive self-perceived body-image quality of life, enhances her/his ability to see life as meaningful, manageable and comprehensible.

Between the health summary scale, PCS and BIQLI there was borderline significance, with a moderate association observed (r_s = 0.33, p = 0.058). This suggests that physical and bodily functioning (in particular, the subscales, PF, RP, BP and GH) are associated with how an individual perceives her/his body image, such that, the more positive the body-image quality of life perception is, the better overall, everyday quality of life is experienced, and vice versa.

In two different US studies, one in 1998 which used the SF-36 v1 questionnaire (Garrat et al. 1993; Tarlov, Ware & Sheldon 1989; Rogers et al. 1998) and one in 2005/2006, which used the SF-36v2 questionnaire (Maglinte, Hays & Kaplan 2012) investigating health-related quality of life in over 3,000 participants per study, scores were 'normed' for both versions of the questionnaire (called Norm-based scoring, NBS), in order for other studies to compare results. All 8 subscales' scores for our study were normalised (by QualityMetric Health Outcomes™ Scoring Software 5.0, 2016). Table 15 lists mean ±SD score values for both US studies compared with this current study's median ±IQR. However, we shall discuss our results in comparison with only the 2005/2006 US study because it is more recent, and more closely resembles participants in our study. (i.e. the US 1998 study comprised patients, whereas the 2005/2006 study was a cross-sectional survey of individuals across the US). However, the US 1998 NBS scores were included for completion.

Table 15 Norm base scores among US general population (adapted from Ware & Kosinski 2003).
(Also adapted from Maglinte, Hays & Kaplan 2012). US score values presented as mean ±SD, compared with this current study 2 score values' median ±IQR.

Study: **Participants:**	**NBS 1998** (v.1) n = 3,053 mean age 54 years age range 18-98	**NBS 2005-2006** (v. 2) n = 3,844 mean age 54.3 years age range 35-89	**Current study** n = 35 mean age 27.4 age range 20-41
SF-36 subscales	Mean ±SD	Mean ±SD	Median ±IQR
NBS Physical functioning (PF)	49.82 ±9.96	50.68 ±14.48	55.02 ±10.48
NBS Role physical (RP)	50.09 ±10.13	49.47 ±14.71	56.24 ±7.07
NBS Bodily pain (BP)	50.05 ±9.90	50.66 ±16.28	55.90 ±20.56
NBS General health (GH)	47.76 ±10.63	50.10 ±16.87	*48.78 ±17.67
NBS Vitality (VT)	50.58 ±10.59	53.71 ±15.35	46.69 ±14.79
NBS Social functioning (SF)	49.75 ±9.90	51.37 ±13.93	51.71 ±16.29
NBS Role emotional (RE)	49.12 ±11.11	51.44 ±13.12	50.08 ±31.60
NBS Mental health (MH)	49.16 ±12.58	54.27 ±13.28	47.04 ±12.27
Physical Component (PCS)	49.76 ±9.78	49.22 ±15.13	*53.88 ±13.17
Mental Component (MCS)	49.34 ±11.70	53.78 ±13.14	*46.42 ±23.10

*1 participant's score value missing.
Norm-base scoring (NBS, mean = 50 and SD = 10) 50 equal to the norm. Scores above 50 are moving towards better health and wellbeing, whereas scores below 50 moves towards poorer health and lower wellbeing. A 1-point difference is 1/10th of a SD unit which has a small effect size of 0.10 (Ware & Kosinski 2003). For PCS and MCS scores range between 30 (worst possible health) and 70 (best possible health).

Regarding the NBS_PF subscale, this study's 35 participants had a higher score (55.02 ±10.48) compared to the US 2005/06 norms who scored lower (50.68 ±14.48). The higher score by our participants suggests they experienced overall, a slightly better level of physical functioning in daily activities, including more vigorous activities such as climbing stairs or running, compared to the US norms. However, the US norms' score suggests 'normal health'. Specifically, in all NBS subscales, a score of 50 indicates 'normal health'. Scores above 50 are indicative of moving towards better health and wellbeing, and a score below 50 moves towards poorer health and lower wellbeing.

Regarding the NBS_RP subscale, the participants from this study also had a higher score (56.24 ±7.07) compared to the US norms, who scored just below 50 (i.e. 49.47 ±14.71). This suggests that the participants from this study experienced overall, better ability in performing daily activities at home and work, which implied they believed they had good physical health, whereas, the US norm felt they had normal health.

Regarding the NBS_BP subscale, the participants from this study, again, had a higher score (55.90 ±20.56), but a larger IQR, compared to the US norms, whose score equated to normal health (50.66 ±16.28). The 35-participants' score from this study suggests that overall, these participants

experienced no limitations in bodily pain, whereas, the US participants felt they experienced normal bodily pain.

Regarding the NBS_GH subscale, the participants from this study had a slightly lower score (48.78 ±17.67) compared to the US norms who scored only slightly higher (50.10 ±16.87). It is interesting that the participants from this study did not score higher on this subscale, particularly because they scored better in the previous 3 subscales. Nevertheless, their score suggests that they experienced belief that their general health was slightly less than average, or just approximately average, compared to the US participants who felt their general health was normal or average.

Regarding the NBS_VT subscale, the participants from this study had a lower score (46.69 ±14.79) compared to the US norms, who had a higher score (53.71 ±15.35). The lower score by the 35-participants suggest that they sometimes experienced feelings of tiredness or being worn out. Whereas, the higher score by the US norms suggests that they experienced more energy and liveliness.

Regarding the NBS_SF subscale, the participants from this study had a nearly identical score to the US norms (51.71 ±16.29 and 51.37 ±13.93, respectively). These scores suggest that both groups of participants experienced 'normal' physical or emotional problems that may interfere with performing normal social activities.

Regarding the NBS_RE subscale, the participants from this study had a similar score (50.08 ±31.60, but very large IQR), to the US norms' score (51.44 ±13.12). The scores overall, suggest that both groups experienced 'normal' emotional problems which interfered with their daily activities at work or home.

Regarding the NBS_MH subscale, the participants from this study had a lower score (47.04 ±12.27) compared to the US norms who scored higher (54.27 ±13.28). The lower score by our-participants suggests that they experienced slightly more often, some feelings of depression and/or nervousness which caused slightly lower psychological wellbeing and slightly more distress. Whereas, the US norms experienced above average higher psychological wellbeing.

Regarding the physical health summary measure, PCS, the participants in this study had a higher score (53.88 ±13.17) than the US norms who had a lower score (49.22 ±15.13). The participants in this study, their score was slightly higher than average, suggesting that they experienced better than average overall physical health. Whereas, the US norms experienced just slightly worse than average overall physical health. Specifically, a score of 50 indicates average health. A score of 70

indicates best possible health, and a score of 30 indicates worst possible health, in both summary measures.

Regarding the mental health summary measure, MCS, the participants in this study had a lower than average score (46.42 ±23.10), and the US norms had a higher than average score (53.78 ±13.14). The lower score by our participants suggests that overall, they experienced lower than average mental health. Whereas, the US norms experienced above average mental health. This lower score by our participants agrees with their lower scores in the VT and MH subscales, such that they experienced more, feelings of depression, nervousness, tiredness and being worn out, compared to the US norms who had higher scores in VT and MH, such that they experienced more feelings of happiness, calm, peacefulness, energised and liveliness. As previously expressed, these differences in scores may be a reflection that the participants in this study are mainly full-time students in university and may experience lower psychological wellbeing due to the stresses and demands of being a student.

A study by Brazier et al. (1992) explored health-related quality of life in a British population with more than 1,500 participants (age range 16 to 74 years), using the SF-36v1 questionnaire. Weight and height data were not reported. Participants were allocated into age groups, which for comparison we will compare only the age groups which are similar to the participants' age in this study. In addition, Brazier et al. (1992) included 77 participants who had a diagnosis of at least one chronic physical health problem (not including mental health). Brazier et al. reported only mean scores (Table 16), which we will compare with our participants' median scores.

Table 16 SF-36v1 in a British population (adapted from Brazier et al. 1992).
British sample score values presented as mean (SD not reported) for 3 different age groups (years) and patients diagnosed with at least one chronic physical problem (CPP); compared with this study 2, 35 participants and BMI groups' score values reported as median ±IQR. (Mean age reported for each BMI group).

SF-36v1 subscales	**16-24** (years) n = 240	**25-34** (years) n = 357	**35-44** (years) n = 298	**CPP** n = 77	**Current study** mean age 27 n = 35	**OB** 31 years n = 10	**OW** 28 years n = 11	**NW** 25 years n = 14
PF	94.0	95.0	89.0	66.0	95.0 ±25.0	70.0 ±46.3	100 ±10.0	100 ±5.0
RP	92.0	90.0	81.0	58.0	100.0 ±25.0	87.5 ±56.3	100 ±25.0	100 ±0
BP	87.0	84.0	78.0	59.0	84.0 ±48.0	57.0 ±39.5	84.0 39.0	84.0 ±25.3
GH	76.0	77.0	72.0	53.0	*67.5 ±37.8	53.5 ±31.5	62.0 ±40.0	*82.0 ±25.0
VT	68.0	63.0	58.0	50.0	50.0 ±30.0	47.5 ±21.3	60.0 ±25.0	57.5 ±37.5
SF	91.0	89.0	87.0	74.0	87.5 ±37.5	75.0 ±40.6	87.5 ±37.5	87.5 ±37.5
RE	84.0	84.0	81.0	74.0	100.0 ±100	66.7 ±100	66.7 ±100	100 ±75.0
MH	74.0	73.0	70.0	69.0	72.0 ±32.0	68.0 ±43.0	72.0 ±36.0	72.0 ±24.0

*1 score value missing. A score of 100 indicates best overall health and wellbeing, whereas a score of 0 indicates poorest health and the lowest level of wellbeing.

Overall, regarding the subscales related to physical health (in particular, PF, RP, and BP) the 35 participants (whose average age was 27 years) from this study scored either similarly or slightly better compared to the age groups 16-24 and 25-34 (i.e. for subscales PF and RP scores for all groups ranged from 90 to 100). This suggests that the 35 participants perceived their physical health to be good to excellent, which agrees with the scores for the two above mentioned age groups (i.e. 16-24 and 25-34). For the BP subscale, scores were between 84 to 87 for these two age groups and our 35 participants, which suggests that these participants experienced the same degree of bodily pain. A score of 100 indicates best overall health and wellbeing, whereas a score of 0 indicates the poorest state of health and lowest wellbeing.

Compared to the 35-44-year group, the 35 participants had higher scores for all three subscales. The fact that our participants had higher scores compared to the older age group (35-44) agrees with Brazier et al.'s (1992) finding where they observed significant differences in scores regarding physical health, where the younger age groups perceived their health to be better, and the older age group perceived their health to be worse on all dimensions ($p < 0.001$) except for mental health.

The participants in our study had a lower score on the GH subscale (67.5) compared to each of the age groups, 16-24 (76.0), 25-34 (77.0) and 35-44 (72.0), which suggests that overall, the participants from this study perceived their overall general health to be less than excellent or good (i.e. possibly, perceived their health to be above average). Although, the scores in the various age groups from the British study were not necessarily high scores either, and one might have expected for younger individuals to have a better perception about her/his health, but they did not. Overall, the lower scores suggest that our study partially agrees with lower scores in GH with other British counterparts.

Regarding the subscales related to mental health, and in particular, the VT subscale, the participants from this study had a lower score (50.0) compared to each age group, 16-24 (68.0), 25-34 (63.0), and 35-44 (58.0). This lower score by our participants suggests that in comparison to the three age groups, they experienced more fatigue or tiredness and perhaps run down or worn out, and overall less energetic. However, the same argument can be made that it would be expected that younger individuals would feel lively and energetic, and yet, the overall scores from the three age groups is not indicative of this. Such that, overall, the participants from this study do not have an incongruous score from their British counterparts.

Regarding the SF subscale, the participants from this study had a similar score (87.5) to the 16-24 (91.0), 25-34 (89.0), and 35-44 (87.0) age groups. This suggests that overall, all groups did not experience emotional or physical problems that would have interfered with their ability to engage in normal social activities.

Regarding the RE subscale, although the participants in this study had a higher score overall (100), they had an enormous IQR (100), which indicates that the score range for these participants was from 0 to 100. Overall, the three age groups had lower scores, 16-24 (84.0), 25-34 (84.0) and 35-44 (81.0). An overall score of 100 suggests that the participants in our study experienced no emotional problems (such as depression or anxiety) that interfered with daily home and work life. However, as was previously discussed, a limitation to this subscale is its response range of 'yes' or 'no', with no scope for 'some of the time', so that, if an individual might have experienced depression or anxiety some of the time, there is no possible way to know this. Whereas, the other subscales relating to mental health have scope for varying degrees (i.e. individuals can choose 'none of the time', 'all of the time' with varying degrees in the middle). Moreover, because the standard deviations to Brazier et al.'s (1992) study were not reported, it is difficult to make true comparisons.

Regarding the MH subscale, the 35 participants scored (72.0) which was similar to how the 3 age groups scored, 16-24 (74.0), 25-34 (73.0) and 35-44 (70.0). Suggesting that overall, all participants experienced more feelings of happiness and calm, than they experienced depression, nervousness and/or anxiety.

We now investigate how the OB group's scores compared to the patients with at least one diagnosed chronic physical problem (CPP) group. Overall, in 6 of the 8 subscales (excluding RP and RE) the OB group scored very similarly to the CPP group. Specifically, the OB group's scores ranged for six of these eight subscales, between a low of 47.5 to a high of 70. For the CPP group scores ranged from a low of 50 to a high of 74. This suggests that the OB group perceived their physical (i.e. PF, BP and GH), and emotional wellbeing to be as poor as individuals who were diagnosed with at least one chronic physical problem.

Regarding the RP subscale, the OB group had a much higher score (87.5) compared to the CPP group who had a much lower score (58.0). A possible explanation for this difference is the response range for this subscale is either 'yes' or 'no'. There is no scope for varying degrees of physical disabilities interfering with daily activities. This implies that for the CPP group, they perceived that they had a physical problem which interfered with their daily activities at home

and/or work, and this is perhaps not surprising that they experienced a physical limitation especially since they were diagnosed by a practitioner. Whereas, the OB group's score overall, indicated that they did not perceive having a physical problem which interfered with their daily lives. However, the OB group had an extremely large IQR (56) which suggests that some of the OB participants did experience physical problems to the extent where it interfered with their daily lives.

Regarding the RE subscale, this subscale is somewhat problematic. The OB group had a lower score (66.7) compared to the CPP group who had a higher score (74.0). The OB group's scores overall suggest that they experienced more emotional problems, relative to the CPP group, that interfered with their daily lives at home and work. It is perhaps not surprising that the OB group had the lowest score for this subscale. As Biedert & Margraf (2004) explain, the physical state of obesity itself may not actually create a psychological burden for an individual with obesity, but more likely, it is society and individuals who create that psychological burden and suffering, through prejudice and discrimination which in turn may have an adverse effect on the psychological wellbeing of the obese individual. Nevertheless, and as previously mentioned this subscale does not give scope for 'some of the time' experiencing emotional problems, it is either 'yes' or 'no'. Additionally, as was explained previously, all BMI groups had an enormous IQR for this scale, and, without knowing the standard deviations in Brazier et al.'s (1992) participants' scores, in this subscale, in particular, it is difficult to make a like for like comparison.

In summary; overall, the 35 participants in this study scored similarly on the SF-36 subscales to their British age-group counterparts, specifically the 16-24 and 25-34-year-old age groups, which was not dissimilar from the age group in our study which had a mean age of 27.4 (±5.8) years. Additionally, the scores, overall, suggested that for the subscales that measured physical wellbeing, our participants scored equally as well as their British counterparts. For the subscales related to mental psychological wellbeing, overall, our participants fared equally as well on these subscales, with the exception of vitality, where our participants did not cope as well as their British counterparts, and may be explained by the fact that overall, a majority of the participants in this study were fulltime university students, such that this may have had an effect on them feeling more tired and worn out and less energetic.

Regarding the OB group, the participants in this study, overall, perceived their physical health to be just as poor as those who suffered from at least one chronic physical condition, with the exception of the role physical where the OB participants fared much better, such that they experienced less physical health problems compared to the British individuals who were

diagnosed with at least one physical chronic health condition. Regarding the subscales related to mental wellbeing, the OB group overall had equivalent scores to the CPP group, which were low scores indicating that both groups perceived poorer mental health, feelings of tiredness, being worn out, feelings of depression, anxiety and/or nervousness such that these experiences may have interfered with their daily life activities.

In summary, regarding the questionnaire analysis, overall, both the NW and OW participants had scores similar to each other's, and fared better compared to the OB participants, in all 7 questionnaires. This is nearly identical with the questionnaire findings from the first study.

Appendix 23

Study 2 IDA – Topics analysis (approx. 25 pages)

Shopping for a variety of foods

Instrumental participants

Cait exemplified the instrumental narrative when asked what influences what she buys, she explained, "*I don't really cook as much, I just kind of buy like convenience things…*" (L55). When asked about shopping for a variety of foods she stated, "*I wouldn't really say so, no*" …*I just kind of have the foods that I eat all the time*" (L79-81) and agreed that she eats a lot of the same things. Although she did not consider herself to be a picky eater, when cooking at home she expressed that she does not like to try new things, she stated "*I've never… just always stick to what (I know)*" (L90). Cait also explained when considering what foods, she bought that "*sometimes you're really cautious of what you're eating… but there are times I just want to have what I want*" (L96-8).

Blair explained that her shopping does not vary, "*not really, it's a very … weeks are very similar*" (L107) (You have set meals) "*Yeah"* (L109). Moreover, she stated that her boyfriend does most of the shopping because she expressed that, "*I am very bad with food, like I eat aaa… I like bad food...*" (L42-3) "*I like cookies, I like crisps and everything, so I if I go, I will be tempted to get something*" (L45-6). Furthermore, she articulated about food that, "*it needs to be quick and easy*" (L225).

Deidra stated that she did not shop for variety, "*I usually end up buying a lot of the same foods... Erm, like, and I think a lot of that is because I know I can trust the taste of it*" (L110-11). She also stated that buying foods to have a balanced meal was not a consideration, and that shopping for convenience foods was something that influenced how she shopped and exclaimed emphatically, "*yeah, definitely*" (L118-24). Earlier in the interview Deidra had made clear that her mood definitely effected the foods she purchased, she stated, "*definitely my mood effects it cause if I'm not focused on, like, I want to get these snacks or I want to make this meal I just sort of go with my staples and my staples aren't particularly healthy.* (L54-6). Deidra had also explained that fruits and vegetables were not among her staples, and that they would rot before she ate them, therefore, she did not buy them or eat them (L95-8).

Flora expressed that she was not a finical eater and that she would explore more foods if it were not for the pickiness of her family, she explained, "*We tend to have the same meals because my husband and daughter are very fussy eaters, I'm not a fussy eater and there's so much more that I*

would eat that erm, I just think to myself, 'do you know what, I can't be bothered to actually preparing a whole separate meal for myself when I'm preparing something different for them' so we tend to go in a cycle with our meals as well, so it's very traditional, mince and tatties, …or steak pie with potatoes, mashed potatoes … my husband and my daughter are very reluctant to try new things" (So that's an influencer as well) "*Definitely*" (L281-94).

Katrina described her partner as being extremely finical, because of this she does not shop for a variety of foods, she explained, "*He… him and my son they dominate what I buy so I have to make sure it's, the food that I buy is very plain, it's always the same food that I buy*" (L134-5). Although she personally prefers a variety, she expressed, "*I like to eat lots of different things and I like spicy food but unfortunately my partner is dead set, against that so I can't, I like what he calls ethnic food*" (L139-40). "*I like things like that, but he doesn't, you know, he's very Scottish with his food eating, so (I) just stick to that*" (L142-3).

Disciplined participants

Mason described how trying new foods was related to what he sees or experiences with others, additionally, he conveyed that for him, variety was about not becoming bored with his food, he explained, "*I do like to try new things. When I'm shopping, I don't think it's got much, I don't think it factors in so much when I'm actually shopping. I think it's more, I will see it, I will see something externally, so like, maybe my flatmate's made it or I've kind of, I've seen it somewhere else and it's made me think 'oh, I'd quite like to try that' and then I'll go, like I'll factor that in before I go shopping*" (L195-9). And in terms of his diet he commented that it was full of variety, he stated, "*it's got a decent amount of variety in it, in terms of the different meals I make and in terms of what those meals have… I'm happy that I'm able to make different meals, enough that nothing kind of, it doesn't start feeling boring*" (L962-3).

Dehlia was not explicitly asked if she shopped for variety, but she did explain that buying organic and the quality of the foods were the main aspects that affected her food purchases, "*I prefer choosing the quality or if something is organic* "(L56). She had explained earlier that she purchased organic produce from a 'veg bag' scheme because the produce comes from a local producer (L19). Dehlia made clear that she was a vegetarian and would not eat meat, she intimated that this was because it was for the protection of the animals (L94). Other factors which were important for her were health and trying new recipes, she stated, "*it's because I want to be healthy and because I like trying new recipes*" she agreed that she was an explorer of trying new foods (L114).

Juliette explained that, as a student, she was on a budget, but she felt that this did not affect food choice but perhaps affected her ability to select more of a variety, "*because of the budget as a student, as I said, I would probably go in other shops as well and buy other things, but I cannot be picky so I try to... that's why probably I turned my cooking into a simpler way, combining less ingredients, just because of that. But that doesn't mean then that I'm cutting down on quality, it's just maybe the variety*" (L534-9). However, when she talked about trying to eat a balanced diet, she expressed it in terms of trying to eat a bit of everything, "(*I try to eat) a balanced diet basically, like having a little bit from everything*. Y*eah, from… meaning from fruits to meat to milk to yeah*" (L405-7). Juliette had explained how she felt about eating in moderation, "*if we try to balance and combine in a limited quantity, the stuff that we eat, I think that would be quite good. And that's why I think we get fat because we eat something of a sort of a… we eat something that cannot be processed by the bodies, by our body and then it gets stuck as fat in our body, so that's why I try to eat a little bit from everything than just eating a large quantity from just one thing*" (L389-95).

Odin felt that he ate very similar to how other people ate, he stated, "*We seem to eat the same sort of, it's like everybody else, we've got sort of set amount of meals you have, you know, …burgers, beef burgers, we eat them. Erm, I get fish, I don't get it from the supermarket, I've got a friend who'll give me a big box of fish and I'll often eat that*" (L126-30).

Aesthetic participants

Even though Annita kept a close watch on her food expense, she conveyed that she enjoyed buying a variety of foods because she does not want to get bored of eating the same foods, she stated, "*I think I like eating like different kinds of foods, so every time I'm trying new stuff… Yeah, because I think I'm kind of feeling bored if I'm eating always the same thing; but if I have favourite meal, I'm just going to eat it each week, but I'm trying to change to have a bigger variety*" (L115-18). She also described her curiosity about food when asked if she tried to have a balanced diet, she emphasised, "*Not really, no. Just my curiosity*" (L141). Annita also expressed that she prefers the taste of her own food, (L231-3). And when discussing her ideal food preparation, she specified it in terms of quantity, and flavour, "*my ideal would be with a lot of stuff inside. I like when you get a lot of taste in the food... like really a lot of vegetables and different meat … so the flavor I think*" (L313-5).

Zada explained that where she chooses to shop, she does so because of the greater variety, quality and freshness of the food (L98-102). On occasions, she will shop at specialty food stores,

she clarified, "*once in a while I go make sushi with my …friends so then we do it, like we go to this Asian shop, Chinese shop and then we buy all of the stuff that we need for sushi, but it's only once in a while*" (L197-200). Additionally, for Zada, variety was about where she shopped to get specific items, she stated emphatically, "*I like my real bread from like a special bakery or cheese from like a cheese shop, or like a delicatessen shop*" (L200-2).

The variety of foods that Lucas ate was described in terms of his trying to have a balanced diet, he commented, "*so having veg, having your wholegrains and stuff like that, having a bit of salt but not too much salt, not, processed, I think you've got to avoid processed food cause it's so difficult to have a balance in processed food, because one meal can be your whole days intake*…" (L736-8). "*Erm and making sure you've got a kind of a variety of different fruits, a variety of different vegetables and a diet of just different types of meals as well, you know*…" (L753-4). And even though Lucas felt that he had a boring diet, because he claimed to use a tomato-base for a lot of his cooking, but intimated real appreciation for the taste of the tomato base, and he really enjoys what he makes, fajitas was an example. Additionally, he expressed enjoyment in cooking and exploring, and trying new foods, he enjoys going into specialty food stores on occasion, he stated, "*Yeah, I sometimes shop in the European shop, erm, that's just because there's certain things that I quite like*" (L283).

How would you describe your diet / Structure

Instrumental participants

Instrumental eaters consistently defined their diet in very unfavourable terms; "*Awful*" was how Cait described it (L332) because of the convenience foods, snacking and chocolate (L335). She stated that she did not feel good about the way she was eating, she expounded, "*I've known for ages that I need to like change it, but… Yeah, I think just 'cuz I've got my routine of getting up, having a coffee, doing stuff, like, I'm not, I don't have the time, well, I could make the time, but like… I don't plan my day around food, so… (It's like a habit) yeah"* (L260-8). Furthermore, she felt that a healthy diet consisted of, "*Like three proper meals, and like obviously getting as much of your fruit and vegetables as you can. Maybe limiting the snacks to like one a day*" (L337-8). "*…I wouldn't take away chocolate and stuff, but I wouldn't eat as much as I do and like the takeaways and stuff, you don't have to have one every week like they can become a treat rather than just, we have no food, we're going to get a takeaway*" (L341-4).

And Deidra professed it as, "*Terrible. Not particularly nutritious*" (L463-5). "*Erm, I know that the way I eat is terrible. Erm, it's not healthy, like I know I need to eat a lot more fruit and vegetables, and exercise and probably not, probably eat better stuff in general, like better quality, erm, but I, it's also like I will, the cost and the effort right now isn't, doesn't make it, er, that much of a priority for me*" (L332-5). She also felt that if her life had more structure she would be eating better, she admitted, "*right now I am unemployed and just waiting for uni to start up, so my eating is just sort of all over the place*" (L656-7).

"*Terrible*" (L501) was also how Katrina spoke about her diet, she explained that if she were to be healthier, "*I would be eating a lot more vegetables in particular, maybe not many types of fruit, but a lot more vegetables, and a lot more fish, things that I wouldn't be eating is pretty much a lot of the stuff that I eat now, especially the treats, the cookies and things like that*" (L509-13).

Lindsay described her diet as "*bad*" (L611). Although she says she enjoys eating she explained that "*I don't plan my day around it*" (L578). And when asked about why she was not interested in trying to eat healthier she explained, "*because I'm so, sorry, I'm so afraid to try new things and I usually don't like them so, I know what I like, at this point, I feel like in life, I know what I like… I'm not really interested in trying new things, I would say*" (L917-20). She was asked if structure would allow for better eating patterns, to which she replied, "*Yeah, and if I maybe brought lunches to work, but I couldn't ever do that*…" (L899).

Shauna expressed dismay when she explained, "*I don't think it's good, I don't think it's healthy…*" (L240-2) "*I would try and cut back on biscuits and things …I kinda set myself a limit in the shop where I'll buy like two packets of biscuits once a week, and once they're gone, they're gone. It kinda doesn't really stop me because then I'm in the shop and I pick up like a sweetie or something, but it stops the kind of household eating with tea*" (L246-50). Additionally, during the interview she expressed that she felt she was probably a food addict, "*I find it (food) really difficult … I think I'm addicted to food, like the pangs when I don't have, it's just so intense, that I give up" (*intimating trying to eat healthy*)* (L410-11). Furthermore, she commented, "*I can see the importance of eating healthy in order to get the shape you require, but (whispering) I don't do it*" (L418-20). Shauna felt that when she had worked full time, her work schedule gave structure to her life, and this allowed for structured eating; and because she was not allowed to have food at her desk (L464-6). But now that she was not working, her days lacked structure.

Blair explained her diet in terms of what she should be doing, "*good eating habits I think is also down to the preparation of your food, so it's easier when you have a structured lifestyle, when you*

know… when it's always the same. For me it's like… yes, like during the semester it is more or less the same, but then you will change again next semester, and then you will change again next semester..." (L617-20). She felt that with more structure in her life she would be eating better (L624).

Serina, when describing what she does for lunch, explained in an exasperated way, "…*sometimes I might have the food that's available in the canteen. Yesterday I had a sandwich from Costa, you know, it totally varies whatever… you know, it's not a fixed thing, not very routine… No, it's not. …I mean, obviously, meals and consumption of food is taking place but it's all a bit, ad hoc* (So it's not structured) *It's not as structured as I would like it to be anyway, no* (So would you like more structure) *Yeah, I would*" (L592-614).

Disciplined participants

The disciplined eaters intimated a positive satisfaction with how they were eating and how they felt about their diets. Mason expressed contentment, stating, "*I'm happy with it because I think it's decently, it's got a decent amount of variety in it, in terms of the different meals I make and in terms of what those meals have*" (L953-4) *"…so I don't feel like I'm eating a lot of things that are very, very high in carbohydrate or just very high in protein or very high in fat, I think that everything I make has a decent mix of everything. …just making sure that, you kind of, your diet is broadly healthy, cause you know that each meal you're having has, you know, has things from different food groups. …and I feel like I'm eating kind of healthily enough*" (L955-64). Mason felt that his days were very structured, "*yeah, well currently it's definitely structured, so sort of like, I'll be here during, I'll be working during the day… I go home, I make my dinner, er, I try to delineate work and kind of home"* (L1278-83).

Dehlia was very positive and underscored, "*I think it's very healthy*" (L453). She went on to clarify what a healthy diet consisted of, "*it has to include fruit and veg and I think after, it's also good fats like olive oil and I think it depends on where you are from…* (L457-58) (would that mean buying local produce from where you are) *Yeah, or the type of fruit or spices.. and I think it's a lot about the type of fat*" (L459-63). She agreed that she tries to always buy all of her oils with the minimum of processing, so extra virgin olive, coconut, and rapeseed oils (L465-73). Additionally, she made clear that she never bought food on campus, but always brought her lunch to university (L604). Although 'structure' did not come up during this interview, it can be inferred that Dehlia's days are structured because she eats breakfast everyday around the same time (L323-30), she cooks a large dinner, so she can take leftovers for lunch the next day (L332-9).

Juliette emphasized that regularity and home cooked were important for her, "*I try to eat regularly, like try to have 3 meals a day, at roughly the same time. … I try not to eat later than 6 my dinner. … and I really, really want... I really like to know what I'm putting in my plate so that is probably why I am not having ready-meals and I try to cook most of the things by myself… a balanced diet basically, like having a little bit from everything*" (L401-5). Inherent in Juliette's answer is that her days are structured. She expressed that her main goal was trying to cut down on the amount she was eating, she felt that she had already cut out the foods that needed cutting out, she stated, "*for the moment, I think the quantity, because as I said, I have already cut some foods, so I'm trying, throughout the year, having these moments of just veggies and I … honestly, I have more energy during these periods*" (L414-6).

Odin reflected on his diet, stating "*Good but could do better*" (L412). He was contemplative about how much processed food he buys, but then stated that he did not really buy processed food and that he tries to buy as healthy as possible, "*I try and buy as healthy as I can"* (L4332-6). Structure was not a concern for him, he stated that he only ate when he was hungry but professed that this kind of 'lack' of routine might sometimes lead to overeating, nevertheless, he expressed disdain at people who were regimented with their eating schedule (L287-92). However, he also underscored that he ate breakfast every morning, and usually prepared his own sandwiches for lunch (L224-37). He articulated that his profession was a physically demanding job, in addition to trying to put on muscle, he explained that he carries food with him to have for when he needs it, "*because I'm so physically active now, that I need the food for me to carry on and do what I'm doing. My job's quite manual as well so I need, I need all these calories for energy*" (L370-6).

Aesthetic participants

The aesthetic eaters intimated overall, contentment with their diets, but two of them felt that they needed to cut down on the quantity. Annita expressed satisfaction in her eating habits, stating, "*most of the time, I think it's healthy, I would say*" (L462), and she explained, "*For me it's eating like mostly… a lot of vegetables and variety… and not a big dose of food, but just like not eat too much, but just like average …and not so (much) fat, for me healthy food would be not so fat... for me fried foods are not really healthy, but… I think you can eat also some fried foods*" (L131-8). *"…if I like it, I am just eating but in moderation*" (L366). However, Annita intimated that her diet was also influenced by her moods and expressed feeling good when she is eating well, but that when she was experiencing a low mood she would eat less healthily (L454-8). Structure was not discussed directly but could be inferred since she eats breakfast every day and cooks double the amount of dinner to have half for lunch the next day (L393-5).

Zada expressed contentment with the quality of the food she was eating but felt that she needed to cut down on the quantity, she stated, *"I think that I eat my fruit and I eat my vegetables, I just... I think I should smaller my portions*" (L435). "*I try to be more aware of what I'm eating (L494)*. She intimated moderation when she explained that she does not usually have dessert after her meals, but that if she was craving something she would have a small amount of an item, *"so I take a little cookie or a little candy just so, you know… something really small, just sometimes*" (L266-9). She conveyed that both caloric and sugar content were the important elements to which she would pay attention to in her shopping, *"if there's like, for example, looking at yoghurt and there's like a huge variety of yoghurt, I look at which brand has the least sugar ... and then I decide, ok, this one seems to be the most healthy, the least calories and least sugar, so I will go for this one* (L498-502). Zada did express frustration however, she felt that as a student her day lacked structure which did not always allow for good eating. She explained that when she was in full-time employment, she had structure and her eating times where very structured as a result; and was how she preferred her life to be.

Lucas was another aesthetic eater who, although he felt he had a healthy balance, professed to eating too much, *"A balance essentially. A good kind of mixture of, erm, everything but I eat too much"* (L728). For Lucas, 'a balance' meant that if he treated himself to a chocolate bar he would '*balance it out*' by eating healthy for the remainder of the day, he conveyed, *"it's about kind of limiting yourself, if you going to have a treat, okay, but you've then got to eat healthy again …and if you're going to have a night out and, you know, be unhealthy, if you're having a meal out and you're going to have a kebab at night or whatever then it's realising okay, for the next week or so maybe you've got to eat healthy*"… (L736-51). Interestingly however, when discussing moderation, Lucas expressed that he had difficulty with 'doing' moderation and therefore, would go without, especially when trying to lose weight. Lucas felt that his work shift definitely allowed for good eating habits (L963).

Body image

Instrumental participants

Cait intimated indifference to her body shape and felt that the shape of her body was affected by the foods she ate, she explained, *"Yes. Well, if I eat a lot of like high calorie foods, but then I'm not eating like, enough of them to like, like I should be fat but I'm not*" (L390-1). She agreed that although she ate a lot of 'junk' food, it was not enough to tip the scale of overeating and therefore

causing her to gain weight (L392-4). When asked if she would like to lose weight, she exclaimed, "*I mean everyone would like to lose a little bit of weight, I'm sure*" (L398), she proffered "*well, this is going to sound daft but maybe like 5 kilograms. Well that's how much weight I've put on since coming to Aberdeen"* (L402-5).

Ivan expressed embarrassment, he stated, "*well, I kind of feel ashamed of it because I know it's not attractive at all and I used to be like a lot thinner in my teenage years but then I gained some weight and I kind of lost confidence with the weight gain, but I'm trying to put down (lose) some weight now and I'm hoping I will regain my confidence with it*" (L780-6). In relation to the importance of food in connection with his body shape and image, he felt, "*Well, it's really important because, for example, when I eat junk food I know that I'm not losing weight so definitely I feel, instantly feel sad and I get angry at myself for it and, yeah, cause like it's, when I eat healthier food I feel fine*" (L789-92), and agreed that the foods he eats has a direct effect on the shape of his body "*Yeah, I do actually*" (L796).

Katrina professed, "*Oh… I think it looks terrible, yeah*" (L646). She definitely felt that the foods she eats affects her shape, she exclaimed, "*Yes. ...100%, yes. ...I mean, it doesn't just happen out of thin air, you don't gain weight out of thin air. The fact that I eat, you know, some of the foods I eat are very high in calories and the fact that I don't exercise that much, I think they're directly the reason I'm overweight. …Well, obese*" (L656-665). Furthermore, she felt that her food choices were important in terms of wanting to lose weight, "*Yes, definitely. I think that's actually, for me, more important than the exercise, cause the exercise I enjoy doing. I will quite willingly go to the swimming pool, but I won't willingly say no to a cookie, you know, you'd have to strap me down*" (L740-1).

Serina exclaimed, "*Very negative*" (L888), then articulated, "*I know that my diet, so whatever I have put into my mouth has contributed to my body shape, there's other things too*..." (L891-3). "*but, you know, my body shape is directly, part, no, that's not strictly true, I'm being a bit hard I think, but you know, there's a lot to do with the choices I have made, as in why my body shape is what it is and to be able to turn it around it needs a real change in approach to my diet… so it's hugely important*" (L895-9).

Andy claimed that his feelings about his body image were not all that important, "*it's not something I've ever been particularly hung up on"* (L876-84). Although he also admitted that his feelings about his body had improved. He expressed that food and diet were important in relation

to his body shape and that if he could change the foods he was snacking on, he could get his body to change shape (L895-902).

Disciplined participants

Mason declared matter-of-factly, "*Fine, I think the best way of putting it is, I don't, I don't spend too much time thinking about it*" (L1094). But he articulated, "*…a distinction I'll make, I feel fairly comfortable with my body but I always felt that there's a distinction between kind of being comfortable with your body and being able to say, 'oh, you know, kind of like I change these things or, you know, I quite like that', …cause some people kind of take comfortable to mean that they have to like everything about themselves, which I, I don't agree with. I think that to be comfortable is to be able to say, yeah, I'm fine with it, this is the way it is*" (L1096-1102).

Dehlia professed, "*I am comfortable, I usually, if my family tells me I don't eat enough then I don't feel comfortable... but most of the time I feel comfortable*" (L549-52). She felt that she had a healthy body shape and that the foods she ate did not have any effect on the shape of her body, she stated, "*not that much, because if I eat anything a lot, my body won't change a lot*" (L561).

Juliette implied dismay, "*I'm not really happy with it, in terms of the... yeah, body shape*" (L461). However, she felt that it helped her in a positive way with her food choices, "*I tend to be more careful at what I eat, as I said, …I could gain weight after eating certain dishes, so I try to not to eat them anymore, so I try to be more careful about them*" (L465-6). And she felt that food has a direct effect on the shape of her body, and her mood, "*Yep, yeah because if I look into the mirror and I don't like what I'm seeing, it affects what I'm eating, by… ...that relationship, yeah*" (L470-1).

Odin intimated that his feelings were shifting because he was currently body building to improve his shape, "*Well, it's in a transition period at the moment 'cuz I've only started back training hard, so I'm happy at the moment, (it) could be better*" (L492-4). He felt that foods did have a direct effect on the shape of his body, he explained, "*Well yeah, 'cuz I noticed a big difference, erm, lately 'cuz I've been taking a lot of high calorie intake and protein and I can see myself filling out more*" (L496-7). (You mean muscle-wise or just in general) "*It's in general, yeah. …But, ken, stronger as well, all the time... I know for a fact that, … trying to get this physique, 30%'s training, the rest is all food and stuff, you know food's… I think, I don't know if it's 30/70% food but it's the diet, about the diet. That's what I've heard*" (L499-512).

Aesthetic participants

Annita expressed, rather matter-of-factly, "*I think I am about average... I'm not like really beautiful, but not really ugly, I'm just like... random girl like*" (L537-42). And about her body shape, "*I think it's ok, yeah, it could be worse*" (L545). She also felt that the foods she eats effect the shape of her body, (L545). Additionally, they can have an effect on one's mental state, "*Yeah, of course I think, but if I'm sad or… it affects me more in the positive way, because I can be feeling happier if I'm eating, but it doesn't make me feel sadder*" (If you're eating, you're feeling happier? But not sadder) "*Yeah, but never negative feelings (*what are you eating to make yourself feel happier*) it's just normal food, it's not like (*crisps and chocolate*) No*" (L551-9).

Zada was optimistically cautious, "*Well, I know it could be worse, but I also know it can be better, so I'm trying to keep that in mind, but like, yeah, I'm fine wearing my clothes, but when I'm in my bikini I'm a bit ooooo… but that's the thing, wearing clothes, you're more protected*" (L627-31). Zada felt that her diet was important in terms of her body shape, but not a priority, she stated, "*It is important, but apparently not that important because*… (otherwise you'd be making the changes) *Yeah*" (L642). She also felt that food does affect the shape of her body, especially her hips (L646). During the interview Zada commented that she was in general confident in herself and her body, she explained, "*In general I feel confidence… but it also depends (on) who you are around or with what kind of group of people… like in general, I'm always really open minded, I'm really easy to get in… like hang out with people, or get in touch with, sometimes there is like a group of people that you're just so different or I'm just like shocked, and then I'm a bit like… (less confident) yeah*". She was asked if this affected what she ate, to which simply expressed, "*No. … well maybe if I have a group of people who are all skinny models, yeah, maybe that will influence me, but I don't have these friends*…" (L833-45).

Lucas identified his feelings about his body in terms of health rather than looks, "*I'm not really uncomfortable with it, unhappy with it 'cause I know that I should be healthier and it's more, I would suggest, health orientated than image orientated. I know it's not healthy for me to have a heavy waist because, you always see in the news that's where the health implications come, when you've got a heavy waist … I'm quite comfortable socially with my weight, it's just... I know that I would be happier, and fitter, for like going up the hill, like I can walk up the hill easier when I'm lighter, so I'd much rather be lighter*" (L835-48). He also felt that, "*Foods 100% effect the shape of the body*" (L854).

Social aspects

Instrumental participants

Deidra expressed enthusiasm and enjoyment when she described that her ideal way of eating, was in terms of being social, "*I'm just like...cause I love social meals, like it was always a super big thing where everyone had to have dinner together, like I grew up with that …even moving out on my own and having different flat-mates I tried to keep up with that, where I'll just be like, yeah, I made extra if you want to come eat and like socialising as well as that. I got out of the habit in this past year 'cause I've lived with new people now and then I'm on my own in my flat now, so not exactly anyone to eat with. Erm, but just big family meals where you come together, and you talk about your day and sort of what's happening*" (L427-33).

Adelina expressed that one aspect of her ideal way of eating food would be to cook for friends, she stated "*maybe also cooking, not just for us, but also for friends… to have four or six people to (have like a social experience with friends) yeah*" (L281-4). She also stated that she enjoys going out to eat, "*twice a month maybe, it's also more like a special treat, it's not every week or something*" (L203-4). She explained that at on a special occasion it is important to share in the occasion, she explained, "*I don't think that it's healthy if there's a birthday and there is a birthday cake and you are just saying, no I'm on a diet, I don't eat any birthday cake, I think you should still be able to, if you are socialising to eat something, but you shouldn't eat three pieces, but just one, then, in that case*" (L495-8).

Lindsay also referred to her ideal way of eating was in terms of socialising with friends and family, she stated, "*I would say, with friends or family, at a table*" (L564-6) (Is it about the social, about the sharing and socialising) "*Yeah, I think so and doing it together. I know it's better if there's more than one person, like a family gathering or something, I think that's the best time to eat cause it's not about the food… Food is just an addition*" (L568-71).

The social aspect of food for Shauna was important, in terms of celebrating, she explained, "*I don't know why it is, I'm going to presume it's how we've grown up that food has always been… you know, if we were having a celebration, we wouldn't go out and… you know go roller blading or something, we would eat, you know it's how it has always been*" (L403-5). Additionally, going out to eat is an activity that Shauna has enjoyed, as a family unit, she explained "*Yes, probably monthly, once a month. It's all of us normally when we go out for tea*" (L155-61). But with friends, "*not really, to be honest, not often*" (L281).

Serina expressed enjoyment in food as a cultural 'thing', "*I enjoy my food. It's in a, you know, it's kind of an enjoyment thing, you know, I think it's a very social thing here, as well, everywhere really, but it's a, quite a social thing, it's a, our culture is very much built around it… so it's become a bit engrained and, you know, the way we do life, it's kind of through food, in certain contexts I mean, you know*" (L870-84). Serina added that she enjoys going out to dinner with her husband, and going to friends' homes for get-togethers and that this in the context around food (L400-3), "*I really enjoy the social aspect*…" (L407).

Disciplined participants

For Mason, ordering takeaways is generally for socialising or marking an occasion, *"Yeah, I tend to enjoy kind of eating with people*" (L1090). …*usually when I order takeaways it's either, I'm usually with people. I've never really ordered on, out of convenience... and, or being like 'oh, I can't be bothered cooking, I'm going to order a takeaway' … Or it's sort of the, not in celebration of something but it's when you, like, somethings happened, you know what, take the night off, we'll have a takeaway*" (L403-12).

Dehlia expressed emphatically that she felt food was important to stay connected with her family, even more so than for the sake of health, *"I think it's not just about eating healthy, it's not only about health… it's also a way of knowing my …relatives*" (L520-2), and she expressed that food was a very important part of socialising (L524). Dehlia wanted to clarify a comment she had expressed during the interview about food not always being about health she expounded, "*when I'm going out I don't think about eating healthy, I just think about enjoying the time with my friends*" (L614-5).

Juliette had explained that although she only goes out for a meal about twice a month, it was not just about the food, but about the social aspect (L237-9). She also indicated ease and enjoyment when sitting around a table with her friends, in her flat eating a meal, but expressed she was comfortable eating alone as well (276-7).

Odin felt that food and socialising was a good way to spend quality time and connect with his family and friends, *"Yeah, I do enjoy, social events like eating around the table and having a couple of drinks and socialising that way. I find it a really important part of people's lives, especially in my last, well I've got two children, we always sat at the table, the four of us, talk about our day, it's a good focal point. Well I had that, I never had that as a kid 'cuz we never had a big enough house for a table but it's a good way to spend some quality time*" (L360-4).

Aesthetic participants

Annita was not specifically asked about going out with friends but explained that because of her financial situation she did not eat out much, instead she waits for when her parents can take her out to eat which was about once every two or three months, and she expressed enjoyment in going to a variety of restaurants (L249-59). At one point during the interview, Annita conveyed ease and satisfaction at cooking her own meals and having her friends around, where she would sit on her sofa and eat and chat with them (L325).

When it came to eating food and/or socialising, Zada gave the impression that she was content either way, *"Sometimes, I like it to be alone, I'm really fine with being alone, but sometimes I really like it, to have dinner with friends, like I'm a bit of both"* (L541-2). She did articulate however, that she felt food was important from a social aspect (L624), she expressed that going out to eat with friends was more about being together, *"So it's like, now it's more the social part to go out to dinner and have a nice drink*" (L254) "*…it's about being together with your friends*" (L260).

Lucas described himself as a sociable person and his enjoyment in eating with other people, for Lucas food was seen as being social, he emphasised, "*I think, I'm quite a sociable person and that's probably why I don't often eat alone because I quite like the banter you have with people when you're having it with dinner and having it with different groups of people as well because it's different experience and different crack and I think that's why I kind of associate food with a social aspect as well*" (L806-9). He also explained that when he cooks for others, *"if I'm eating with other people, I'll generally make a nicer meal*" (L813).

Importance of food / Symbolic

Instrumental participants

Although food was expressed as being important to Cait, it had a low priority, she explained, "*it is quite important but I do put like everything before food*" (L369), and when asked if she attached importance to her diet, she stated "*no*" (L461) she felt that "*most of the time I probably eat to live but then sometimes I do (really enjoy eating)"* (L311). Her clarification for why she thought food was important was "*'cuz you need it to maintain your health*" (L375), and she agreed that it affects mental health as well but did not expound on this (L376). She had professed her lack of confidence in her cooking abilities despite four years of home education at school, *"I'm just not*

confident with myself to be able to cook up a nice meal" (L201-2) which is why she acknowledged to eating more convenience meals.

Cait expressed a symbolic attitude when she explained that she buys her fish from the fish counter because that was how she was raised (L58-60). Additionally, she will not buy food from the reduced aisle in hopes of finding cheaper food, she emphasised that she actively avoids this area (L69-74). It can be argued however, that because of her distrust in food in general, her motivation for these two acts may stem from fear, as she said herself, "*sometimes you're really cautious of what you're eating and like*" (L96-8).

Ivan expressed that there were times when food became less important, he stated, "*Well, it (food) is really important but there are some days where, for example, if I, I always have these mood swings like I always, I get depressed easily and when I'm depressed I don't feel like eating …so there are times and days where, yeah of course, I don't eat at all or I just eat something just to satisfy my stomach*" (L735-41). (So, then food becomes less important) – "*Yeah, definitely, food becomes less important and I just replace, sometimes I just replace it by smoking… I cut down on the foods, or my food intake and I increased my cigarettes*" (L733-5). Ivan did not appear to express any symbolic attitude towards food, he articulated that promotions, reductions and the 'sell by date' influenced his food purchases (L68-9).

Deidra embodies an instrumental attitude to food because she views it as a necessity, *"I mean I definitely need it to live, and in order, you know, to make sure that I have the energy to do the stuff that I want to do. I love eating food, just, I love the way it tastes and, erm, I enjoy cooking, like, it's not something I would like a career out of, or start blogging about, but it's something I enjoy doing it when I have the time and dedication, erm, but, so food is important but...I don't know*" (L531-5) (But you don't prioritise it) – "*Not really*" (L537).

A symbolic attitude that Deidra expressed was in terms of her ideal food shop, she stated, "*if, money was no object kind of, I would love to shop at, like an upscale grocery store, so not Asda but somewhere that has like a, meat counter and like an actual butcher and I go and buy like, you know, a leg of lamb or actual like thick steaks and big old chickens and things like that and go through and buy fresh fruit and veg and know that I'm actually going to eat it, erm, and kind of stay away from more of the frozen things…*" (L233-9). She had stated earlier that her food shops were mainly convenience foods, ready-made and frozen (L124-6), because as a student she was just making ends meet (L739-42).

Lindsay elucidated foods importance in terms of energy, "*There are some foods that boosts your energy or brain food, but I've never really looked into it. I usually know that if I'm doing something, I'd better eat just so I have energy cause if I know I'm not going to eat for a long time …so it's useful to eat something to have energy for later*" (L732-6).

Lindsay expressed a symbolic value to food when she made clear that she does not buy the bottom brand, but can afford the middle brand of a product, *"I do care how expensive products are, but at the same time I don't buy everything from the lowest shelf. I do appreciate somewhere the balance between quality and price*" (L62-3). (Do you mean lowest quality) "*Yes, like say own brand. I can appreciate that some products are completely fine, but then there are ones that I prefer*" (L66-7). (So, you sort of buy the middle brand) "*Yes, I would say so*" (L69). (Is that because you think the middle brand will be better than the lower brand) "*As I said, it depends on the product and the choice what, as I said, Tesco, let's see, Tesco own pasta, I'm sure there's nothing wrong with it but maybe the sauce will be better on the middle shelf*" (L74-6). She also intimated disdain when asked about if she liked her food shopping choices near her, "*No … the only thing close is Farm Foods …and that's not really, like, I don't eat healthy, but I even know that eating everything frozen is not good*" (L947-50).

Serina expressed a recent development of the importance of food in her life but embodies an instrumental attitude because she views it as 'something you've got to do', she elucidated, *"It's pretty important. I'm in quite a phase at the moment where it's become more important than it was, up until recently, I think*" (L846-51) (So recently it wasn't as important) *"It wasn't as, erm, I'm in this phase recently, been in a phase recently where just, just life, and it's just been, it's been my go to and it's that, and so that is quite sad really cause when you say 'is food important' you say, yes, it is actually important, erm, it...important is a difficult word as well, it's, cause it's something you've got to do, you do it, erm, I suppose I place quite a lot of attention on it, that's what I would say. Erm, I mean, clearly it's, you mostly have certain, you have your family and all that sort of things are far more important than food, that's not, but I certainly know that I place quite a lot of attention on it just now… at certain times of the day*" (L853-63). She explained that the attention she paid food was more in terms of comfort eating, "*Yeah. That's what it is, I think* (An emotional comfort) *Yeah. And an enjoyment. I enjoy my food*" (L870-4).

The best quality was the symbolic value that Serina placed on food, she clarified, "*so for example, rice, let's say it's microwavable rice, I like to buy the, you know, the best one I can get of that, or if it's sweetcorn, for example, I like to buy, not the store brand, I like to buy Green Giant, you know, that's… that's a personal choice cause I just know that's going to taste the best*" (L147-55). She

also expressed that due to getting older, she is now more careful about the quality of the meat she purchases, "*as I'm getting a bit older, I've noticed I'm being more, erm, careful about what I'm choosing, in terms of the quality, and we're using the butcher a lot more rather than the supermarket. Yeah, yeah*" (L157-61).

Other instrumental profile eaters such as Ada, Adelina and Andy expressed that food held a low priority and was not an overly important part of their lives. Whereas, Blair, Emma and Dylan felt food was important because it gives you "energy" or "keeps you alive". Only Katrina conveyed the importance of food in terms of giving pleasure, but then pronounced that it had become a habit, that is a habit of eating foods that she should not be eating. Camilla expressed that food was very important nutritionally for health and wellbeing, but then intimated an obsession with it because she thinks about it all the time. She explained how she would spend "hours" in the grocery store placing cakes and biscuits in her cart, but then circling the store and putting them back on the shelf, but then buying them anyway.

Additionally, among the instrumental profiles, a number of these participants indicated some symbolic attitudes towards their food purchases. As an example, Ada, Flora and Shauna prefer to buy organic, Flora wants to avoid the pesticides. Ada chooses to patronize local restaurants to help support them. And Shauna will buy only the top brands of packaged foods. Zoe selects local and seasonal produce, also expensive basmati rice. Emma uses only quinoa and couscous instead of rice because it is healthier. Camila and Elizabeth will only make their sauces from scratch, actively avoiding purchasing jarred sauces. Blair will not buy battery chickens, because she believes they are pumped full of water, so will only purchase free range, furthermore, she is not interested in value for money, she wants quality. Abigail will not purchase supermarket variety sausages, she will only purchase them from the butchers.

Disciplined participants

Mason felt that food was important to a degree, *"I would say, yeah, food's quite important in my life but it's not, ah, I don't think it's more so important to me than it is to anyone else*" (L1041-2). He expounded, *"food is, it's sort of functional that you need to make sure you are getting it... I know, I understand the value of food just as a functional thing that we need to ingest and the role it plays in terms of physical ability, in terms of health, but I also see it as something that we can enjoy, as opposed to just a thing you kind of need to kind of get set allocations. I think there is a sort of pleasure side to it… and I think that, probably in my mind, are kind of equally important*" (L1070-87).

For Mason, symbolic value of food was equated with a better name brand, "*if I had more money then I might get some of the branded things or I might, erm, get more, kind of more expensive kind of versions of the same ingredient"* (L1427-45). When asked if he felt that a higher brand implied better quality he stated, "*I don't think it's a guarantee of quality …but I think there are certain things that that is the case. Certain brands are just generally better than off brand versions*" (L1448-76).

Dehlia equated the importance of food in her life as a conduit for connecting with family ties, she articulated, "*I think in my family it's very important, I think it always has been something important, I think it's not just about eating healthy, it's not only about health. ...* Dehlia further elucidated the different cultural background of each of her parents and food was a way to 'know' her relatives (L510-24).

Dehlia's symbolic attitude towards food was expressed in terms of organic, local produce and for the protection of the animals, she stated that she buys the veg bag "*because it's organic and local producers*" (L15-9). In general, when shopping she places a high value on buying organic produce and eggs even though it meant she might pay a little more but was also why she chose to shop at LIDL, "*LIDL has like a sale where they have organic food or local food*" (L237-9); and, she chooses to be a vegetarian, "*it's first for the animals, yeah*" (L94).

Although Juliette expressed that there were more important things in her life than food, she did explain that she takes the time to make her meals because food was important to her in terms of her health and mood. "*I think it's pretty important because as I said, …I want to cook and everything by myself and know what I have in my dish, it takes a large chunk of my time, from that respect, time-wise, yeah, I think it's quite important"* (L455-7). She clarified, "*It's important because it affects my health and my mood sometimes, and yeah*…" (L455-9). *"…I have other stuff more important, it's just I try to enjoy when I'm doing it, when I'm eating and not just doing something in a rush*" (L381-3).

Juliette conveys a symbolic attitude about the produce she purchases when she clarified that it must be able to rot, because then you know it is natural, "*For me, the fruit or vegetable, it's nutritious when it can rot, or it has… when it's not perfect, basically …so the single units for me there, they are too perfect because they are not wrapped in a plastic container or bag, they have to look perfect so they do something else in the background, you know*" (So will you not buy them then) "*No*" (L89-95). She also expressed that she chooses to bake her own bread rather than purchase the store bought (L144).

Odin expressed pragmatically that food is "*Very important, 'cuz you need to eat to live* (L484). Because Odin is trying to gain more muscle mass, he sees it as functional fuel "*Oh definitely, yeah*" (L376). The extent of Odin's symbolic attitude towards food was, he was emphatic that he does not get his fish from the supermarket but from a friend who gives him a big box (L129-38). Whether he felt that was superior however, was not explored.

That food is functional fuel, as was expressed by some of the disciplined eaters above, Grayson, Jake, Theo and Amelia also conveyed this, that food was important because it was "*a necessity*", "*functional fuel*", "*cannot live without it!*". Ellie described it as important for physical and mental performance. Whereas, others, similar to how Dehlia indicated earlier that it was important for her cultural identity. Hazel, Nora and Natalie also identified with the importance of food as a way to connect to friends and family. Max felt that in general, 'we' take food for granted, and it is important to be mindful and appreciate what 'we' have.

Dehlia and Juliette expressed the concept of the symbolic value of food, in terms of purchasing organic, and indeed, a number of other disciplined eaters felt this way. Nora was concerned about pesticides, Hazel expressed buying organic in order to help the farmers and the environment, and, Hazel has become vegetarian mainly for this reason, and, if she buys meat, she will only buy organic, and refuses to buy foods with colouring or additives. Logan also became vegetarian for environmental reasons and tries to buy only free-range eggs and local produce. Max also tries to buy only free-range eggs. Grayson was very proud when discussing how he and his wife grow their own vegetables. In a similar vein, Ellie expressed desire to be able to buy produce which was "*dug out of the earth*".

However, there were a few other concepts that arose around symbolism towards food: for Amelia, family mealtimes were not to be spent in front of the TV, but at the table. Natalie spoke very proudly when she uttered "*my dad knows how to cook*" and how, when she is on holiday with her family, they spend long afternoons eating their meal. Jake expressed disdain towards Asda and felt that Sainsbury's caters to the "*weird and wonderful*" which is why he shops there. He buys only fresh fish from the counter, refuses to buy sweeteners, and margarines are "*fake*", he will only buy the real foods, sugar and butter, when he does purchase these items, although rarely.

Aesthetic participants

Annita is an excellent example of an individual who embodies an aesthetic attitude towards food, because she had to teach herself how to cook, and she professed that at first her cooking was not

very good, but she persevered, because food is such an important part of her life, "*I think it's really important... like really! … I think that's the best moment of my day, I'm really feeling happy when I'm eating… I was cooking like really not so good stuff, and I was really depressed with all of that… just because I wasn't eating well. And I wanna try cooking by myself, I was like feeling much better, so yeah, I think it's really important*" (L516-24). And she specified that food was important not only for feeling happy, but she underscored its importance in terms of her future health, "*I think I'm taking care about that because it could be easier in the future if I'm… I think it's important in my life because I'm thinking that it's good for my body*..." (L529-31).

Regarding symbolic, Annita explained that although she felt that the most expensive brands in the store were generally better, she buys what she can afford, "*I'm trying to not take the cheaper one (brand), but the cheaper before... The one I can buy (afford) which is not so bad*" (L81-7). And for her ideal shop she explained that instead of buying the middle brand, she'd prefer to buy the top brand (L287).

The main importance of food for Zada was also tied in with symbolism. Firstly, she had expressed that food was important for socialising (L624), and she proudly described an experience where she and her friends would go to a specialty food store to buy what they needed to make sushi (L199-200). Additionally, proper authentic restaurants ranked higher on her scale than the expense of the meal, "*it's not always… like expensive dinner… but this is like a real Italian, it's like, the best!"* (L236-46).

The symbolic value of certain food items was clearly important to Zada, "*like my real bread from like a special bakery or cheese from like a cheese shop, or like a delicatessen shop*" (L200-2) she intimated disdain in her voice if these items lacked authenticity. She also quipped that she preferred shopping at Morrison's even though it was more expensive than Asda, she was willing to pay more for the quality, plus it reminded her more of a European shop (L88), additionally she would try to shop earlier in the day to find the items which were important to her (L31).

Earlier, Juliette (a disciplined eater) had described how if her produce was not wrapped in plastic she did not trust it, in complete contrast, Zada expressed complete contempt for produce wrapped in plastic, "*I don't like the products that are packed, for example you can buy kiwis which is packed in double plastic and I hate that*" (because you can't feel) "*yeah, and it's like a waste of plastic*" (L278-82).

Similar to Zada, the importance of food for Lucas was about socialising, he explained how he preferred to eat with other people around and with different groups of people, he made clear

that he really enjoyed these interactions, "*I quite like the banter you have with people when you're having it with dinner and having it with different groups of people as well because it's a different experience and different crack and I think that's why I kind of associate food with a social aspect as well"* (L806-9) … "*if I'm eating with other people I'll generally make a nicer meal"* (L813). Additionally, Lucas expressed that food was "*quite*" important to him, "*I always want to know what I'm having for dinner, cause, I like to have a nice dinner"* (L800-2).

Similar to Zada's symbolic attitude towards the quality of food, Lucas expressed that he would happily pay more for an item he felt was better quality (L295-6) and is one of the reasons why he chooses to shop at Sainsbury's, *"because I think the food is the best quality for the price you pay"* (L8).

The effect of stress and other emotions on eating

Instrumental participants

Blair epitomizes the instrumental profile when she proffered that under most circumstances, "*when I'm bored, I eat, when I'm down, I eat, when I'm stressed, I eat… I'm an emotional eater*" (L349).

Zoe specified "*stress makes me want to eat more sugar, to be awake*" (L596). Camila commented that "*if I'm tired or stressed I just want pudding and will go out of my way for sweet things*" (L473-6). While Emma pragmatically stated, "*I hit the chocolate or ice-cream when stressed or in a mood*" (L719-21).

Lindsay articulated that stress affects the "*quantity of food I eat not the type of food*" (L1022-6), and intimated that she mindlessly eats about twice a week (L551-62). Additionally, Elizabeth, if stressed, "*will definitely eat more and it won't be healthy food, it's going to be convenient, fast, filthy food*" (L956-9), "*emotions definitely play a part in what I eat*" (L530-2), she also expressed that she will eat when bored (L503-15), and will mindlessly eat when tired (L587-91).

Ivan stated that stress causes him to lose his appetite, but that he also does not pay attention to what he eats when feeling stressed, *"I don't pay any attention to what I'm eating... I'm making less homemade meals as well ...it's more convenient, yeah*" (L929-38). Additionally, he expounded that his moods affect what he eats, *"my mood swings definitely influence my, food choices… for example, when I'm sad or depressed or kind of down about something I usually just don't pay any*

attention to what I'm having. It can be just like the most unhealthy food on the planet but I'm going to have it anyway because I wouldn't care at this time" (L948-51). In a similar manner, Deidra commented that stress makes her lose her appetite, but that she will mindlessly eat when reading or watching TV, or also out of boredom, *"I want to have something to snack on even if I'm not particularly hungry and I, that's just been a constant through my life"* (L410-14).

Cait indicated that stress and eating were mixed, "*that can vary actually, 'cuz sometimes like I could go through the whole day without eating, 'cuz it's not a priority, I'm thinking of other things, then other days like I'll be just like I need all the chocolate, it's like fatty sort of food that you're wanting just cause it makes you feel a bit better*" (L497-500). She also expressed that when she has friends around, she will mindlessly eat, or eat the whole time, chatting and eating, which happens about twice a week (L287-92).

Andy was uncertain about whether or not stress caused him to eat but felt that he probably responded to stress the same way he does to boredom, which causes him to eat (L1101-3).

Shauna remarked that she mindlessly eats "*all of the time*" (L268) and engages in comfort eating when under stress (L518-9). In addition, Ada expressed that stress increases her need for mindless, emotional and comfort eating, which is, she stated, her default (L734-41 and L778-82).

Both Katrina and Serina conveyed resignation and disappointment with themselves for losing willpower, Serina uttered, *"when I'm a bit stressed that's when I don't want to be...that's when I don't have a clarity of thought about what I'm really wanting to do… but what I find is that when life becomes stressful all of that goes out the window. That's my pattern"* (L645-54). And for Katrina, stress causes her to 'give in' to ordering a takeaway, but she is clearly not happy with this choice, "*If my partner says 'let me just get a takeaway', okey, because I find that a lot of the junk food that I eat, when I'm eating it, it almost has a, it sedates me almost, it's almost like an addict, almost like I'm addicted to a high. I think it's more the high of eating that food rather than the foods itself, I don't know, but I don't experience that high when I eat an apple"* (L780-4).

Disciplined participants

Juliette, Amelia, Nora and Dehlia all expressed losing their appetite under stress. However, each of these participants did clarify that when bored or feeling sad, would engage in eating. Juliette explained that organising herself helps her to manage her stress, but she articulated that she would eat when she was feeling bored or melancholic, *"sad in terms of not stressed, when I'm*

stressed, I cannot eat. Sad, in terms of, I don't know, sad… melancholy" (L357-61) and "*I feel really bored so I go and look in my fridge, what's there"* (L518-22).

In a similar way, Amelia and Dehlia expressed that they engaged in some form of mindless eating, generally because of boredom. And although Nora stated that she engaged in mindless eating sometimes, she highlighted that compared to her flat mates she engaged in it less, "*yeah, I think that sometimes it happens, sometimes I'm eating more snacks than usual, yeah, it's on biscuits, but it's still not a lot. It's only in comparison with what I do with my flat mates where some of them are eating a lot of snacks*" (L389-91).

In a similar manner to how Juliette described earlier how she helps herself deal with stress (i.e. being very organised), Grayson, Hazel, Natalie and Ellie, (who lose their appetite when stressed), also chose to do something about the stress, or in response to it, such as, Grayson who stated, "*first thing I'll do is put my shoes on and go for a run with the dog, just go and blow off and have a think, or just forget for that hour that I'm away"* (L609-11). Hazel expounded, *"I meditate, so I don't stress myself"* (L693). However, Hazel did state that if she had to sit down and do some university work, she would have a snack of biscuits or crisps while working, regardless of whether or not she had just eaten. Grayson explained that the only time he would mindlessly eat would be a box of popcorn at the cinema, which he admitted occurred only occasionally.

Natalie explained, *"when something is stressing me, I just take a while to calm myself down, I just try to see the situation and try to think about it; to just think 'ok, it's just this way, what should I do, in this way' then after I think about it, in maybe 10 minutes, I am finding that I'm not stressed anymore"* (L494-9). Ellie commented, *"if I'm stressed, I would have a cup of tea rather than go for, you know, eat something sweet or something like that, yeah"* (L980-1). And, both Natalie and Ellie expressed that they did not engage in mindless eating, Natalie made clear that she is hungry at meal times because she does not snack. Ellie emphasised that she was quite conscious of what she eats and when.

Mason expressed that how stress affected him was in terms of being very busy so the knock-on effect was having less time to cook such that, he would cook more meals and freeze them to have for later, *"so kind of make more meals that I can freeze basically… so that I'd be cooking less but still have the meals"* (L1389). When discussing mindless eating, Mason preferred to not have any snack foods around, *"I don't really keep it around 'cuz I know I don't really want to mindlessly eat because then you don't enjoy the thing you're eating and that's, that's kind of defeating the purpose… in a lot of ways"* (L797-802).

Whereas, Theo explained buying lesser quality, "*if it's stress, related to money I'm more likely to eat cheaper things, maybe things that aren't, like buy cheaper meats, that have maybe got higher fat, so you know they're cheaper, erm, stress, sometimes I do stress eat. Like eat, eat more if I'm stressed, had a bad day and I can't be bothered cooking I'm just going to have something rubbish, I'll get a takeaway or something bad, just like, something to try and cheer me up*" (L821-25). However, Theo made clear that he does not keep snack foods in his flat because he stated if bored, he will eat them, but if they are not around, he cannot be bothered to go to the shop to get them (L471-4).

Logan emphasised and intimated that he bought more convenience-based foods when stressed, *"Definitely (affects what I eat). I mentioned earlier, not listening to the sort of smarter side …so I put my own feelings of things to the side just for ease of eatin', so I'm less cautious of like um… about the way I want to be, like not that I eat meat, but instead of worrying about what proteins are, other nutrients that I need, I'll just eat something dead quick because I'm usually on the go again"* (L707-20). However, he professed to having engaged in mindless eating when he was younger, but does not do that anymore, that he cut it out (L388).

Max clarified that when stressed he tries "*to eat as consistently and normally as possible cause otherwise you get into bad habits"* (L1086-9). Earlier in the interview, he had mentioned that during times of stress he would not be open to trying new foods, *"I would never even dream of trying (new foods) if I was stressed"* (L104). For Max, mindless eating occurred when he was engaged in conversation with friends and having a bag of crisps, and not thinking about the enjoyment of the food, but about the conversation (L602-20).

Only one disciplined eater expressed that stress causes him to eat more, Jake stated, *"Yes, it does. I do understand people stress-eating 'cuz I tend to do it myself"* (L713). And he conveyed that the he would engage in mindless eating, *"tends to be at work, like if there's something open at work, especially sweeties, … at Christmas time, it's a nightmare 'cuz there's a box of chocolates everywhere and you just will, you're not, you don't want it, but you will eat it… I think it's a boredom thing"* (L374-9).

Only Odin stated that stress did not affect his appetite in any way, he emphasised, *"no it takes a lot for me to lose my appetite* (L696) … *that's what I'm saying, I wouldn't eat more, no*" (L700). Additionally, Odin explained that he would snack, but not on biscuits, but sandwiches, *"I do snack, yeah... again, coming out with a sandwich, I don't buy biscuits, I've never bought biscuits, cause they're so full of sugar, if you don't buy it you won't eat it, that's my motto*" (L275-85).

Aesthetic participants

Annita intimated loss of appetite when stressed, *"Not really, if I'm stressed, I'm more lazy, and if I'm lazy I'm cooking less, so maybe that effects, but it's not a direct affect … I think it's just maybe I'm eating less ... if I'm feeling stressed, I'm not like jumping on one kind of, one type of food just to (be) feeling better, I'm just more... yeah, I don't want to do anything, so I'm just focused on what's my problem and I'm not thinking about (food). Yeah, so sometimes, I eat less*" (L680-95).

Whereas Zada stated that she forgets to eat when she is stressed, *"Yeah, it depends, sometimes I just forget to eat, or I just don't eat much... when I'm stressed or busy with Uni, I can't be bothered to do shopping or cook, so I will buy something... so, I grab something easy from the Tesco Express*" (L812-19).

Lucas, did not express that, when stressed, he ate immediately in response to it, but instead would wait for the end of his work day to treat himself, *"if I've had a hard day or I'm feeling stressed out I'll be like, right, okay, give us, give us a, that wee treat, you can have a bottle of beer and some crisps and that's your wee treat…*" (L1056-8).

Both Annita and Lucas stated that there were times when they would mindlessly eat. Annita specified that she would do this sometimes when watching TV, *"I think that when I'm watching something, I like to eat something so, (do you finish the whole bag) Yeah ... It's the small one, but sometimes I eat two"* (L409-14). Annita also made clear that when experiencing a sad mood, eating made her feel happier, when asked what she ate she explained, *"it's just normal food, it's not like (crisps and chocolate) no*" (L551-9). Lucas also stated that he would mindlessly eat when sitting in front of the TV, *"When I have the sharer bag of crisps in front of me and it's like… and I go to take like another handful and it's, well, that bag's empty, erm, that's like, yeah"* (L648-52), but he quantified that this occurs about only once a week. Whereas, Zada intimated that she does not eat mindlessly, but rather when she is craving something, "*I take a little cookie or a little candy just you know…*" (L266) but other than that she made clear that she had a healthy diet and she would not eat for the sake of eating (if she was not hungry) (L528).

Appendix 24

ASO Poster presentation, University of Nottingham, September 2016

EXPLORING THE OBESOGENIC ENVIRONMENT: UNDERSTANDING THE HEALTH IMPACT OF CONTEMPORARY URBAN LIVING

ROBERT GORDON UNIVERSITY ABERDEEN

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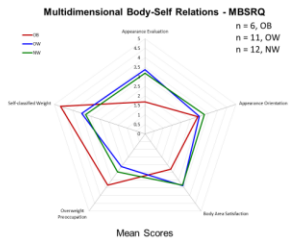
INTRODUCTION The obesogenic environment consists of a variety of influences that the surrounding, opportunities or condition of life have on promoting obesity in individuals. It encompasses several factors including societal, individual and biological ones. For example, socio-economic status, food choices made at the individual level, and what affects those choices, how an individual shops and cooks, including attitudes and behaviour towards food, themselves and outlook on life; the promotion of readily available foodstuffs and its convenience, and increased levels of sedentary behaviour are all factors which can promote obesity. Few studies have taken a multidisciplinary approach to investigating such complex factors.

AIM To explore multiple and interrelated processes with respect to behaviour and attitudes of individuals in an obesogenic environment that may help to understand underlying behaviours for promotion of obesity.

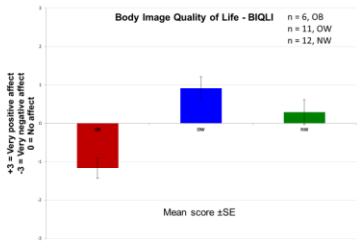
METHOD Using a qualitative approach, seven validated questionnaires were used to investigate different aspects of the obesogenic environment that could have an impact on body image, quality of life, outlook on life, psychological eating behaviours, food addiction, food choices and physical activity. Results from 3 questionnaires have been reported below. Twenty-nine participants from the North East of Scotland (convenience sample), age 18-79 y, were grouped according to body mass index, (BMI): participants with obesity (OB) BMI ≥30 kg/m² (n=6); participants who are overweight (OW) BMI between 25 – 29.99 kg/m² (n=11) and participants who are normal weight (NW) BMI <24.99 kg/m² (n=12). In addition, semi-structured interviews were carried out on a subgroup of participants (n=17).

RESULTS

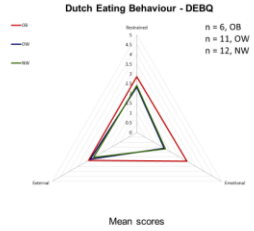
QUESTIONNAIRES



Attitude toward body image and physical appearance are assessed by the MBSRQ. OB have the lowest score for Appearance Evaluation, indicating a general unhappiness with physical appearance and attractiveness; whereas OW and NW score indicate they neither agree nor disagree with feelings of contentment regarding physical appearance and attractiveness. A higher score for Overweight Preoccupation indicates of fear of being fat or becoming fat. P < 0.05 between OW and OB; and between NW and OB for all scales except for the Appearance Orientation scale where P > 0.05 for all participants.



The low score for OB indicates poor body image which negatively impacts well-being, while OW exhibit a positive impact; and NW exhibit no impact. P < 0.05 between OW an OB; and between NW and OB. No statistical significance between OW and NW participants.



Three traits of psychological eating behaviour were considered in the DEBQ. OB score 3.0 for the Emotional scale indicating they are more likely to eat in response to negative emotions such as loneliness, boredom and disappointment. P < 0.05 between OW and OB; and NW and OB. No statistical significance between OW and NW. There is no significant difference between External and Restrained eating traits among participants.

SEMI-STRUCTURED INTERVIEWS

INSTRUMENTAL (n = 4)
- Eat to live
- Food not important
- Does not rule my life
- Will pass out if I do not eat
- Diet not important
- Do not eat breakfast
- Do not enjoy shopping
- Finical eater
- Convenience is most important
- Texture and look is important
- Cut fat off of everything
- Food labelling not important
- Do not know if full after a meal
- Diet not balanced
- Need to eat more fruit & vegetables
- Emotional eating; mindless eating
- Eat main meal in front of TV

AESTHETIC (n = 6)
- Lives to eat
- Food very important
- Enjoyment of life
- Everything in moderation
- Diet is important
- Eat breakfast
- Enjoy shopping
- Explorer of foods
- Quality, freshness & taste are important
- Can wait to eat something I really enjoy
- Like fat on meats
- Food labelling - sugar
- Will go back for seconds
- Diet balanced
- Love vegetables
- No emotional eating; no mindless eating
- Eat main meal at the table

DISCIPLINED (n = 7)
- Eat to live and live to eat
- Food is functional
- Food is nutritional fuel
- Everything in moderation
- Diet is/is not important
- Will /will not eat breakfast
- Always shop with a list
- Conscious of nutritional value of food
- Convenience is important
- Do not snack
- Aware of the amount of fat
- Food labelling – sugar and fat
- No going back for seconds
- Diet balanced
- Enjoy fruit and vegetables
- No emotional eating; no mindless eating
- Eat main meal at the table/or TV

ANALYSIS of semi-structured interviews suggest that there are three distinct approaches to food and overall life attitudes which are summarised above. OB display a poor body image, low levels of self-esteem, with an instrumental approach towards food and being finical eaters. OW present a more relaxed attitude toward body image and higher levels of self-esteem, with a clear aesthetic appreciation for food. NW exhibit a mix of attitude (either like or dislike) towards food, their body image and a somewhat lower level of self-esteem than OW but not as low as OB. Some NW and OW present more overlap in how they relate to food (i.e. both an aesthetic and disciplined approach towards food), though NW may possess greater discipline than OW; where OW are more likely to go back for second helpings and appreciate a glass or two of wine with their evening meals. Additionally, some NW present characteristics which overlap with OB in their instrumental attitude towards foods, i.e. relating to food as a source of fuel for the body without the attachment of aesthetic pleasures of food.

CONCLUSION & DISCUSSION

The findings from this pilot study may cast doubt on the traditional understanding that being overweight is on a pathway of 'disease progression' to obesity. It may be possible that an individual's relationship with food and his/her attitude towards him/herself and life may promote obesity, and that obesity is not a consequence of merely being overweight. If results from a subsequent study involving a different cohort of people and a larger sample size, support the current findings, this may have implications for government policy and inform legislative frameworks regarding food promotion. Advertising boards and television/radio announcements may encourage individuals to have a relaxed approach to food, and by experimenting outside one's habitual food choice with a wider variety of food types, they may make food choices which have a greater influence on general wellbeing.

Acknowledgement: Faculty of Health and Social Care at Robert Gordon University for providing PhD scholarship to RH Sibson
the MacRobert Trust for providing funding for this research project.

Appendix 25 Research Presentation day in Dundee, Scotland- Oral Power Point Presentation, 29 April 2017

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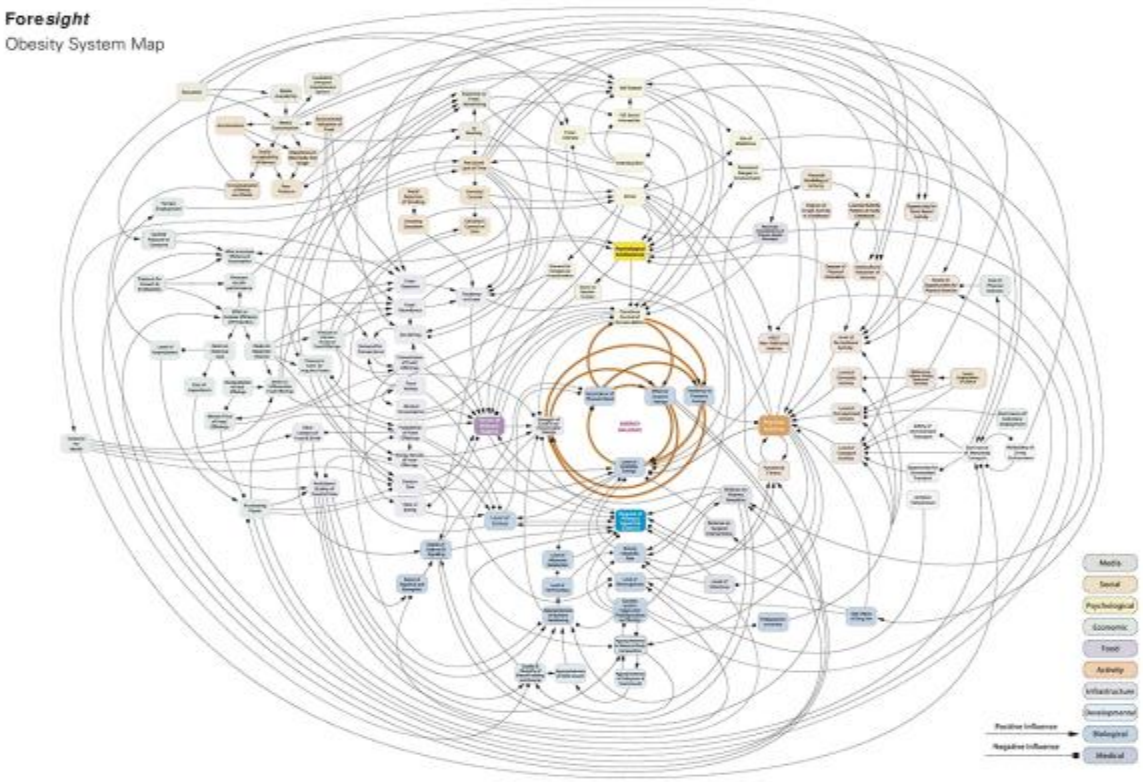
EXPLORING THE OBESOGENIC ENVIRONMENT: UNDERSTANDING THE HEALTH IMPACT OF CONTEMPORARY LIVING

Rachael H Sibson
Main Supervisor: Giovanna Bermano,
Secondary Supervisors: Chris Yuill,
Arthur D Stewart & Iain Broom

BMI in kg/m² Adult Classification (WHO, 2015)

Underweight	Normal	Overweight	Obese	Severe Obese	Morbidly Obese
≤18.49	18.5-24.99	25-29.99	30-34.99	35-39.99	≥40



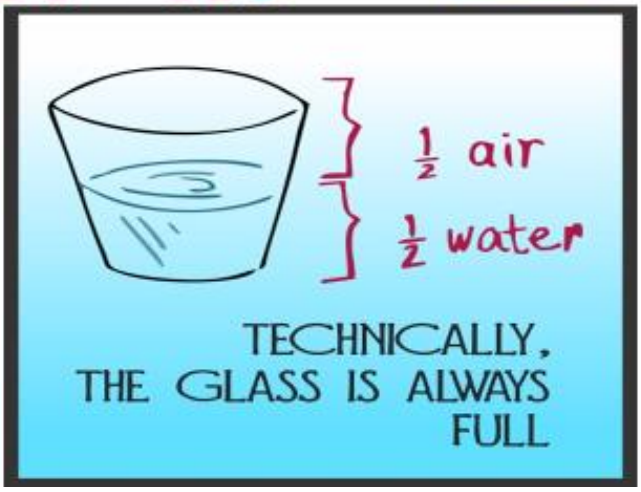
Likely causes for Obesity:
Environmental – Obesogenic society

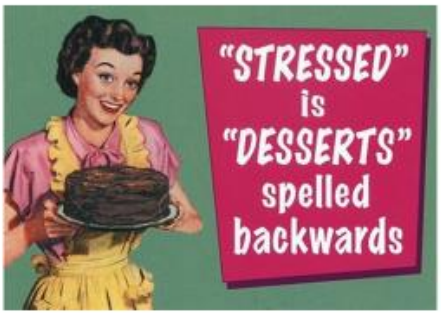
WHY YOU SHOULD NEVER DRAW ATTENTION TO YOUR FLAWS.

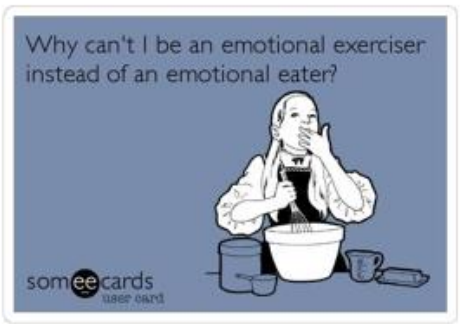
i need
~~thinner legs~~
~~a flatter stomach~~
~~longer hair~~
~~whiter teeth~~
~~softer skin~~
~~a prettier face~~
~~more friends~~
a change in perspective &
a higher self esteem

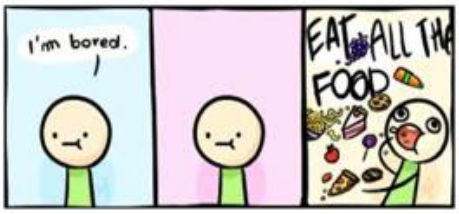

WHO

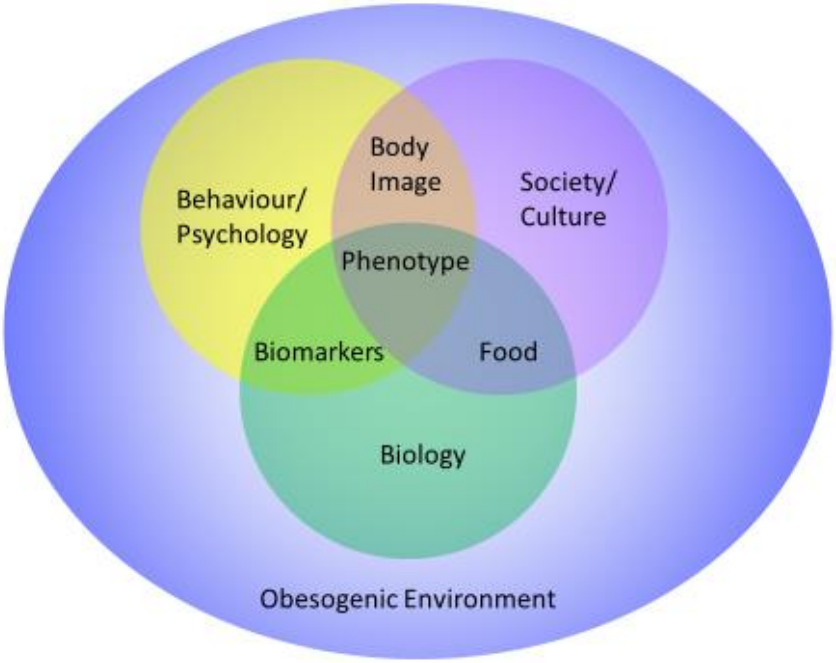

HELP
SUPPORT
ADVICE
ASSISTANCE
GUIDANCE


½ air
½ water
TECHNICALLY,
THE GLASS IS ALWAYS
FULL


"STRESSED"
is
"DESSERTS"
spelled
backwards


Why can't I be an emotional exerciser instead of an emotional eater?
someecards


I'm bored.
EAT ALL THE FOOD



Aim

- Seeks to gain a comprehensive understanding of how living in an obesogenic society influences biological and social aspects of body weight and wellbeing.
- And by exploring the ways in which each individual factor may interact

Objective

• Focuses on exploring the relationship between individuals and their environment

- It explores their day-to-day lives in terms of food, self-perception and orientation to life

• Attitudes and behaviours are explored by drawing on both qualitative and quantitative methods

The aetiology of obesity is complex hence choice in methodology is very important

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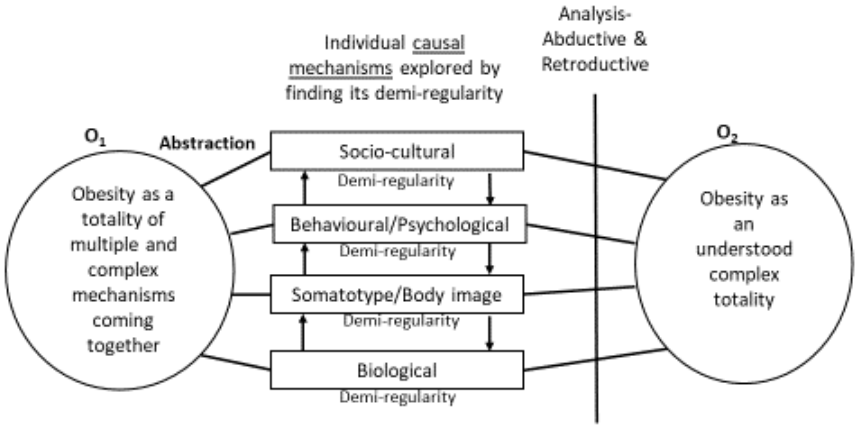
Meta-Methodology Bhaskar's Critical Realism



Each line projecting from the obesity 1 (O_1) circle is a level of abstraction, where different processes of obesity are being separated into individual mechanisms to be investigated. It is possible that underlying each mechanism is a demi-regularity. Each mechanism is interrelated as indicated by the arrows. Through different modes of analysis (abduction and retroduction) the mechanisms are reassembled through explanation into a more complete understanding of obesity, shown in the obesity 2 (O_2) circle.

Phase 1:

- 29 participants (16F; 13M): Northeast Scotland
- 20-70 years age range
- BMI range 20 – 42kg/m^2 (one outlier of 63)
- Body measurements
- Semi-structured interviews (n = 4 OB; 6 OW; 7 NW)
- 7 Validated questionnaires (n = 6 OB; 11 OW; 12 NW)

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Three thematic social practices relating to food

INSTRUMENTAL
- Mostly eat to live
- Will pass out if I don't eat
- Food/diet is not important
- Food does not rule my life
- Finical eater

AESTHETIC
- Mostly lives to eat
- Everything in moderation
- Food/diet is very important
- Part of the enjoyment of life
- Explorer of foods

DISCIPLINED
- Eats to live OR Lives to eat
- Everything in moderation
- Diet is/isn't important
- Functional/nutritional fuel
- Conscious nutritional value

Each of the identified eating behaviours related to the accepted, albeit problematic classifications of weight based on the body mass index; that is, overall, most instrumental eaters were represented by the obese category; whereas disciplined eaters, the normal weight category

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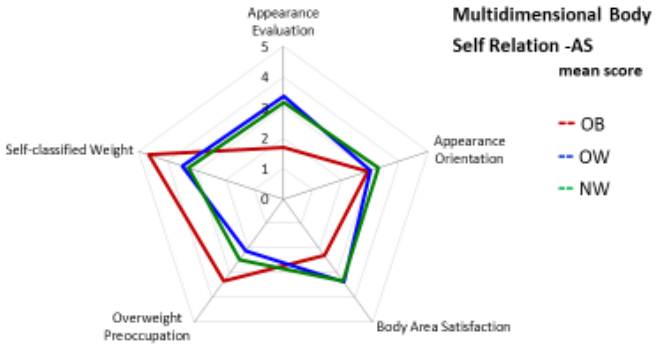
Results from Body image & SSi



INSTRUMENTAL
- Not happy w/body image
- Would like to lose weight
- Foods affect my body shape

AESTHETIC
- Content; happy w/body image
- Would like to lose weight
- Fitness or balance between muscle and fat
- Foods affect/don't affect

DISCIPLINED
- My body image is ok/happy
- Would like to be more slender or more toned, there are wobbly bits
- Foods affect/don't affect my body shape

Results from DEBQ & SSi

INSTRUMENTAL
- Emotional eating
- Mindless eating
- Eat when stressed
- Don't know if full or still hungry after a meal

AESTHETIC
- No emotional eating
- No mindless eating
- Doesn't eat when stressed
- Will go back for a second helping if still hungry

DISCIPLINED
- No emotional eating
- No mindless eating
- Doesn't eat when stressed
- Will not go back for second helpings

DEBQ: Response scale: 1 = Never; 2 = Seldom; 3 = Sometimes; 4 = Often; 5 = Very often

- LIMITATIONS

- 29 participants, not an equal number in each category (n = 6 OB; 11 OW; 12 NW)
- Not an equal number of SSIs (n = 4 OB; 6 OW; 7 NW)
- Age range is large
- Hawthorne affect

However preliminary findings may challenge the traditional understanding that being overweight is on a pathway to obesity and forms the basis for a larger study on a diverse population

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Phase 2 – currently under way

- Age limit 20-40 years
- 12-15 participants in each BMI category
- Analysis blood biomarkers
- Semi-structured interview
- Seven validated questionnaires
- Body measurements
- Somatotype profile

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Expected outcomes

- Findings from this study may
  - challenge the traditional understanding that being overweight is on a pathway to obesity
  - identify patterns of behaviours and attitudes that make some individuals more susceptible to the obesogenic environment
  - identify an association between healthier biomarker profile and better quality of life to overweight individuals

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In conclusion

This information could be used to inform public health policies to educate

- young people of the benefits of enjoying a wide range of foods on health and wellbeing
- general population of the importance and greater implications that attitudes and behaviours towards life and self-perception may have on body weight status

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Appendix 26

European Sociological Association, Athens, Greece – Oral Power Point Presentation, 31 August 2017

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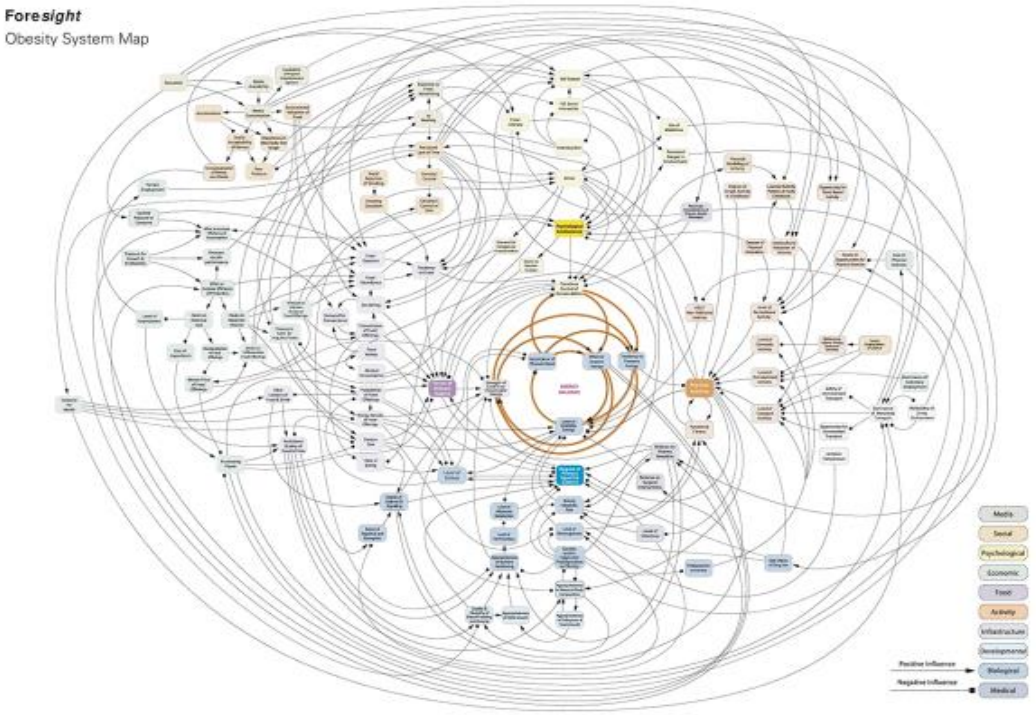
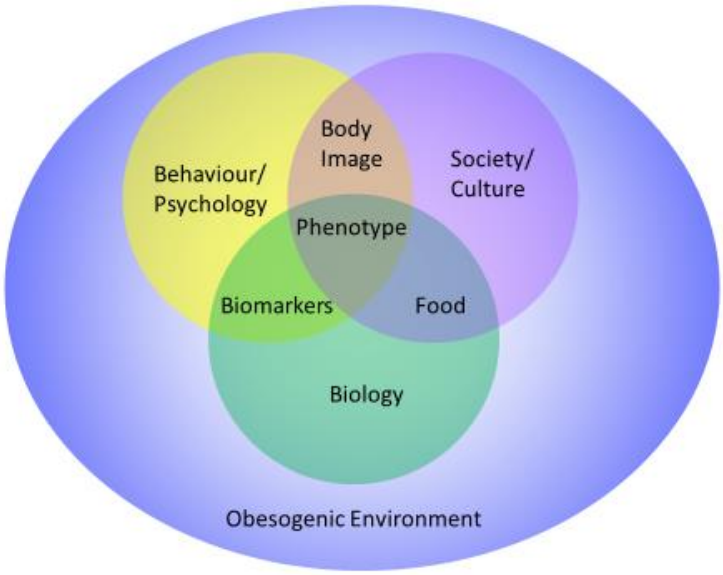
Exploring the relation between food, health and contemporary living in an obesogenic environment

Rachael H Sibson

Supervisors: Drs Giovanna Bermano, Chris Yuill, Arthur D Stewart & Professor Iain Broom





Aim

- To gain a comprehensive understanding of how living in a society influences biological and social aspects of body weight and wellbeing, by exploring ways in which each individual factor may interact

Objectives

• Explore the relationship between individuals and their environment - their day-to-day lives in terms of food, self-perception and orientation to life

• Explore attitudes and behaviours by drawing on both qualitative and quantitative methods

The aetiology of obesity is complex hence choice in methodology is very important

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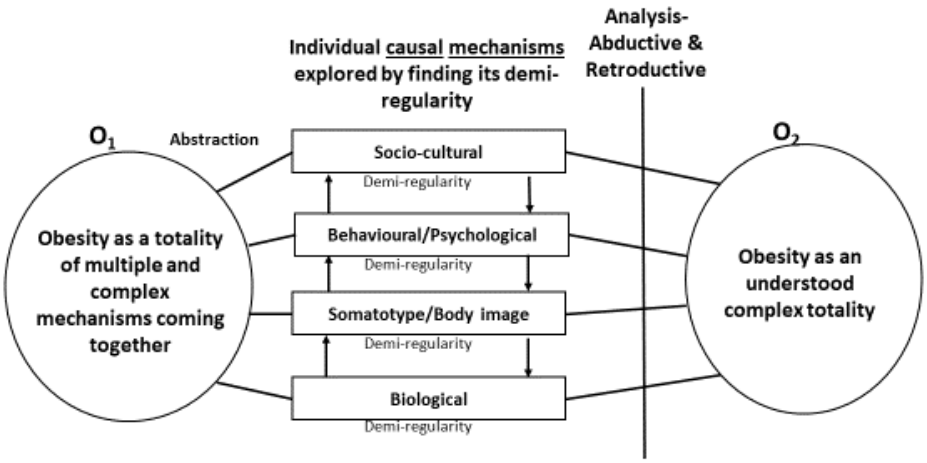
Meta-Methodology Critical Realism



Phase 1 study

- 29 participants (16F; 13M): Northeast Scotland
- 20-70 years age range
- BMI range 20 – 42kg/m^2 (one outlier of 63)
- Anthropometric measurements (ex. S.A.D)
- Semi-structured interviews (n = 4 OB; 6 OW; 7 NW)
- 7 Validated questionnaires (n = 6 OB; 11 OW; 12 NW)

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Three thematic social practices relating to food IDA analysis

INSTRUMENTAL
- Mostly eat to live
- Will pass out if I don't eat
- Food/diet is not important
- Food does not rule my life
- Finical eater
- Food labelling not important
- Diet not balanced
- Need to eat more veg/fruit

DISCIPLINED
- Eat to live OR Live to eat
- Everything in moderation
- Diet is/isn't important
- Functional/nutritional fuel
- Conscious nutritional value
- Food labelling sugar & fat
- Diet balanced
- Enjoy fruit and vegetables

AESTHETIC
- Mostly lives to eat
- Everything in moderation
- Food/diet is very important
- Part of the enjoyment of life
- Explorer of foods
- Food labelling – sugar
- Diet is balanced
- Love vegetables

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Instrumental eater quotes:

Iona – "Food is not that important, obviously you need to eat to keep your energy up, but it's not the main importance in my life… don't really enjoy shopping… I'm not really concerned with nutritional balance… I don't really think about my diet… just eat when I eat… I am a fussy eater… do not eat 5-a-day… I avoid fish… I drink a lot of fizzy drink, that's my worst habit… sometimes will eat crisps or biscuits just because it's there"

Beth – "Food is not that important, I do not attach importance to it… I eat a lot of stuff, just not paying attention to what I'm eating… when money is running out, I think 'what's really cheap'." …I follow recipes exactly, I will not do a variation on it.. It's never as good as you think it's going to be, I put all that effort in and the food is disgusting… I definitely Do Not live to eat… I don't know if I'd call it a dessert, frequently it's something I have to eat, because otherwise I'd pass out"

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Disciplined eater quotes:

William – "Diet is important, but not a ruling factor, I don't stress about it… I always have a food list when shopping… don't buy snacks because I know I would eat them, I've cut down (on snacks), don't keep any of that around… I consciously don't buy things to bring into the house… I eat only what I have prepared and don't go back for seconds… treat myself on weekends "

Sky -"Food is pretty important, I like eating, I love eating… I like going to different countries for their food… meats, I always cut off the fat, I don't like it, I can't eat it… I compare sugar content (between products) won't get the ones with the red sugar label… non-fat isn't always better because it has more sugar, I'd rather have the fat… I don't buy much bread… I eat 5-a-day… I try to watch my fruit and vegetable (intake), and try not to eat too much… try limiting bad food, try not to eat crisps and chocolate every day… a little bit of everything in moderation"

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Aesthetic eater quotes:

Neville – "Food is very important in my life… food is part of the enjoyment in life… I live to eat mostly, and eat to live… I mostly enjoy shopping… I'm anticipating what I'm going to do with it (the ingredients)… I enjoy cooking, enjoy experimenting… low-fat is not worth it… you can eat well for cheaply… I pay attention to food labels, but not obsessively… If you take anything in excess it will always cause damage, my principle is anything in moderation is ok"

Gina – "I quite enjoy shopping, I'm planning what I'm going to cook… I really like and enjoy food… I like experimenting, doing a little twist in the recipe.. You can find different ways to substitute these things even for the flavour and taste… eating is a nice opportunity to see someone and enjoy food as well… I can wait to eat something I really enjoy, I wouldn't go for the easy choice… I sometimes pay attention to the nutrition labels, but sometimes not, because some days I'm not going to make the most healthy dinner, using pasta, cream and bacon, but you don't do it every day… Most of the time I'm trying to keep it a decent amount of food and not go really to the extreme side"

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Each of the identified eating behaviours relate to the accepted, albeit problematic, classifications of weight based on BMI (body mass index)

……overall most instrumental eaters were represented by the obese category; whereas disciplined eaters, by the normal weight category

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Phase 2 study – currently under way

- Age limit 20-40 years
- 10-15 participants in each BMI category
- Analysis blood biomarkers
- Semi-structured interview
- Seven validated questionnaires
- Anthropometric measurements
- Somatotype physique descriptor

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Expected outcomes

Findings from this study may

- challenge the traditional (medicalized) understanding that being overweight is on a pathway to obesity
- identify patterns of behaviours and attitudes that make some individuals more susceptible to obesity… alternatively, what is it about the environment that may cause individuals to be obese
- identify an association between healthier biomarker profiles and better quality of life in aesthetic/overweight individuals

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In conclusion

- The standard ways of looking at obesity, and the negative approaches, such as fat shaming and stigmatising, have not helped reduce its prevalence
- Instead of seeing food as a series of constraints and diets, having a positive relationship with food, by adopting an 'aesthetic eaters' approach, may be a better approach for reducing obesity prevalence

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