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SIECZKOWSKA, S.M., PADILHA DE LIMA, A. SWINTON, P.A., DOLAN, E., ROSCHEL, H. and GUALANO, B.

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Sofia Mendes Sieczkowska[1], MSc, Alisson Padilha de Lima[1,2], MSc, Paul Alan Swinton[3], PhD, Eimear Dolan[1], PhD, Hamilton Roschel[1], PhD, Bruno Gualano[1*], PhD.

[1] Applied Physiology & Nutrition Research Group; School of Physical Education and Sport; Laboratory of Assessment and Conditioning in Rheumatology; School of Medicine, FMUSP, University of Sao Paulo, Sao Paulo, SP, BR

[2] School of Physical Education, Faculty IELUSC, Joinville-SC, BR

[3] School of Health Sciences, Robert Gordon University, Aberdeen, UK.

Corresponding author (to whom reprint requests should be addressed):

Bruno Gualano, PhD

e-mail: gualano@usp.br

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List of abbreviations:

95% CrIs : Credible intervals

ES: Effect size (ES)

GRADE: Grading of Recommendations, Assessment, Development and Evaluation

MCA: Multiple correspondence analysis

PICOS: Population, intervention, comparator, outcomes and study design

PRISMA: Preferred reporting items for Systematic Reviews and Meta-Analyses

PROSPERO: Prospective Register of Systematic Reviews

RCT: Randomized controlled trial

ROB: Risk of bias

VHL: Virtual Health Library

Abstract

Health coaching has emerged as a potential supporting tool for health professionals to overcome behavioural barriers, but its efficacy in weight management remains unclear. We conducted a systematic review and meta-analysis to synthesize and evaluate the quality of evidence supporting the use of self-reported health coaching for weight loss. Seven electronic databases (PubMed, Web of Science, Scopus, Cochrane, Psyinfo, VHL, and Scielo) were independently searched from inception to May 2020. This review was conducted in accordance with PRISMA guidelines and quality of evidence was assessed using GRADE recommendations. Any study that investigated a self-reported health coaching intervention with the goal of inducing weight loss in individuals of any age, health or training status was considered for inclusion. Quantitative data were analysed using multi-level hierarchical meta-regression models conducted within a Bayesian framework. Six hundred and fifty-three studies were screened and 38 were selected for inclusion. The quality of evidence supporting outcomes based on the entire evidence base was very low and studies were deemed to have high risk of bias. Meta-analysis of controlled studies provided evidence of an effect favouring coaching compared to usual care, but was trivial in magnitude ($ES_{0.5}$: -0.09; 95%CrI: -0.17, -0.02). The multilevel extension of Egger's regression-intercept test indicated the existence of publication bias, while a sensitivity analysis based only on those studies deemed to be of high-quality provided no evidence of an effect of coaching on weight loss ($ES_{0.5}$: -0.04; 95%CrI: -0.12, 0.09). Considered collectively, the results of this investigation indicate that the available evidence is not of sufficient quality to support the use of self-reported health coaching as a health care intervention for weight loss.

Key-words: behaviour change, weight-loss, health coaching, weight, BMI, waist circumference.

Introduction

The quest for effective treatment and management strategies is an everlasting issue in obesity and overweight care. Despite the plethora of studies supporting lifestyle changes (*i.e.,* physical activity and dietary habits) for excessive weight management (1,2), long-term sustainability of behaviour changes are problematic (3), and often result in significant weight regain and health impairment (4,5). Counselling approaches and integrative theories of behavioural change, such as motivational interviewing and the transtheoretical model, are often used to facilitate longer term lifestyle changes and are well-supported by the available evidence base (6–8). More recently, health coaching has also emerged as a supporting tool for health professionals to overcome behavioural barriers (9–11). Whilst no consensual definition exists, health coaching is considered to be a goal-oriented, client-centred partnership focused on health and based on a process of enlightenment and empowerment of the client (12,13). The use of health coaching is widespread and appears to be ever-increasing. Indeed, a study commissioned by the International Coaching Federation in 2016 reported that the total number of professional coach practitioners worldwide is approximately 53,300, with most of these located in higher-income regions, and that the U.S. estimated market value for personal coaching was $1.02 billion (14).

The term health coaching is often used to describe activities usually associated with other health care practitioners, including nutritionists, fitness trainers, behavioural counsellors, and/or behavioural therapists, all of whom are trained in the delivery of well-established, evidence-based interventions that are known to promote health related benefits, including weight loss (8,15,16). However, despite the rapid expansion of a health coaching industry in recent years, there has been no synthesis of the scientific evidence to determine exactly how coaches are implementing their interventions in practice, nor whether there is

scientific support for its use either as an adjunct or a main therapy in weight management. In this scenario, it is important to identify what has actually been done under the rubric of "health coaching" and whether this has been effective. As an intervention model that intends to hold its own *episteme* (*e.g.,* theoretical background, implementation techniques, clinical tools and approaches, professional training and certification programs), health coaching should be subject to the same level of scientific scrutiny as all other health care interventions. Accordingly, the aim of the current investigation was to synthesize and evaluate the quality of evidence supporting the use of self-reported health coaching for weight loss.

Methods

Quality of evidence was determined using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach. The evidence base for assessment of these domains was selected during a systematic literature search, the protocol for which was designed in accordance with PRISMA guidelines. This systematic review was registered in the International Prospective Register of Systematic Reviews (PROSPERO - CRD42020159023). The inclusion and exclusion criteria were assigned according to the population, intervention, comparator, outcomes and study design (PICOS). To better capture the features and outcomes of this intervention in its miscellanea, we reviewed all studies that were self-defined as health coaching.

Eligibility criteria

- ***Population***: Individuals of any age, health, or training status, who had a goal of weight loss.

- ***Intervention***: Health coaching, lifestyle coaching or any type of coaching with the goal of inducing weight loss. Given the lack of a consensual definition of health coaching, and to better capture all the possible ways this intervention has been employed in literature, we included any study described as "coaching" by the authors. No restrictions on intervention duration was placed.
- ***Comparator***: Both controlled and uncontrolled interventions were considered for inclusion, with comparators comprising usual care.
- ***Outcomes***: Body mass (kg), body mass index ($kg \cdot m^{-2}$) and/or waist circumference (cm).
- ***Study Design***: Any study design that comprised a coaching intervention for weight loss with relevant outcomes assessed pre and post intervention was considered for inclusion.

Search Strategy, Study Selection and Data Extraction

Seven electronic databases (PubMed, Web of Science, Scopus, Cochrane, Psyinfo, VHL, and Scielo) were independently searched by two members of the review team, with no restrictions placed on date or language. The search terms and descriptors used were related to health coaching ("motivational interviewing based health coaching" OR "lifestyle coaching" OR "health coaching" OR "dietary coaching" OR "nutrition coaching" OR "weight loss coaching" OR "physical coaching" OR "coaching intervention") and study design ("randomized clinical trial" OR "randomized controlled trial" OR "nonrandomized controlled trial" OR "clinical trial" OR "before-after trial" OR "crossover Trial"). The searches were conducted in June of 2020, using the search strategy presented in the supplemental file 1. All articles identified in the search strategy were screened using a 2-stage strategy, namely 1) Title and abstract screen and 2) Full text

review and any discrepancies were resolved through discussion, or third-party mediation, if required. To identify other relevant study data, we also screened reference lists of primary studies included and review articles. Data were extracted using a pre-piloted spreadsheet and independently verified by a second member of the review team. Study authors were contacted to request additional or missing data if required; the authors were given one month to respond. If the authors of the studies with missing outcome data did not respond, the articles were not considered further.

Assessment of evidence quality

The primary outcome of this review was the quality of the evidence base as a whole. This was supported by the results from three statistical analysis models. The first of these estimated the influence of coaching on weight loss using controlled intervention trials only. Two secondary analyses were also conducted, namely the influence of coaching on weight loss using all trials that included a pre-post measure (controlled and uncontrolled) and a sensitivity analysis based only on those studies deemed to be of high quality. The quality of each of these outcomes was ascertained using a strategy based on the recommendations of the Grading of Recommendations Assessment Development and Evaluation (GRADE) working group (17) in accordance with 8 separate domains. Potential downgrading factors included risk of bias, indirectness, inconsistency, imprecision or the presence of publication bias, while potential upgrading factors included the presence of large-effects, evidence of dose-response and the presence of plausible residual confounding factors. Starting quality level was ranked as high for randomized controlled trials, moderate for nonrandomized controlled trials, and low for uncontrolled trials. **Risk of bias** (ROB) was independently appraised for each individual study by 2 reviewers, using the Cochrane Collaboration Risk of Bias tool (18). The tool

evaluated studies according to 7 domains, namely random sequence generation; allocation concealment; participant blinding; evaluator blinding; incomplete outcomes; selective reporting and other biases, which we defined as the lack of use of intention to treat analyses and appropriateness of the statistical analyses undertaken. Studies were assigned either 0 (low ROB); 1 (unclear ROB) or 2 (high ROB) points for each of these domains, and the overall risk of bias was based on the cumulative points awarded to each individual study outcome and within the following categories: low ROB <4; moderate ROB 5-9; and high ROB 10-16. The quality rating for studies deemed to have a moderate ROB were downgraded one level, while studies with a high ROB were downgraded by two levels. **Indirectness** of evidence was ascertained based on 4 questions that we considered key to the quality of these particular studies, namely 1) Was the intervention delivered by health professionals (*e.g.,* nurses, psychologists, dietitians, health counsellors, exercise trainers, or graduate students in any health area)? 2) Were the health coaches specifically trained in the delivery of this intervention? 3) Was the intervention described in sufficient detail to allow replication? And 4) In addition to weight loss, did the authors report changes in target behaviour (*e.g.,* modifications in diet or physical activity levels)? Studies were downgraded a quality level if the answer to any of these questions was no, and were downgraded 2 quality levels if 2 or more questions were answered no. Both ROB and directness were initially assessed at the level of the individual study, and the median ratings were used to describe the evidence base as a whole, whereas the median ratings for each study included in each individual statistical analysis were used to describe the quality of that outcome. **Inconsistency** was ascertained using the meta-analysis results, and was based on visual inspection of effect size estimates, whether or not confidence intervals overlapped, and on statistical tests for heterogeneity (described below in the data analysis section). **Imprecision** was judged

based on the number of outcomes available (with any analysis for which <3 independent outcomes were available downgraded) and on visual analysis of the width of the confidence intervals. **Publication bias** was assessed using Egger's regression-intercept test (described below in the data analysis section) along with visual inspection of funnel plots.

Data Analysis

Data were extracted from studies comprising both between- and within-group designs. Pairwise effect sizes were calculated by dividing mean differences by pooled standard deviations. At the study level, variance of effect sizes were calculated according to standard distributional assumptions (19). All meta-analyses were conducted within a Bayesian framework enabling interpretation with subjective probabilities. Three-level hierarchical models were conducted to account for covariance between multiple outcomes presented in the same study, as described elsewhere (20). Inferences from all analyses were performed on posterior samples generated using Hamiltonian Markov Chain Monte Carlo method and through the use of Bayesian 95% credible intervals (CrIs) constructed to enable probabilistic interpretations of parameter values. Interpretations were based on visual inspection of the posterior sample, the median value ($ES_{0.5}$: 0.5 – quantile) and 95%CrIs. Cohen's standard threshold values (21) of 0.2, 0.5, and 0.8 were used to describe effect sizes as small, moderate and large, with values between 0 and 0.2 described as trivial. Analyses were performed using the R wrapper package brms, which interfaced with Stan to perform sampling (22). Convergence of parameter estimates was obtained for all models with Gelman-Rubin R-hat values below 1.1 (23). Assessment of publication bias was made using a multilevel extension of Egger's regression-intercept test with effect sizes regressed on the inverse of standard errors (24). To describe

underlying structure in research quality, multiple correspondence analysis (MCA) was conducted. The MCA results were used to identify percentage contribution to the dimensions constructed. MCA analysis was completed using the FactoMineR package (25).

Results:

Description of included studies

The search strategy resulted in 1291 manuscripts, and 38 of these were selected for inclusion in the review (see **Figure 1** for search flow diagram). In relation to study design, the included studies comprised 21 randomized controlled trials, 5 randomized non-controlled trials, 4 non-randomized controlled trials, 7 single-group trials and 1 case study. The included studies comprised 10717 individuals: 34 studies with males and females, 2 studies with males only (26,27), 1 study with females only (28), and 1 study which did not specify (29). Two studies were conducted with individuals aged <18 years (30,31) and all others studies were conducted with individuals aged 18 – 65 years. Thirty-five of the 38 included studies investigated populations with obesity and/or cardiometabolic conditions, one investigated patients with chronic kidney disease, while the remaining two studies investigated patients with cancer (32). Twenty-one studies had a primary goal of inducing weight loss, while this was considered a secondary outcome in the remaining 17 studies. The frequency (twice weekly – once per month) and duration (6 – 72 weeks) of the interventions varied widely. Details of the coaching interventions are summarized in **Table 1**.

Analysis of evidence quality

Analysis of quality based on the entire evidence base (n = 38) was ascertained at the individual study level, and according to study design, risk of bias and indirectness. This assessment indicated that 57.9% of the studies were of very low quality, 13.1% low quality, 7.9% moderate quality and 21.0% high quality.

Meta-analysis

Of the 38 studies included in the review, 12 studies had insufficient data to warrant inclusion in the meta-analysis (*e.g.,* data were reported as % change only or without an estimate of variation). The primary meta-analysis was completed on 16 controlled studies comprising 47 outcomes from a total of 2501 participants (overall n = 156; range: 10 to 763) allocated to coaching interventions and a total of 1729 participants (overall n = 108; range: 10 to 360) allocated to usual care. The analyses indicated a trivial effect favouring coaching compared to usual care ($ES_{0.5}$: -0.09; 95%CrI: -0.17, -0.02; $\tau_{0.5}$: 0.11; 95%CrI: 0.05 – 0.21; ICC: 0.04; 95%CrI: 0.00, 0.45; Figure 2). However, the probability that the pooled effect in favour of coaching could be classified as small or beyond was very low ($d \leq -0.2$; P-value: 0.007) and classified as medium or beyond was effectually zero ($d \leq -0.5$; P-value: <0.0001). The multilevel extension of Egger's regression-intercept test indicated the existence of asymmetry and publication bias with potential missing small sample studies reporting effects sizes less favourable to coaching ($Eggers_{0.5}$: -0.12; 95%CrI: -0.24, 0.00). Additionally, the analysis identified that studies categorized as very low quality tended to generate larger effect sizes favouring coaching ($ES_{0.5}$: -0.14; 95%CrI: -0.32, -0.01). The quality of evidence supporting this outcome was very low (**see Table 2**). To investigate associations between intervention duration and pooled effect size, studies were split into short-term (≤12 weeks, 16 outcomes) and long-term (>12

weeks, 31 outcomes). Results demonstrated similar pooled effect sizes across durations with the median effect size difference between short- and long-term equal to $ES_{0.5}$: 0.002; 95%CrI: -0.14, 0.16. A sensitivity analysis based on studies whereby weight loss was described as the primary outcome showed similar results and did not meaningfully alter data interpretation (data not shown).

A secondary analyses was conducted using pre-post data from all coaching interventions (controlled and uncontrolled). This analysis was based on 26 studies comprising 77 outcomes from a total of 3601 participants (overall *n:* 139; range: 9 – 763). The results also indicated a trivial effect similar to that identified using control group data favouring coaching ($ES_{0.5}$: -0.10; 95%CrI: -0.15, -0.05; $\tau_{0.5}$: 0.07; 95%CrI: 0.04, 0.13; ICC: 0.09; 95%CrI: 0.00, 0.34; Figure 3). The quality of evidence supporting this outcome was very low (Table 2) and the probability that the pooled effect in favour of coaching could be classified as small or beyond was effectively zero ($d \leq -0.2$; P-value: <0.0001).

A final sensitivity analysis was completed with what was considered the most reliable data which was from RCT's judged as high-quality, which was based on study design, risk of bias and indirectness. This criterion was met by 5 studies and comprised 20 outcomes from a total of 554 participants (overall $n = 111$; range: 12 to 189) allocated to coaching interventions and a total of 506 participants (average $n = 101$; range: 26 to 191) allocated to usual care. The pooled effect size demonstrated minimal evidence of any effect ($ES_{0.5}$: -0.04; 95%CrI: -0.12, 0.09; $\tau_{0.5}$: 0.04; 95%CrI: 0.00, 0.20; ICC: 0.22; 95%CrI: 0.00, 0.70).

Discussion

The purpose of this investigation was to evaluate the quality of evidence supporting the use of self-reported health coaching for weight loss. Considered collectively, the available

studies had a high risk of bias, and evidence of publication bias favouring positive results was observed. Information regarding the professional status and level of administrator training was scant, as were specific details regarding the coaching intervention itself. From the meta-analyses, we identified a trivial effect from controlled studies favouring the use of coaching for weight loss, but the quality of evidence supporting this finding was very low. Lower quality studies were more likely to report results that favoured the use of coaching over usual care, whereas studies deemed to be of high-quality showed no effect of health coaching on weight loss. Based on this objective assessment of study parameters, combined with meta-analysis results, we conclude that the current evidence base is not of sufficient quality to support the use of self-reported coaching as a health care intervention for weight loss.

Transparency in reporting is widely recognised as an important factor determining the quality of studies, as it allows for a more complete evaluation of methodological appropriateness and the possibility for adequate replication (33). Published guidelines are available that clearly define the parameters that should be described when reporting health related research (34,35). including specific guidelines for psychological interventions (36). The present systematic review indicates that these guidelines were not adequately adhered to with most of the included studies deemed to be of high risk of bias, while the overall quality of evidence supporting effects reported was largely of low and very low-quality (~70%). Of particular concern was the lack of information on the professional status and training level of those administering the health coaching intervention, along with scant information on whether the intervention had an appreciable effect on the intended behaviours. Without such information it remains difficult to evaluate the appropriateness of health coaching, or indeed, what exactly it comprises.

An important limitation of the body of evidence is the lack of a consensual definition of health coaching and how the practice differs from other lifestyle or behaviour change interventions. In the absence of a clearly-defined explanation of what distinguishes health coaching from other models, we chose to select studies that were self-reported as health coaching by their own authors. This approach allowed us to evaluate the actual interventional features of self-reported health coaching in its miscellany. To advance this research area and to develop the evidence base required to indicate whether or not the widespread public practice and implementation of health coaching interventions is warranted, we recommend that a clear definition of health coaching is developed, along with recommendations of the precise parameters that define what constitutes this intervention.

Most of the studies evaluated in this review described their intervention as being based on one (27,30,37–55), or a combination of two or more (26,31,32,56–61) counselling approaches and theories of behavioural change, with motivational interviewing and the transtheoretical model most frequently cited. Both of these theoretical models follow clearly defined procedures (62,63) and are supported by extensive evidence bases (6–8). Despite stating that interventions were underpinned by theory, the majority of studies did not clearly establish how theory was implemented, or indeed, provide justification for such implementation and interpretation. One thing that is clear is that the adaptations made do not appear to be fit for purpose. For example, a large body of research indicates a favourable effect of motivational interviewing on weight loss (7,16,64,65), with meta-analytic results showing standardized effects to the order of approximately 0.5 – 0.7 (16,64). In contrast, the current meta-analysis of all controlled studies estimated only a trivial effect of health coaching over usual care, with $ES_{0.5}$: -0.09; 95%CrI: -0.17, -0.02 (Figure 2), while analyses based only on high-quality studies indicated no effect of

coaching. In a previous review evaluating the effectiveness of motivational interviewing, most studies reported specific training (13 of 15) and engagement metrics (11 of 15) (65). Conversely, in our review, several studies (17 of 38) did not even report whether health coaching was able to modify behaviour, hampering firm conclusions of a cause-and-effect relationship between potential lifestyle changes (*e.g.,* diet and physical activity) and the outcome (weight loss). Therefore, the discrepant results reported for the efficacy of health coaching and other evidence-based health care interventions are not surprising, since these interventions fundamentally differ as regard to (at least) their scientific implementation and appraisal. Therefore, while health coaching programs may have incorporated a few practical and theoretical elements from other well-accepted counselling approaches and theories (e.g., motivational interviewing or the transtheoretical model), it remains unclear *i)* how this reconciles as a reproducible, coherent intervention in the clinical setting, and, more importantly, *ii)* to what extent this intervention can benefit patients. In order to eventually benefit from health coaching, much more insights into essential elements of this intervention is needed.

At least for weight loss, it seems unlikely that such trivial effects found in the current study would have any clinically relevant health benefits. It is also important to highlight that the trustworthiness of these estimates is very low, as observed in our quality assessment. Indeed, when considering only those trials judged as high-quality (n = 5), minimal evidence of an effect of health coaching was observed ($ES_{0.5}$: -0.04; 95%CrI: -0.12, 0.09). The effects favouring health coaching found in higher quality studies were even lower than those of poorer quality studies, evidencing a publication bias and further undermining the confidence in the efficacy of this intervention.

This study has limitations. First, given the lack of a consensual definition of what coaching is, we decided to review all studies self-reported as health coaching. Although

this approach enabled us to thoroughly describe what has been done under the "rubric" of coaching (Table 1), it is possible that this review missed some studies that tested other similar interventions, but that were not identified as such by the authors. Second, health coaching may be potentially used in several health related contexts (e.g., wellness, disease prevention and management). Thus, the current conclusions should be restricted to the context of weight loss, which is one of the main goals of health coaching in clinical practice.

Based on this objective assessment of study parameters, combined with meta-analysis results, we conclude that the current evidence base is not of sufficient quality to support the use of self-reported coaching as a health care intervention for weight loss. Despite its wide-spread use, the practice of health coaching appears to lack its own episteme, and the available scientific use does not support the use of self-reported health coaching strategies for weight loss. We recommend that pending more precise definitions of what exactly health coaching constitutes, and the publication of higher quality research supporting its use, self-reported health coaching strategies should be regulated to ensure evidence-based and fit for purpose practice. As a research agenda, researchers should focus on *i)* reaching consensus on what health coaching is and what is its guiding concepts; *ii)* better defining and describing their coaching interventions; *iii)* properly training health professionals to deliver coaching interventions consistently; and *iv)* conducting pragmatic, randomized controlled trials following CONSORT guidelines to test clinically significant outcomes.

346 **Contributors**

347 BG designed the study. SMS, APL and ED conducted the systematic review. PAS did the
348 meta-analysis. SMS, ED and HR wrote the first draft of the report. BG and HR revised
349 the manuscript. All authors read and approved the final version.

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Table 1. Characteristics of coaching interventions that evaluated the effectiveness of self-reported health coaching for weight loss

Author (data)	n	Groups	Population	Sex	Type of coach	Behavior target	Guiding Concepts Identified	Outcomes [1]	Duration (weeks)	Frequency of contact	Time*[2]
Yun et al.(66)	394	Health coaching + web group x web-only group x control group	Patients cancer survivors	♀♂	Web-based program and health Coaching	Physical activity; weight and positive growth	NR	BMI	24	Twenty sessions	NR
Kelly et al.(60)	80	Coaching x control group	Patients with chronic kidney disease	♀♂	Telephone-based health coaching	Diet	Behavior change, motivational interviewing	Weight, WC	24	Phase one) Call every 2 w and 1 message per w/ Phase two) 1 message per week	NR
Kim et al. (67)	227	Coaching x aged matched control group	Patients with diabetes	♀♂	Virtual health coaching	Diet and physical activity	NR	BMI, Weight	52	Weekly	NR
Looijmans et al.(61)	244	Coaching x usual care	Patients with serious mental illness	♀♂	In person and with a web tool	Based on the patients' needs	Motivational interviewing and the stage of change model	BMI, WC	48	Biweekly	15 min
Godino et al.(44)	298	Coaching with call x coaching text's only x control group	overweight and obese adults	♀♂	Telephone-based health coaching	Diet, sedentary behavior, and physical activity	Social cognitive theory	BMI, weight	48	Daily messages	5 to 10 min (calls)
Sakane et al.(45)	1.597	Coaching x control group	Patients with fasting Plasma Glucose (120-125 mg/dL)	♀♂	Telephone-based health coaching	Exercise habits, dietary fiber intake, and restriction of alcohol intake	Motivational interviewing	BMI, Weight,	488	Six phone calls per year	15 to 30 min (calls)
Gill. et al.(46)	118	Coaching x control group	Patients with chronic disease	♀♂	In person, smartphone app and with a web tool (site)	Diet, sedentary behavior, and physical activity	S. M.A.R.T. goal setting principles	BMI, Weight, WC	72/24*	In person (months 0, 2, 4, and 6)/ other months by eHealth tools and resources	30-40 min
Coventry et al. (55)	209	Coaching x online coaching	People with nondiabetic hyperglycemia	♀♂	Telephone only vs telephone and online	Diet and exercise	Motivational interviewing	BMI	36	Eight calls	10-40 min
Choi et al. (68)	100	Coaching x standard-of-care	Cardiac patients overweight or obese	♀♂	Coaching delivered by smartphone app	Diet	NR	BMI, Weight	12	Once	one session in person – 60 min

Viglione et al. (27)	45	Coaching x usual care	Veterans overweight or obese	♂	Telephone-based health coaching	Diet and physical activity	5As framework	Weight	48	Twelve calls	25 min
Chapman et al.(37)	711	Coaching x usual care	Patients with diabetes	♀♂	In person and telephone-based	Management targets as specified within the Chinese diabetes guidelines	Motivational interviewing	BMI, Weight, WC	72	Phase one) Once per week / Phase two) 3 per m / Phase three) 2 per m / Phase four)1 per m	NR
Johnson et al. (29)	30	Coaching in person x coaching online x control group	Obese adults	NR	In person and online (video conference)	Diet and exercise	NR	BMI, Weight	12	Once	NR
Bus et al.(38)	92	Coaching in person x coaching online	Obese or overweight adults	♀♂	In person and online (video conference)	Diet and exercise	Motivational interviewing	BMI, Weight	8	Once	NR
Miller et al. (39)	152 2	Telephone-based health coaching x standard-of-care	Individuals with mixed dyslipidemia	♀♂	Telephone-based health coaching	Diet and physical activity	Motivational interviewing	BMI, Weight	24	Three or more calls	30 initial/ 15-20 min
Williams et al. (40)	159	Telephone-based health coaching x control group	Patients with chronic low back pain who were overweight or obese	♀♂	Telephone-based health coaching	Diet and physical activity	Self Determination Theory	BMI, Weight, WC	24	Ten calls	NR
Bollyky et al. (41)	330	Intensive lifestyle coaching x lightweight coaching x no intervention	Patients with diabetes overweight or obese	♀♂	Telephone-based health coaching	Diet	AADE7 Self-Care Behavior guidelines	Weight	12	One onboarding call	ILC - 60 min and daily messages, LWC - 20 min
Chad-Friedman et al. (42)	27	Only one group of coach	Obese or overweight adults	♀♂	Telephone-based health coaching	Diet, exercise, sleep quality and relaxation strategy	Motivational interviewing	BMI, Weight	24	One in person session + 12 calls	20 min
Tanaka et al. (43)	112	Coaching x standard-of-care	Obese or overweight adults	♀♂	Coaching delivered by smartphone app	Diet	Transtheoretical model	Weight, WC	8	Daily	NR

Everett et al. (47)	55	Only one group of coach	Adults with prediabetes	♀♂	Coaching delivered by smartphone app	Diet and physical activity	Behavioral change theory	BMI, Weight, WC	16	Daily	The app provided just-in-time adaptive support in the form of daily push notifications.
Taveras et al. (30)	721	Coaching x standard-of-care	Obese children	♀♂	Telephone-based health coaching and video conference	Diet, exercise and, sleep quality	Motivational interviewing	BMI	48	Twice-weekly text messages and telephone or video contacts every other month	video contacts - 15–20 min
Mao et al. (69)	836	Coaching x matched-pair control	Obese or overweight adults	♀♂	Telephone-based health coaching	Healthy nutrition, physical activity, stress management, and medication adherence	NR	Weight	16	Daily	NR
Djuric et al. (56)	82	Only one group of coach	Obese or overweight adults	♀♂	In person and telephone-based	Sleep, diet, and/or physical activity	Motivational interviewing and autonomous goal setting	BMI, WC	12	Twice	The initial coaching session typically lasted one hour (average 54 minutes, SD 17 min). Follow-up coaching sessions averaged 14 minutes each (SD 6 min).
Lancha, Sforzo and lancha et al. (26)	1	Case report	One obese male	♂	In person	Nutritional coaching was prompting motivation for physical activity practice.	Motivational interviewing, decisional balance, positive psychology, transtheoretical model.	BMI, Weight, WC	12	Once	45 min
Browning et al.(49)	711	Coaching x usual care	Patients with diabetes	♀♂	In person and telephone-based	Management targets as specified within the Chinese diabetes guidelines	Motivational interviewing	BMI, Weight, WC	24	Phase one) Once per week / Phase two) 3 per m / Phase three) 2 per m / Phase four)1 per m	NR
Speyer et al. (59)	428	Coaching x care coordination x standard-of-care	Adults with severe mental illness and overweight	♀♂	In person and telephone-based	Diet, physical activity and -where relevant - smoking cessation.	Transtheoretical model and motivational interviewing	BMI, Weight, WC	48	Once	variable duration, often one hour

Wennehorst et al.(50)	83	Coaching x usual care	People with prediabetes, type 2 diabetes, or were at risk of developing diabetes and/or cardiovascular diseases	♀♂	In person	Diet, exercise, health behavior changes, including social support, coping strategies, and stress management	CHIP hand and workbooks and multimedia contents.	BMI, Weight, WC	8	Twice	150 min
Wayne et al. (52)	131	Coaching delivered by app x coaching in person	Patients with type 2 diabetes.	♀♂	Coaching delivered by ssmartphone app	Diet and exercise	Behavior change techniques	BMI, Weight, WC	24	through the app	App delivered – not specified
Aschbrenner et al. (57)	10	Only one group ff coach	Overweight and obese individuals with serious mental illness	♀♂	In person	Diet and exercise	Motivational interviewing, behavior change techniques	Weight	24	NR	60 min
Bartels et al. (58)	210	Coaching x fitness club membership	Overweight and obese individuals with serious mental illness	♀♂	In person	Diet and physical activity	Behavior change techniques and motivational interviewing	BMI, Weight, WC	48	Once	45-60 min
Sangster et al. (70)	313	Coaching health weight x coaching physical activity	Cardiac patients	♀♂	Telephone-based health coaching	Health weigh x physical activity	NR	BMI, Weight	8 and 6	Four calls (CHW) e two calls (CPA)	13-27 min
Cha et al. (54)	14	Only one group of coach	Young adults with prediabetes	♀♂	Coaching delivered by smartphone app	Diet and physical activity	Social cognitive theory.	BMI, Weight	12	Once	NR
Varney et al.(71)	94	Coaching x standard-of-care	Adults with type 2 diabetes	♀♂	Telephone-based health coaching	Diet and exercise	NR	BMI, Weight, WC	24	Six (4-9) coaching sessions	20-45 min
Wayne et al. (51)	21	Only one group of coach	Adults with type 2 diabetes	♀♂	Coaching delivered by smartphone app	Diet, physical activity, and overall health goals	Behavior change techniques	BMI, Weight, WC	24	through the app	App delivered – not specified
Shahnazari et al.(53)	84	Coaching x control group	Veterans overweight or obese	♀♂	Telephone-based health coaching	Diet	Transtheoretical model	Weight	24	Phase one) one per week/ Phase two one per month	60-min session; final session 15 min
Blackberry et al. (48)	468	Coaching x control group	Patients with diabetes	♀♂	Telephone-based health coaching and in person	Dealing with lifestyle issues, medication adherence and dosing, self monitoring of their	Patient empowerment	Weight, WC	72	Once each 6 w (for 6 months) + 4 sessions (in an interval of 4 months)	NR

			disease								
Hawkes et al. (32)	22	Only one group of coach	Patients with colorectal cancer	♀♂	Telephone-based health coaching	Diet, physical activity, weight management, alcohol and smoking	Behavioral models of health and illness and behaviour change, Acceptance Commitment	BMI, WC	6	Once	60 min
Ball et al. (31)	46	Health initiatives program x youth lifestyle program x control group	Obese adolescents	♀♂	In person	Diet and physical activity	Motivational interviewing and cognitive behavioral therapy (one group)	BMI, Weight, WC	16-20	Sixteen sessions	45-60 min
Rimmer et al. (28)	92	Lower support x higher support x control group	Women with severe obesity and mobility disability	♀	Telephone-based health coaching	Exercise	NR	BMI, Weight	48	Once	5-35 min

Legend: BMI – body mass index; CHIP - German Version of Comprehensive Health Improvement Project ; CHW - Coaching health weight; CPA- coaching physical activity; m –months; min – minutes; NR- not reported; WC – Waist Circumference; ♀ - female; ♂- male;

[1]Outcomes analysed by the review's authors* ; [2] Time – duration of the coach session;

Table 1. Assessment of methodological quality of the studies that evaluated the effectiveness of self-reported health coaching for weight loss

Outcome	Downgrading Factors					Upgrading Factors			GRADE
	Risk of Bias	Directness	Consistency	Precision	Publication Bias	Large Effects	Dose-Response	Residual Confounders	
Primary meta-analysis [1]	⊕⊕⊕◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯
Secondary meta-analysis [2]	⊕⊕⊕◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯	⊕◯◯◯
Sensitivity analysis based on high-quality RCTs [3]	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕	⊕⊕⊕⊕

Legend: ⊕⊕⊕⊕ High quality; ⊕⊕⊕◯ Moderate quality; ⊕⊕◯◯ Low quality and ⊕◯◯◯ Very low

[1] Primary meta-analysis was with 16 controlled studies comprising 47 outcomes indicated a trivial effect favouring the inclusion of coaching compared to usual care; [2] secondary meta-analysis was conducted using the pre-post data from coaching interventions only (both controlled and before-after designs). [3] Analysis based on those studied determined to be of high quality.

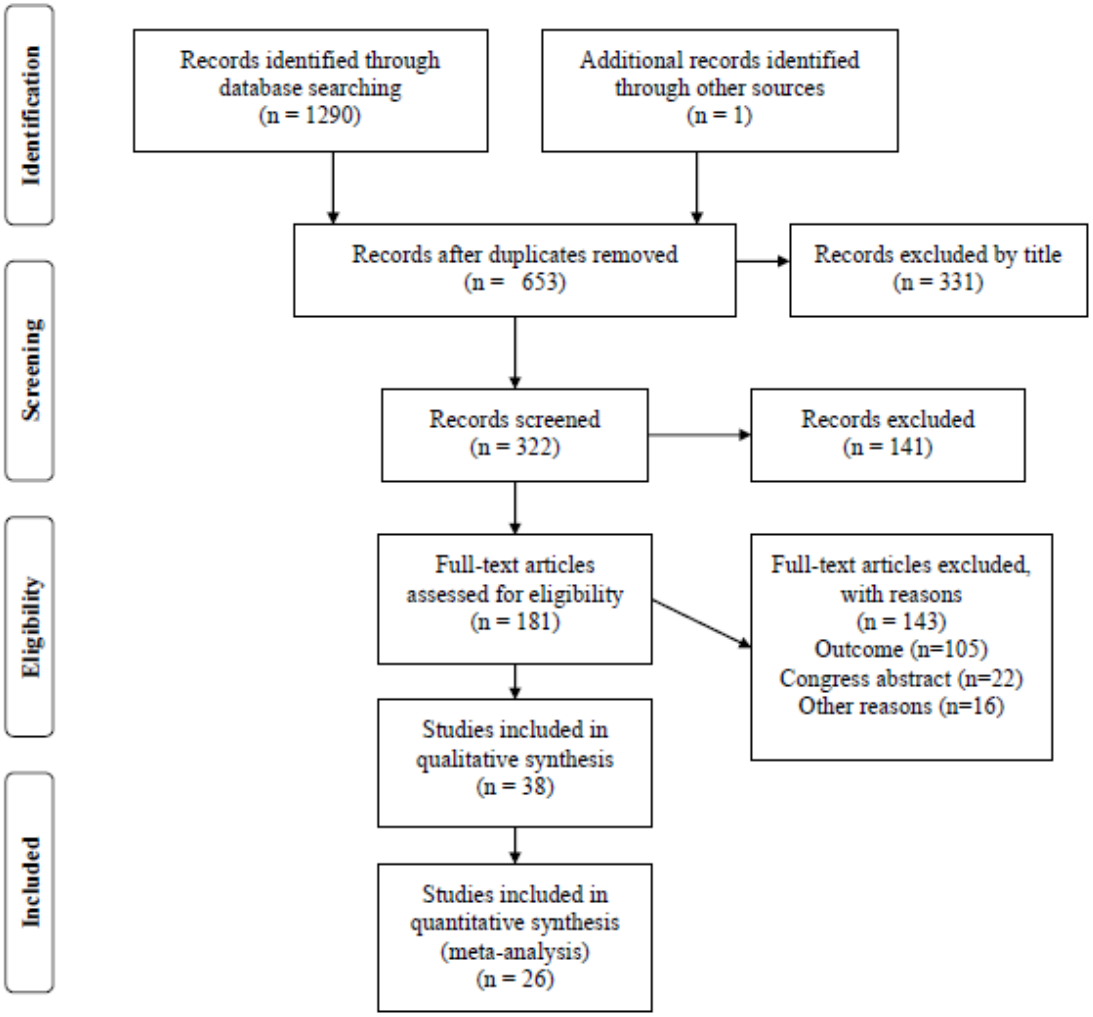

Figure 1. Flow diagram illustrating literature search and selection process of studies assessing self-reported health coaching for weight loss

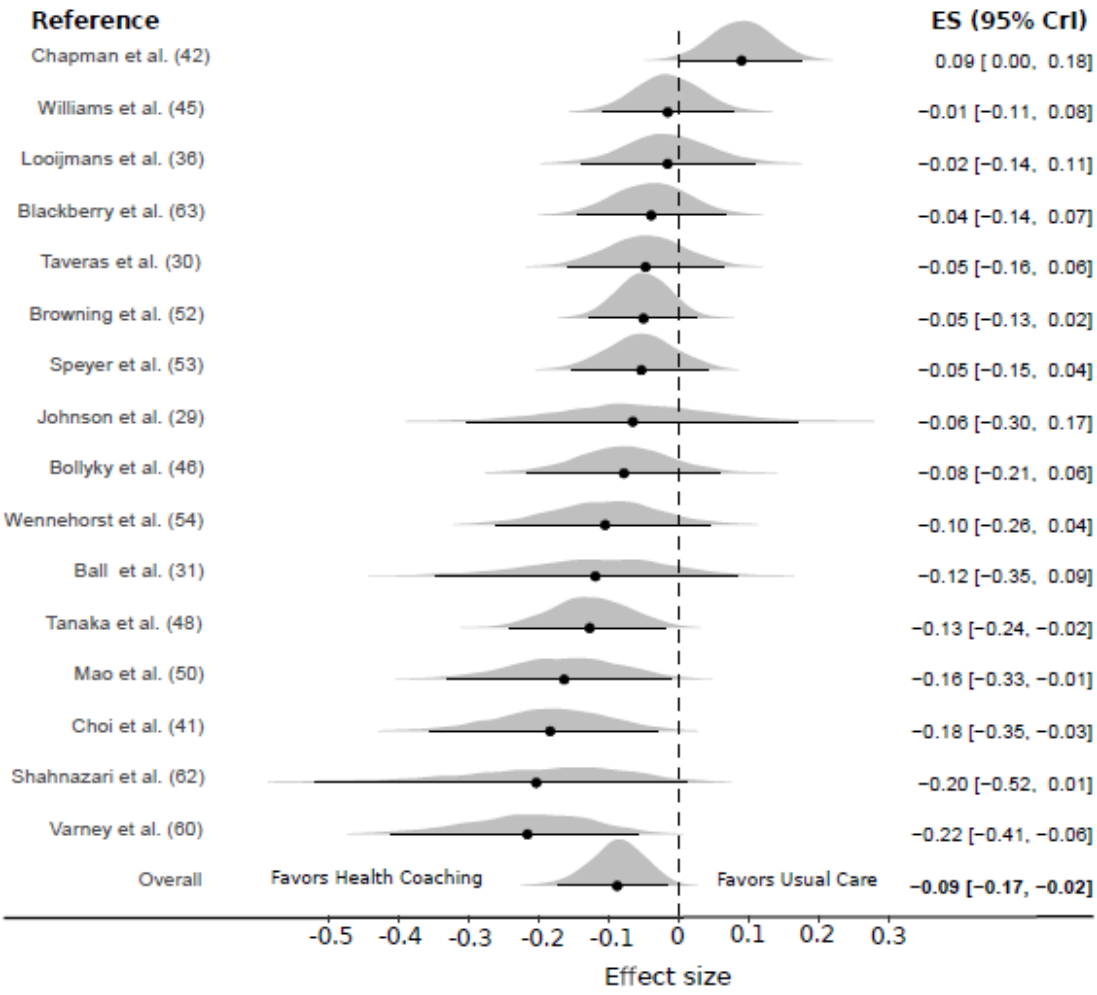

Figure 2. Bayesian forest plots of modelled study effect sizes assessing self-reported health coaching on weight loss outcomes.

Legend: Comparison of health coaching (n = 2501) with usual care (n =1729)

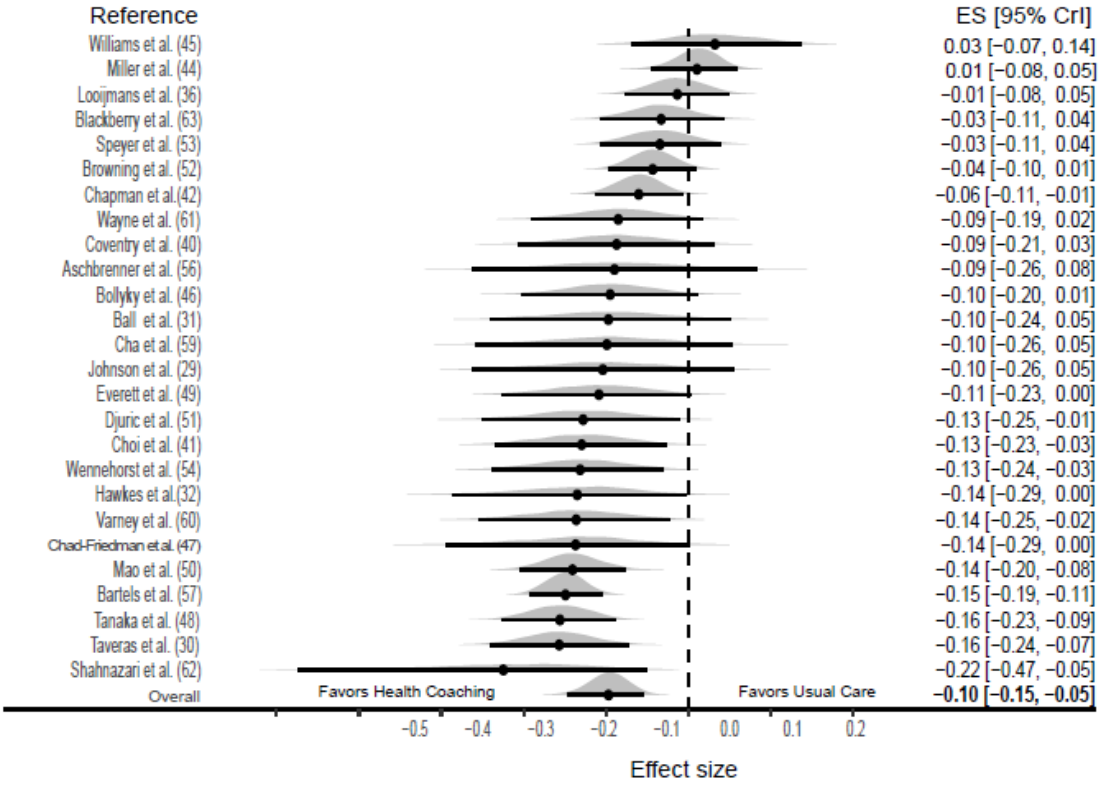

Figure 3. Pooled effect sizes assessing self-reported health coaching on weight loss outcomes.

Legend: Comparison of pre-post data from those allocated to health coaching (n = 3601).