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Shortened title: Nutrition for adolescents from deprived areas

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None.

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HS made substantial contributions to the background research, development of interview questions, project design, obtaining ethical approval, recruitment, data collection, data analysis and preparation of this article. CC initiated this project and supported with the development of the interview questions and review of this paper. LCAC made substantial contributions to the background research, development of interview questions, project design, obtaining ethical approval, data analysis and review of the article.

Ethical Standards Disclosure:
This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the University of Aberdeen Rowett Ethics Review Panel. Written informed consent was obtained for all subjects.
Abstract:

Objective: To identify the key features of a nutrition resource that are important to adolescents with a low socioeconomic status.

Design: Structured interviews were conducted to explore participants’ preferences relating to features of a nutrition resource. Thematic framework analysis approach was used to determine key themes, subthemes and concepts from the data.

Setting: Streetsport activity sessions, North East of Scotland.

Subjects: 18 adolescents aged 12-17 years, from a low socioeconomic background.

Results: The overarching themes identified were barriers and facilitators to engagement with a nutrition resource. Adolescents expressed a preference for an app and this was mainly attributed to convenience and low cost. There was also an emphasis on the integral role social media has in their lives. Aesthetics was a facilitator for both male and female participants, with a particular focus on weight loss. Behaviour change support including reminders, access to simple recipes and adopting a ‘small change approach’ were identified as possible facilitators whereas cost, environmental influences and existing eating habits were identified as possible barriers to engaging with a nutrition resource.

Conclusions: A number of subthemes, including aesthetics, cost and convenience, which have previously been reported in adolescents with a higher socioeconomic status, were prominent in our research. The present study contributes to insights relating to behaviour change tools which should be considered when developing a nutrition resource targeting disadvantaged adolescents. Further research focusing on how mobile phone technology and social media can be utilised to support dietary behaviour change in low SES adolescents is recommended.

Keywords: Adolescents, low socioeconomic status, nutrition, healthy eating, resource, app
Introduction:

During adolescence independence is established, and this is often accompanied by changes in eating practices\(^1\). With this, just 8% of UK adolescents are achieving the recommended 5 portions of fruit and vegetables per day\(^2\), and the most commonly purchased foods in this age group include confectionary and sugar sweetened beverages\(^3\). This is of particular concern because dietary habits established during adolescence often continue into adulthood\(^4\) and poor diet is strongly related to chronic diseases including diabetes, cancer and cardiovascular disease\(^5\).

It is well documented that those with a lower socioeconomic status (SES) have a higher risk of poor nutrition than their wealthier peers\(^6\). Those with a low SES typically consume more discretionary foods and less fruit and vegetables\(^7\). These poor food choices parallel health inequalities, which are highlighted by the existence of significant socioeconomic differences in the rates of obesity and chronic diseases\(^8\). In Scotland, children and adolescents in the most deprived areas have a greater risk of obesity in comparison to their age matched peers in the least deprived areas\(^9\), and this translates to 22% and 13% respectively. Additionally the NHS have reported that 26% of 15 year olds from the most deprived areas have extensive tooth decay compared to 12% of 15 year olds who are not eligible for free school meals\(^10\). Consequently there is a 3 fold increased risk in adult periodontal disease and caries in low versus high childhood SES groups\(^11\).

There have been multiple policies introduced to address poor nutrition in children and adolescents in Scotland. Schools are now legally bound to meet minimum nutrition standards\(^12\), whilst health education and promotion is regarded as mandatory\(^13\). Nonetheless 33% of Scottish adolescents aged 12-15 years remain at risk of overweight and obesity\(^14\). This figure has fluctuated since 1998, but there has not been significant reductions in the proportion of children and adolescents who are at risk of overweight (including obesity), and socioeconomic discrepancies relating to diet continue\(^15\). Published literature supports the theory that increased knowledge is not sufficient to change behaviour\(^16\), as demonstrated in a Scottish study which found that an education intervention increased knowledge but failed to elicit dietary behaviour change in school-aged children\(^17\).

The use of technology based health promotion is increasing amongst adolescents, and this has been referred to as a ‘new channel’ to illicit health related behaviour change\(^18\). Given the increased reliance on the internet in the adolescent population, there is a need to determine how healthy eating behaviour can be promoted using online tools\(^19\). Research conducted in America has demonstrated
effective behaviour change for both diet and physical activity in adolescents following on from interventions with an online resource\(^{(20,21)}\). Nonetheless, there is limited research in this area in the UK. The current study sought to investigate key features of a nutrition resource that are important to adolescents with a low SES, and also aimed to determine if electronic media is an acceptable format for delivering nutrition information to this group.
Methods:

The present study partnered with the Denis Law Legacy Trust, a not for profit charity operating in Aberdeen City, North-East Scotland\(^{(22)}\), providing a range of free sport (e.g. football, basketball, tennis, netball, dance, street games, based on demand) and creative activity sessions to children and adolescents in deprived areas as part of the Streetsport initiative. These work on a pop-up basis, with Streetsport bringing equipment to different sites across the City. Young people participate in a drop-in fashion based on word of mouth, advertising via social media, posters, leaflets, website, local community groups, or referral via school or social workers. The research was conducted across 3 Streetsport sites in Aberdeen City; Northfield, Torry and George Street. These locations are classified within the top 20% most deprived areas in Scotland in accordance with the Scottish Index of Multiple Deprivation (SIMD)\(^{(23)}\), the Scottish Government’s tool for identifying areas of deprivation based on postcode.

A review of literature and a series of discussions between the research team and stakeholders with relevant experience including public health, education and academic professionals as well as Streetsport staff, informed the development of structured interview questions. The researcher also volunteered at Streetsport for 8 weeks prior to data collection, enabling them to gain familiarity with the adolescents and vice versa, establishing a rapport and trust, which is considered a suitable approach for hard-to-reach groups\(^{(24)}\).

Recruitment took place at Streetsport sessions. One week prior to data collection potential participants were approached by the researcher (HS) who explained the study and provided them with an information sheet. Those under the age of 16 were also provided with an information pack for their parents.

In order to participate in the study, those aged 12-15 years were required to return a signed parental consent form. Prior to data collection they were asked to complete an assent form. In line with age of ethical consent in Scotland, those aged 16-17 years were asked to give signed consent themselves before taking part.

Data collection took place in May 2017 and June 2017. Structured face to face interviews were conducted by HS at Streetsport sessions. This was seen as the most appropriate location and method of data collection because low response rates are a particular challenge in this group\(^{(25)}\), and reducing participant burden was prioritised. The interviews encompassed 5 main topics outlined in table 1. Questions were typically open ended with visual prompts to support (Supplementary data).
This method was chosen to elicit in depth views from the adolescents. However, due to the setting audio recording was not possible and therefore all answers were written down by the researcher. SES was determined by postcode using SIMD 2016\(^{(23)}\).

Data was analysed using a ‘Framework’ approach, as described by Spencer et al. (2010)\(^{(26)}\), allowing for comparison in responses across subgroups. The responses were read by two researchers (HS, a MSc Human Nutrition student with an interest in health and fitness and LCAC, a researcher with a background in Health Sciences and Public Health Nutrition) who identified themes and subthemes reflecting all the responses, and met to discuss their independent analysis of the data. The participant responses were coded against the subthemes using Microsoft Excel.
Results:

A total of 55 participants were given information sheets during the recruitment phase; 22 aged 16-17 years and 23 under the age of 16. Eighteen adolescents participated in this study (33%); 10 males and 8 females, the majority of whom (n=16) were aged 16-17 years and most of them (n=14) lived in the most deprived SIMD areas 1 and 2 (see table 2 for detailed demographics). Five participants were volunteers at Streetsport, but had previously been participants and wanted to continue to attend the activity sessions.

The overarching themes identified were barriers and facilitators to engaging with a healthy eating resource. Emergent subthemes were identified along with key concepts, illustrated in figure 1. Cost and convenience were both prominent emerging subthemes considered as both barrier and facilitator. Barriers identified included existing unhealthy eating habits and environmental influences, whereas facilitators included aesthetics, health and fitness, communication with peers, behaviour change, developing knowledge of healthy eating, and additional engaging features. These emerged from the researchers’ interpretation of the data in the context of the aims of the study and were partly driven by the questions asked.

Cost

Cost was identified as a prominent emerging subtheme linked to both barriers and facilitators.

Providing a resource that is free was important to participants, whilst paying to access a nutrition tool was not considered a priority:

‘There are other resources that are free so why spend money when you don’t have to.’ (P02, female, 17 years)

Participants perceived healthy foods as expensive whereas less nutritious foods were considered cheap. There was reference to the cost of food being a barrier to engaging with a nutrition tool because this factor alone strongly influences their current food choices:

‘The cost of healthy food is expensive. Salad vs burger in McDonalds. I always go for the cheaper option’. (P08, female, 16 years)

Additionally, participants felt that the cost of healthy food prevented them from relating to famous role models because they are wealthier and can afford healthier foods:

‘They (celebrities) have money to eat better and to have personal trainers and I don’t. Healthy food is expensive’. (P05, female, 17 years)
On the other hand, participants discussed what they liked most about the apps they are currently using. Free access was an important feature, and therefore cost was also identified as a facilitator to engaging this group with a nutrition resource:

‘They (apps) are a free way to speak to folk.’ (P15, male, 16 years)

Convenience

One of the most prominent subthemes to emerge was convenience, with time, accessibility and ease identified as important concepts. When asked if there was anything that would prevent participants from using a healthy eating resource, there was an emphasis that time is a barrier, with other things taking priority:

‘I go to work early and come back late. I don’t have time to read stuff on healthy eating’. (P15, male, 16 years)

Although, this was not just the case for the older participants, indeed, one of the participants, who was under the age of 16, said ‘I don’t have a lot of free time’ and for this reason she reported that she would not engage with a healthy eating app but instead she would prefer an interactive learning session. However, this was not the reported preference for the other participant under the age of 16. Additionally, when discussing the content of a nutrition tool it was common for participants to mention that time was a limiting factor and that they would not want anything that ‘takes too long’.

On the other hand, time was also identified as a facilitator, and this was apparent when participants described an app as their preferred format for a nutrition tool:

‘Apps are quick and you can use them at any time.’ (P03, male, 16 years)

The accessibility of apps and the ability to use them anywhere at any time was also a significant feature that participants made reference to, and was identified as both a barrier and facilitator to engaging participants with a nutrition tool. This response was typical:

‘An app would be good because you have your phone on you all the time and can use it whenever or wherever.’ (P04, female, 16 years)

On the other hand, the majority of those who did not choose an app as a preferred method made reference to having limited data storage on their phones, which would make an app less accessible. These participants had a preference to using either a website or television as a source of nutrition information and again ease of access was a facilitator:

‘Websites are easy to access, apps take up storage.’ (P03, male, 16 years)

‘I watch TV every night. It doesn’t need effort.’ (P15, male, 16 years)
When asked what participants liked about the apps they are currently using they described them as 'easy to use' and 'easy to look at', and it was apparent that using their phones was effortless:

'My phone is always with me. It's easier, I can use 4G wherever I am.' (P08, female, 16 years)

Features such as taking photographs of foods eaten were also viewed as an easy option and were considered an appealing feature to some participants:

'Taking photos would be easier. My phone is always on me and I can take photos wherever.' (P10, female, 16 years)

However, there were mixed views on this and those who did not want to take photographs of their food also spoke about ease, with one participant saying ‘it’s easier to write’.

Existing unhealthy eating habits

Existing unhealthy eating habits were mentioned throughout the interviews and there was a general consensus that there are ‘lots of unhealthy options’ available, which could prevent participants from engaging with a nutrition tool. Meal skipping, in particular breakfast, was discussed:

'It’s the only time I eat during the day (lunch). I don’t eat breakfast'. (P02, female, 17 years)

Moreover, it was common for participants to make reference to their poor food choices during their lunch break. Consequently, there was an interest in learning more about how to make healthier food choices at lunch time. This example was typical:

'I normally eat bad at lunch, there are lots of unhealthy options and I never think to have healthy food.' (P09, female, 16 years)

Environmental influences

Participants acknowledged that the environment encourages the purchase of unhealthy foods and this was seen as a barrier that may prevent them from engaging with a healthy eating resource. One participant felt that ‘the food around you stops you focusing on being healthy’. In agreement with this, advertisements were also considered a barrier:

'You see a new food and immediately want to try it even when it’s unhealthy. Even if you don’t want to eat bad seeing the advert will make you want to try it.' (P03, male, 16 years)

Aesthetics
Aesthetics was a prominent subtheme and was considered a strong motivator for participants when discussing engagement with a nutrition tool. Weight and body image were frequently referenced, and this was common in both male and female responses:

'I feel better when I lose weight, I have more friends when I am thinner.' (P10, female, 16 years)

This focus on body image was also apparent when participants were asked about their thoughts relating to the use of celebrities as a role model for healthy eating:

'If a celebrity had a nice body this would motivate me. I want a nice body, I would focus on weight.' (P04, female, 16 years)

In addition to body image, participants made reference to how their teeth look. It was viewed as important to not have ‘rotten teeth’ and making healthier choices, such as choosing sugar free drinks, was mentioned. Participants reported that they would want to learn more about how food affects your teeth:

'It looks good to have healthy teeth and a nice smile.' (P08, female, 16 years)

Health and fitness

Throughout the interviews health and fitness was commonly discussed, with sport, feeling good and having a healthy diet identified as the main concepts. Improving fitness was important and was a prominent subtheme that emerged during interviews with male participants, and was occasionally referenced in the responses of female participants:

'Healthy eating would help to run well for football.' (P08, female, 16 years)

'I would want to learn more to get better at rugby and football.' (P17, male, 17 years)

Additionally, it was common for participants to make reference to the relationship between a healthy diet and feeling good, and this was viewed as a motivator to improving food choices:

'If you feel good from eating better you would stick to it, otherwise you wouldn’t.' (P15, male, 16 years)

In general, there was a positive attitude towards having a healthy diet amongst participants, and all but 4 participants reported that they would be interested in learning more about nutrition. Those who did not want to learn more either attributed this to time and cost or they felt they already had adequate knowledge of what foods are good for you with one participant saying ‘I already know what to do, eat well to move well’. When discussing food swaps to enable a healthier diet, there were some participants who reported they would choose the healthiest option imminently:
'I would chose fruit because it’s the healthiest option so may as well go for that one.' (P12, male, 16 years)

Additionally, some participants reported that they are currently trying to improve their diet:

'I would set healthy eating targets. I did it today. I wanted to have the healthier option today. When I was offered fizzy juice I asked for water.' (P06, female, 13 years)

However, others preferred to make smaller changes and this is discussed later under ‘behaviour change’.

Communication with peers

All but one participant reported using some form of social media, which was described as being a ‘good way to stay connected’. The participant who did not report currently using social media was under the age of 16 and reported that her phone was broken. There was a strong emphasis on the importance of communicating with friends, and this was an attractive feature of their current apps:

‘Apps keep you connected with friends, you can talk to them all the time and see what they are doing.’ (P04, female, 16 years)

Behaviour change

Throughout the discussions, participants inferred that behaviour change support was an important feature of a nutrition resource. This was reported across the age groups and in both males and females. It was apparent that setting nutrition related targets was viewed as an effective approach:

‘That would help (setting healthy eating targets) because if you set targets it will help you with eating healthy in everyday life.’ (P18, male, 16 years)

Additionally, reminders related to healthy eating targets were viewed as an important feature of a nutrition resource since it was common for participants to reference healthy eating as something that is ‘easy to forget’:

‘I would like this because it would stop me forgetting. It’s easy to forget to eat well.’ (P06, female, 13 years)

When asked for their own views on what features of a nutrition tool are important, there was reference made to recipes and shopping lists to support behaviour change. Participants felt that recipes that are easy to prepare would support them in improving their diet:

‘There is a lack of simple recipes. Something with few ingredients that is easy to make. Pictures would be best.’ (P02, female, 17 years)
Additionally, an example shopping list was also seen as a good tool to support dietary behaviour change:

‘A list of what to eat, like a shopping list of healthy foods to buy for a week, to be organised and not just buy whatever.’ (P16, female, 16 years)

Finally adopting a small change approach was identified as a potential facilitator to engaging participants with a nutrition tool. Providing options for snack swaps was discussed, with options ranging from reduced portion sizes to healthier choices. There was a mixed response in what participants would prefer but it was apparent that still having the option to ‘eat what you want’ or to ‘cut down slowly’ was important:

‘You don’t have to give up what you like, I’d rather cut down.’ (P18, male, 16 years)

Developing knowledge of healthy eating:

There was a positive attitude to expanding knowledge of nutrition related topics amongst the group, with access to an education resource being viewed as ‘interesting’ and ‘helpful’. Participants reported that they wanted to learn more about the composition of foods:

‘I want to learn what is in different foods and what is good and bad.’ (P02, female, 17 years)

Conversations were also led to which topics would be of interest to participants, and increasing knowledge was desirable.

‘I would like to know about this (energy balance and weight) to know what to eat.’ (P14, female, 13 years)

Although the most commonly reported topic of interest was energy balance and weight, other topics including how food affects your teeth, making healthy choices at lunch time and increasing fruit and vegetable consumption were also areas participants wanted to learn more about.

When discussing the inclusion of a quiz as a learning tool for a nutrition resource, participants generally felt this was an acceptable approach that could support them with their learning:

‘You would get feedback which helps with learning and learning from mistakes.’ (P02, female, 17 years)

Additionally, expert advice that you can ‘trust’ was a concept that was important:

‘It’s experts who are giving advice, they have personal experience and you can trust their advice.’ (P11, male, 17 years)
Additional features to support engagement with a nutrition tool:

The appearance of a nutrition resource was important to participants. One participant reported that taking photographs of food is engaging because it would make the resource ‘colourful’.

Additionally, it was seen that this is a good approach to draw attention to the resource:

'It should be bright coloured to attract people. It needs to be enjoyable. Otherwise you just get bored.' (P11, male, 17 years)

A further concept that was commonly discussed during the interviews was the general dislike of reading, which was perceived as boring and would potentially discourage participants from engaging with a nutrition tool. For this reason, something with an interactive element was considered a facilitator to engaging this group:

'Quizzes would be alright because it’s different and better than reading.' (P12, male, 16 years)
Discussion:

This study points to a range of key barriers and facilitators to engaging adolescents from a low socioeconomic background with a nutrition resource and the majority of participants identified both barriers and facilitators. The study found that there is an interest in learning more about nutrition within this group, and this was emphasised throughout the interviews, despite the fact that many appeared to already have some knowledge of healthy eating. There was a general preference for a nutrition tool to be in an app format, and this was attributed to convenience and low cost, which was possibly unsurprising given the research was conducted amongst low SES adolescents. Indeed mobile phone health related resources have previously been shown to increase the potential for reaching hard-to-reach groups\(^27\). Nonetheless, one participant, who was under the age of 16 years, reported that she did not have time for her phone. Since this age group was poorly represented in our sample we are unable to draw conclusions relating to discrepancies between preferences of younger and older adolescents. However Ofcom have reported that 71\% of adolescents aged 12-15 years have a social media site and 70\% of those aged 13 have a smartphone\(^28\). They also highlighted that no particular socioeconomic group is more or less likely to own a smartphone. Therefore, an app is possibly an acceptable format for a nutrition resource in this group, but further research is required to confirm this amongst younger adolescents.

It was also of note that our participants valued apps for social interaction, and the only apps participants spoke about were social media. With the knowledge that social norms amongst peers influences adolescent food choices, and are often unsupportive of healthy eating\(^29\), there is an opportunity for social media to be utilised as a tool to support behaviour change. Indeed a recent qualitative study reported that Australian adolescents from disadvantaged areas favoured electronic media as a method for accessing nutrition information, with frequent reference to Facebook\(^30\). With this, there is a demand for research to focus on how the use of social media can be adapted to promote diet related behaviour change across the adolescent population.

The importance of convenience was related to both the nutrition tool and the preparation of food and it was clear that other factors in their life took priority. Indeed previous research in adolescents has reported that time and accessibility were key themes relating to the use of online sexual health education resources\(^31\). Additionally research focusing on older adolescents and young adults with a low SES found that participants liked foods that were fast and easy\(^32\), which is aligned with the reference made to ‘simple’ recipes ‘with few ingredients’ during our interviews. Previous qualitative research has reported that parents of adolescents with a low SES typically do not
influence food choices and family meals are not part of their normal routine, which conflicts with what is reported from those with a higher SES\(^{(33)}\). Therefore, recipes provided should be suitable for adolescents, as it is likely they will be preparing their own meals, and therefore simplicity is important. There were mixed preferences for use of photographs versus written information, however use of images could overcome possible literacy issues which may be more common in low SES groups.

Convenience was also linked to the preference for a ‘small change approach’ amongst some of the participants in our group. Although many of our participants said that they would make healthy changes imminently, and indeed some already were, others reported they would rather reduce portion sizes and make smaller changes towards healthy eating. It is important to recognise that those from lower SES may not have access to the healthy food options at home, and it has been reported that those of lower SES purchase significantly lower percentages of energy from fruits and vegetables\(^{(34)}\). Therefore, the consumption of the healthiest option may not be an easy option for adolescents in this group and providing options which include reducing portion size could be more realistic. This approach has been shown to enhance self-efficacy through achieving small lifestyle changes, which has previously been demonstrated as an effective method for eliciting behaviour change in adolescents\(^{(35)}\).

Cost was also a prominent subtheme that was identified as both a barrier and facilitator, and it was perceived that healthy diets were expensive. The price of food is one of the main factors that influences food choices in lower SES groups\(^{(36)}\) and adolescents typically look for cheap foods\(^{(37)}\). Previous studies have demonstrated that subsidising healthy foods increases consumption in the adolescent population\(^{(38)}\). Consequently it has been recommended that budgeting and demonstrating cost effective options should be covered in nutrition education in lower SES groups\(^{(39)}\), and this is an important consideration for the development of a nutrition resource targeting adolescents with a low SES. Additionally the cost of a nutrition tool could be a facilitator or barrier to engaging adolescents, and this is in agreement with the previous research that has reported that low SES adolescents feel that nutrition information should be free\(^{(31)}\).

Qualitative research has previously demonstrated that aesthetics is a priority to adolescents\(^{(40)}\), and this was a prominent subtheme in our study. Weight loss was frequently mentioned, and this was observed across the age groups and in both males and females. Indeed adolescents have previously reported that a thin body holds power in both friendships and social groups at school\(^{(41)}\). Since dieting behaviours for weight loss are a risk factor for the development of unhealthy eating
behaviours in adolescents\(^42\), an integrated approach that provides information on energy balance and weight, and the dangers of excessive dieting could have advantages in terms of relevance and safety\(^43\). Another aesthetical motivator was having healthy teeth. Zotti \textit{et al.} (2016) found that using an app to enhance standard oral hygiene motivation amongst an adolescent population was effective in improving oral health status\(^44\). This intervention included the use of photographs and text messages to motivate and remind participants to adhere to the instructions, highlighting the acceptability of an interactive tool to elicit health behaviour change in adolescents.

The association between nutrition and fitness was well recognised amongst our participants, and this may be due to their current interest in sport. Indeed published literature focusing on improving nutrition in adolescents have often targeted physical activity and nutrition together\(^45,46\). The idea of using a professional sports person as role model to improve nutrition elicited mixed responses. Knowledge focusing on nutrition for professional athletes was thought to be motivating to those who wanted to improve sport performance and this has previously proved effective in health promotion interventions targeting children and adolescents with a low SES\(^47\). However during our interviews it was apparent that the perceived higher cost of healthy food meant some participants felt they could not relate to famous role models who have more money available. Again this highlights the need to consider cost and relevance when designing different features of a nutrition tool to engage adolescents with a low SES.

Finally, the results demonstrated that health behaviour change approaches are viewed as important to our participants and some were already goal setting. Interventions targeting low income groups are advised to include simple techniques such as encouraging participants to set goals which help them translate motivation into action\(^48\), and this approach was well received across the interviews. Interestingly, our participants felt healthy eating was something they often forgot about. Indeed Bacckett-Millburn \textit{et al.} have previously discussed that the parents of low SES adolescents consider food choices to be the responsibility of their children, and therefore this group may not be prompted to eat healthy foods at home\(^33\). Randomised controlled trials have demonstrated improved efficacy and adherence to health related interventions that have included reminders, in the form of text messages, in both children and adolescents\(^49,50\). Nonetheless of the current health apps available to adolescents, reminders are not commonly utilised to support behaviour change\(^51\). This demonstrates the need to address the most effective behaviour change techniques in apps targeting this group.
A number of study limitations should be acknowledged. The approach for obtaining consent meant it was challenging to recruit participants under the age of 16, and this is highlighted by the low response rate. This limits the ability to draw conclusions for younger adolescents from the results available. Indeed previous research in adolescents has reported that studies that use opt out consent result in higher participation and a more representative sample, particularly in low SES populations\(^\text{(52)}\). It is also possible that the sample was biased towards those who have an interest in healthy eating. Amongst the group there were multiple participants who were engaged with sport, whilst others had an interest in nutrition that was attributed to career aspirations or previous dieting. Therefore the results may not be reflective of the wider low SES adolescent population. Due to the drop-in style of the Streetsport sessions, the number of eligible participants was difficult to assess. We did not routinely collect information on whether participants were at school or working and also whether or not they were living with parents or elsewhere, which may have influenced their responses and limits the ability to interpret the data. Finally, there were multiple distractions including noise, disruption from peers and adverse weather conditions at the Streetsport sessions. This made recruitment challenging and prevented the researcher from audio recording the interviews. Also having friends nearby whilst being interviewed may have influenced the adolescents’ responses. Although the researcher attempted to capture the words as spoken, they may have influenced the data in the way that it was written. With written notes, there is a risk of the interviewer biasing the data collected, by being subjective or misinterpreting what is said. It could be considered that the data had already been partly synthesised and interpreted by the interviewer and was not first-order data. In addition, this approach interrupted the flow of the interview and limited the depth and richness of the data collected. It also limited the second researcher analysing the data from fully understanding the context of the words. Finally, the background of the researchers is likely to have influenced the interpretation of the data.

On the other hand, the qualitative design allowed insight to be gained into personal, social and environmental factors relating to engaging this group with a nutrition tool. It was also beneficial for the researcher to volunteer at Streetsport prior to data collection, as this allowed for the most appropriate methodologies to be identified and trust to be built with this ‘hard-to-reach’ group. The perspective of disadvantaged adolescents on this topic is poorly represented and the information collected provides insightful considerations for the development of a nutrition tool targeting this group.
In summary the findings are aligned with current research relating to adolescents, mainly conducted amongst those from higher SES, in terms of their preference to receive health information through electronic media. Convenience, aesthetics and cost are key considerations, and this has previously been reported elsewhere. More specifically, resources targeting this group should be interactive as reading is considered ‘boring’ and is likely to prevent engagement. The findings provide new insight relating to appropriate behaviour change support such as access to easy recipes, reminders and a small change approach which were identified as facilitators to engaging adolescents with a low SES with a nutrition resource. More research is required to determine if there are discrepancies between younger and older adolescents, as well as to establish how social media can be utilised to encourage dietary behaviour change in this group.
References:


Table 1: Description of the topics discussed during the structured interviews.

<table>
<thead>
<tr>
<th>Topic Area</th>
<th>Focus of questions</th>
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</thead>
<tbody>
<tr>
<td>Background information</td>
<td>Understanding of the term ‘healthy eating’</td>
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<td></td>
<td>Interest in learning more about ‘healthy eating’</td>
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<td></td>
<td>Previous resources used to look up information on healthy eating</td>
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<tr>
<td>Format of tool</td>
<td>Preference in regards to the delivery of healthy eating information</td>
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<td></td>
<td>Reasons behind preferred choice</td>
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<tr>
<td></td>
<td>Topics of interest</td>
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<tr>
<td>Barriers and facilitators</td>
<td>Any specific barriers or motivators to using a nutrition resource</td>
</tr>
<tr>
<td>Participant input</td>
<td>Any additional ideas that participants felt would be important for a healthy eating resource</td>
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Table 2: Participant demographic information recorded at the structured interviews

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<th>ID</th>
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<th>Location of data collection</th>
<th>SIMD 2016 Quintile*</th>
<th>Role at Streetsport</th>
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*1 most deprived, 5 least deprived
Figure 1: A summary of the themes, subthemes and concepts that were identified in the thematic analysis of the responses from the structured interviews. + and – signs represent facilitators and barriers respectively, whereas +/- represents the subthemes that were identified as both a barrier and facilitator to engaging with a nutrition resource. Bold text identifies prominent subthemes and italics, emerging subthemes.
Thank you for volunteering for my research project. It will take about 15 minutes to go through these questions, if you need me to explain anything or repeat the question then please let me know.

Section 1 – Demographics:

Name:

Age:

Postcode (if known):

Sex:

Section 2 – Background:

1) What do you understand by the term ‘healthy eating’?
   Prompt – have you heard about eating a balanced diet? Is this something you consider important? Can you explain why?

2) Are you interested in learning more about healthy eating?

3) Can you explain the reasons behind your answer to this (question 2)?

4) i) Have you ever used any resources to learn more about healthy eating? Yes/no
   ii) If yes which resources have you used?
       iii) What did you like or dislike about these resources?

Section 3 – Format:

1) Which of the following would you prefer as an option for learning about healthy eating?
   i) App on your phone
   ii) Website
   iii) Paper based for example a leaflet or booklet (show prompt)
   iv) Interactive sessions at Streetsport for example games
   v) TV adverts
   vi) Other

2) Can you explain why you chose (answer to question 1)
3) What apps are you currently using? If they need a prompt give examples including facebook, snapchat, Instagram, twitter.

4) What do you like about these apps?

Section 4 – Content:

1) How do you feel about setting healthy eating targets? If a prompt is required use examples such as swapping chocolate or crisps with fruit.

2) Food diaries can be used to look at what you eat. If you were to keep a food diary would you prefer a photographic food diary (show prompt) or a written food diary (show prompt).
   
   A photographic food diary means you take photos of the meals and snacks you eat and upload them onto a diary. The written diary would involve you writing down everything you eat.

3) Please can you explain why you prefer (answer to question 2)?

4) How would you feel about having healthy eating reminders send to you? Examples of reminders include text messages or pop ups on your phone.

5) Would knowing what healthy foods a celebrity sports person eats motivate you to make healthier food choices?
   
   Prompt - For example Andy Murray or Lionel Messi (allow the participant the opportunity to name any potential role models).

6) How would you feel about doing healthy eating quizzes as a way of learning more about healthy food options?
7) Food swaps are a good way to make healthier food choices. If you were to swap a fizzy drink, for example coke or Irn Bru, which of the following would you be most likely to choose? Use prompt

i) Half a portion of coke or Irn Bru
ii) Diet coke or diet Irn Bru
iii) Diluting juice
iv) Water
v) Other (ask what other options they might choose)

8) If you were to swap a chocolate bar, for example a galaxy or mars bar, which of the following would you be most likely to choose? Use prompt

i) A smaller portion for example a snack size mars bar
ii) A cereal bar
iii) A piece of fruit
iv) Other (ask what other options they might choose)

9) Out of the following, which would you be most interested in learning more about? You can pick as many or as few as you like.

i) Information on sugar and health
ii) Health benefits of fruit and vegetables
iii) Ways to increase fruit and vegetable consumption
iv) Making healthy food choices at lunch time
v) Energy balance and weight
vi) How eating effects your teeth
vii) How to keep a food diary
viii) Other
Section 5 – Barriers and facilitators:

1) Is there anything specific that would stop you using a healthy eating resource?

2) Can you explain why?

3) Can you describe anything that could potentially encourage or motivate you to using a healthy eating tool?
   Prompt – looking good (good skin, healthy teeth), feeling good, weight loss, long term health benefits

4) Can you explain why?

Section 6 – Participant input:

1) Is there anything that we have not discussed that think is particularly important for a nutrition tool?

2) Why do you feel this would be important?

Thank you for taking the time to speak with me today. Your answers will remain confidential and you will not be named in the final report for this research. If you have any questions please let me know.
Barriers and Facilitators

Cost (+/-)
- Cost of food
- Cost of resource
- Time
- Accessibility
- Ease
- Meal skipping
- Poor food choices at lunch

Convenience (+/-)
- Existing unhealthy eating habits (-)
- Environmental influences (-)

Aesthetics (+)
- Teeth
- Weight and body image

Health and fitness (+)
- Feeling good
- Sport and fitness
- Healthy diet

Communication with peers (+)
- Targets
- Easy to forget to eat healthy
- Shopping list and recipes
- Small change approach

Behaviour change (+)
- Desire to learn
- Learning from mistakes
- Expert advice

Developing knowledge of healthy eating (+)
- Colourful appearance
- Interactive

Additional engaging features (+)