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**Review**

Self-Directed Interventions to Promote Weight Loss:

A Systematic Review of Reviews

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**Abstract**

**BACKGROUND:** A wide range of self-directed, weight-loss interventions are available, providing users with a variety of tools delivered through various formats to regulate weight-related behavior patterns. However, it is unclear how effective self-directed interventions are and how they promote weight loss and weight maintenance.

**OBJECTIVES:** A systematic review of reviews was conducted to examine the effectiveness of such interventions and to identify intervention content associated with effectiveness.

**METHODS:** MEDLINE, EMBASE, PsycINFO, CINAHL and the Cochrane Library for systematic reviews were searched from 2000 to 2012 for reviews of the effectiveness of self-directed interventions on weight loss and weight maintenance in adults. Two reviewers used predefined inclusion criteria to select relevant reviews and assess their quality using the Overview Quality Assessment Questionnaire (OQAQ). We extracted data on effectiveness and on relationships between intervention characteristics and effectiveness.

**RESULTS:** Twenty reviews were included and quality assessed. Findings relevant to self-directed interventions, including interactive websites, smart-phone applications and text messaging were summarized. Findings were mixed but promising. For example, one review of internet-based interventions found that, when used in conjunction with standard weight loss programs, these interventions resulted in a significant average increase in weight loss of 1.5kg over evaluation periods. Unfortunately, only 7 of 20 reviews were of high methodological quality according to OQAQ scores, only 4 employed meta-analyses. Few reviews linked intervention content to effectiveness.

**CONCLUSIONS:** Current evidence suggests that self-directed interventions can independently promote weight loss and can augment interventions involving personal contact. Particular change techniques and delivery modes including individualized feedback, email counselling and online social support appear to enhance effectiveness. Further reviews of the content of self-directed, weight-loss intervention studies are needed to clarify which change techniques delivered through which delivery formats optimize intervention effectiveness.

**Keywords:** Weight loss; Obesity; Internet; E-health; Home-based; Text-message; Self-delivered; Intervention; Systematic review

## Introduction

Weight reduction is a global health priority because being overweight or obese is associated with multiple health problems, including the leading causes of preventable death such as cardiovascular disease, type 2 diabetes, and particular cancers [1,2]. Yet the prevalence of obesity and health services resources devoted to treating its consequences are increasing internationally. In the United States, for example, 68% of adults are overweight or obese accounting for more than 20% of health care costs [3].

Pharmaceutical and bariatric surgery treatments are effective for some overweight and obese people but are expensive and often accompanied by adverse side effects. Consequently, they tend to be weight loss treatments of last resort [4]. Reversing population obesity trends depends on prompting widespread changes in diet and physical activity patterns [5,6]. Promotion of initiation and maintenance of weight changes will be optimized by an understanding of the processes regulating eating and physical activity patterns [7,8].

Effective face-to-face interventions have been developed to promote weight loss through changes in diet and physical activity [9], but these require substantial, specialist delivery personnel and resources [10]. Consequently, more intensive (higher contact frequency) and expensive interventions are most effective. Further research is warranted on intervention formats that could reduce costs without decreasing effectiveness [11]. Effective, high-intensity, low-cost interventions may be developed if participants self-deliver intervention content using printed media (eg, self-help manuals) or interactive software (on mobile phones, the Internet, or other online mobile devices). We use the term “self-directed interventions” to mean those that require minimal professional contact (for example, provision of initial instructions) or no professional contact and can be easily used with existing infrastructure and in the context of users’ everyday lives. Many such interventions have been developed [12], and although attrition rates are often high [13], such interventions have been found to be effective for a broad range of health behavior changes including improving diabetes self-management and smoking cessation [14,15].

Self-directed interventions are likely to be most effective when they empower participants to control and regulate their own thoughts, feelings, and behaviors, thereby changing psychological and environmental prompts to weight-gain behaviors [8]. These interventions are not only self-directed but also “self-regulatory” in that people are taught to change the regulatory processes that maintain current behavior patterns and establish new ones. For example, it has been suggested that prompting self-regulation through self-monitoring of behavior, providing timely feedback on behavior changes, prompting goal setting, and specific action planning are all associated with effectiveness in dietary and physical activity interventions [16,11]. Nonetheless, it remains unclear which self-directed weight loss interventions are effective and why. For example, which combinations of behavior change techniques [17,18] (eg, Abraham and Michie, 2008; Abraham, 2012) targeting which behavior regulation processes delivered through which particular delivery formats [19] optimize weight loss and weight maintenance over time?

Considerable research has been devoted to developing and evaluating self-directed, weight loss interventions, and a number of recent reviews are available. Some reviews have focused solely on studies evaluating interventions using weight loss outcomes [20], while others have included studies evaluating interventions in terms of weight loss alongside studies using other outcome measures such as self-report behavioral measures.

In a systematic review of reviews, Kohl and Crutzen (2013) examined the efficacy, use, and reach of Internet-based interventions for lifestyle changes in physical activity, dietary behaviors, smoking, alcohol consumption, and condom use [21]. One meta-analysis included in this review found that Internet-based interventions of longer duration, based on social cognitive theories, and including educational components with regular updates of intervention content increased physical activity levels [22]. These reviewers also reported that interactive elements, such as chat rooms and online peer support, were associated with greater efficacy. However, identification of such components across interventions was rare.

We are not aware of any previous review of reviews of self-directed interventions evaluated in terms of weight loss outcomes. We therefore conducted a systematic review of reviews to summarize efficacy evidence and design features of self-directed interventions designed to reduce weight and sustain weight maintenance. Within identified reviews, we focused on the conclusions that reviewers drew about interventions evaluated in terms of weight loss. This meant that, for some reviews, all the included primary studies were relevant to our research questions, while for others, a minority of the primary studies were relevant.

Our review aimed to summarize evidence in relation to three key questions:

R1. How effective are self-directed weight loss interventions?

R2. Is effectiveness enhanced by use of particular change techniques?

R3. Is effectiveness enhanced by using particular delivery formats?

## Methods

### Review Inclusion Criteria

To meet these aims, we included reviews based on systematic literature searches published in English between 2000 and 2012 that included at least one primary intervention evaluation:

1. Of an individual-level, self-directed weight loss intervention targeting healthy adults (18 years or over) who were normal weight, sedentary, overweight, or obese. Normal weight intervention participants were included because such studies are important to understanding what works best in prevention of weight gain and maintenance of normal weight in nonclinical populations.
2. Targeting physical activity, diet, or both and were evaluated using at least one weight-related outcome (eg, weight, body mass index [BMI], waist circumference, waist to hip ratio).
3. Employed randomized controlled trials (RCTs), observational, quasi-experimental, and/or cohort studies. Comparison groups could include usual care, other interventions, or no intervention.

### Search Strategy

Reviews that met these inclusion criteria were searched for on the bibliographic electronic databases MEDLINE (Ovid), Embase (Ovid), PsycINFO (Ovid), CINAHL, and the Cochrane Library. Full searches applied in each database are available from the authors.

### Study Selection

The first author examined the titles and abstracts of articles identified by our search against the predefined inclusion criteria. A second researcher repeated this process, and discrepancies were resolved through discussion. Full text articles were obtained and assessed to ensure correspondence to inclusion criteria by the first 3 authors. Disagreements were resolved through discussion, and reasons for exclusion were outlined for each review. See Multimedia Appendix 1 for a list of included and excluded reviews (n=32). References in eligible reviews were checked to identify further relevant reviews.

### Quality Assessment

The quality of each full-text article that met the inclusion criteria was rated by the first and second authors using the Overview Quality Assessment Questionnaire (OQAQ) [23]. Each review was scored against a checklist of nine standard items, including transparency, selection bias, study quality, and replicability. The few scoring disagreements arising were resolved through discussion. Following Greaves et al’s (2011) review of reviews on components associated with effectiveness in dietary and physical activity intervention evaluations [11], we labeled reviews as high quality if they scored 14-18 on the OQAQ. Those falling slightly below this threshold (11-13) were labeled medium quality 11-13, and reviews scoring below 11 were regarded as low quality.

### Data Extraction

From each included review, we extracted information concerning setting and methods (eg, country, context, study design, inclusion and exclusion criteria), participants (eg, total number of participants, missing participants, mean age, gender), outcome measures (method of assessing outcomes, duration), main findings (especially effectiveness summaries and analyses relating intervention content to effectiveness), intervention (eg, type of intervention, change targets in terms of cognitive, emotional, or physiological changes targeted and or assessed in process evaluations, mode of delivery, intervention content). Data extraction forms are available from the authors.

### Analyses

Each review was searched for descriptions of content of relevant self-directed weight loss interventions and for both statistical and narrative assessment of the relationship between intervention content and effectiveness. This information was extracted and is summarized for each review in Multimedia Appendix 2.

## Results

### Search Results

In accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, Figure 1 shows that our search strategy identified 524 articles after removal of duplicates. Title and abstract examination and reference-checking generated 32 potentially eligible articles of which 20 met our inclusion criteria. The number of participants included in studies within each review ranged from 298 to 12,417. Three of the selected reviews did not report total sample size.

Records identified through database searching
(n=843)

## Screening

## Included

## Eligibility

## Identification

Additional records identified through other sources
(n=3)

Records after duplicates were removed
(n=524)

Records screened
(n=524)

Records excluded
(n=496)

Full-text articles assessed for eligibility
(n=28) hand search (4)

Full-text articles excluded, with reasons (n=12)

- Not a systematic review (4)

- Wrong outcomes (3)

- No interactive components (6)

- Not a self-directed intervention (8)

Reviews included in qualitative synthesis
(n=20)

*Figure 1.* Study selection; PRISMA Flow Diagram

### Review Characteristics

Included reviews were published between 2006 and 2012 and focused on weight loss in overweight or obese adults aged 20-79 years old. A summary description of each of the 20 reviews included is provided in Multimedia Appendix 2. The appendix describes review type, search period, inclusion criteria, OQAQ score, review aims, the number of primary intervention studies reviewed, the number of primary intervention studies meeting our inclusion criteria, the content of interventions meeting our inclusion criteria, and the overall results and conclusions.

Three of the selected reviews did not report total sample size across reviewed studies. Of the remaining, Enwald and Huotari’s (2010) included the most participants (n=12,417) and Keller, Records, Ainsworth, Permana, Coonrod (2008) the fewest (n= 298) [24,25]. Most reviews focused on participants living in the community, although one review included home-based interventions for postpartum women [25].

All reviews, apart from one, summarized evaluation studies of weight loss or weight maintenance interventions. Three reviews excluded weight maintenance interventions [26-28]. Reviews included a variety of primary intervention evaluations, some relevant to our review and others not. For example, Kroeze, Werkman, and Brug (2006) reviewed the effectiveness of computer-tailored educational interventions evaluated in relation to a series of health-related outcomes, including smoking cessation, diabetes, and asthma management [29]. Consequently, only 2 of 31 primary evaluation studies included in this review were relevant to our research questions and so met our inclusion criteria. By contrast, all studies included in Weinstein (2006) met our inclusion criteria [30]. Thus for some reviews, we focus on conclusions based on a minority of the primary evaluations included in the review.

Only 4 reviews reported meta-analyses of weight-related outcomes [20,26,31,32]. The remaining 16 reviews reported narrative syntheses of primary studies (see Multimedia Appendix 2 for overview of reviews) [12,24,25,27,28-30,33-41].

### Review Quality

The overall methodological quality of included reviews was relatively poor. The average OQAQ score was 12.8. Individual review scores are shown in Multimedia Appendix 2. Only 5 reviews applied study quality assessment criteria to inform their analyses/interpretations [20,26,31,37,40], and most reviews did not assess the methodological quality of primary studies or consider potential reporting biases. Of the 20 included reviews, Loveman et al (2011), Tuah et al (2011), and Wieland et al (2012) had the highest quality scores (of 18) [20,37,40] and 4 others were high quality, scoring 17 [26,31], 15 [32], and 14 [33].

Apart from Neve et al (2010), who did not use quality assessment criteria, all high-quality reviews examined the methodological quality of primary studies. Four reviews used the Cochrane Collaboration Risk of Bias Tool [20,26,31,40]. Harris et al (2011) also used the Effective Public Health Practice Project quality assessment index [31], and 2 reviews developed their own methodological quality assessments [33,37]. While all 7 high-quality reviews included primary evaluations of interventions for overweight or obese adults, Cole-Lewis et al (2011) and Harris et al (2011) also included interventions with adolescents, so their conclusions do not refer exclusively to adult populations [33,31].

### Weight Loss Effectiveness and Mode of Delivery

Across 20 reviews, we identified 99 primary evaluation studies that met our inclusion criteria. The interventions described in these studies employed a range of delivery formats including online programs, mobile phone applications, text messaging, email, electronic and print newsletters, telephone-based communication, print manuals, and booklets.

To explore findings, we grouped reviews according to the main delivery formats used by the interventions they considered. Nine reviews focused on Internet interventions. Three reviews evaluated interventions based on electronic devices such as mobile phones (referred to as “eHealth” interventions). Seven reviewed various multicomponent interventions, some of which were described as “home-based”, and one reviewed text-messaging interventions.

### Internet-Based Interventions

In a narrative review judged to be of medium quality, Weinstein (2006) included 8 evaluative studies (5 assessing weight loss and 3 assessing weight maintenance) [30]. All 8 met our inclusion criteria. The review included data from 418 overweight or obese participants aged 30-62 years with intervention durations of 6-12 months. Four of the five weight loss studies supported Weinstein’s (2006) conclusion that Internet-based interventions could provide an alternative to traditional interventions achieving weight loss of 1.7 kg (SD 2.7) to 2.2 kg (SD 2.6). The exception compared two self-delivered approaches. This study found that participants using a manual-based program lost substantially more weight than those using a tailored online dietary intervention.

Findings were equivocal for the 3 weight maintenance interventions, and Weinstein called for further research. For example, Harvey-Berino, Pintauro, Buzzell, and Gold (2004) randomized 250 participants to an Internet support group, minimal in-person support, or frequent in-person support group following a 6-month weight loss intervention involving interactive television. After 12 months, no differences were found. Interestingly, the Internet-based group experienced greater peer contact and were more likely to complete self-monitoring diaries but nonetheless had the highest attrition rate, suggesting that, for some participants, the intervention had diminishing appeal over time [42].

Weinstein concluded that the content of Internet-based interventions is crucial to effectiveness and highlighted the potential importance of use of food records, sending weekly emails, and using telephone reminders. Weinstein called for further randomized trials on the use of Internet-based interventions for weight loss and weight maintenance.

In a medium quality review, Kroeze, Werkman, and Brug (2006) report effectiveness of computer-tailored education on physical activity and dietary behaviors [29]. Only 2 of the 31 studies met our inclusion criteria because, although many assessed weight-related outcomes, most did not report weight lost. Results were inconclusive in relation to weight loss effectiveness.

In a narrative review judged to be low quality, Saperstein et al (2007) included 6 studies of online social support interventions that included feedback from a therapist, e-bulletin boards for peer support, and email communication with a counselor [28]. All 6 studies met our inclusion criteria. These interventions were effective with interventions achieving a weight loss range of 2.6-8.3kg, but only when specific change strategies were used. Information provision alone without feedback had no effect on weight outcomes. Saperstein et al concluded that “personalization through ongoing tailored information and feedback, either via email from a human counsellor or a computer-based program, was a critical component” (p. 4).

In another narrative review judged to be of medium quality, Turk et al (2009) included 40 studies that focused primarily on weight maintenance [41]. Only 8 of these studies met our inclusion criteria. Findings from 2 of these suggest that behavioral interventions with online chat sessions delivered via the Internet were as effective as an in-person behavioral therapy intervention [42,43]. Contrary to these findings, however, Harvey-Berino et al (2002) reported that an Internet chat group maintained significantly less weight than a minimal in-person and frequent in-person group (–5.7 kg [SD 5.9] vs –10.4 kg [SD 9.3] vs –10.4 kg [SD 6.3], respectively) [44]. Moreover, in Wing, Tate, Gorin, Raynor, and Fava et al’s (2006) study, an Internet chat room group was less successful in maintaining weight than in-person behavioral treatment (4.7 kg [SD 8.6] vs 2.5 kg [SD 6.7], respectively) [45]. These studies describe different interventions evaluated using different methods. The interventions evaluated in these studies vary greatly methodologically, which renders data synthesis impossible. Thus, findings in this review are equivocal, and the relative effectiveness of Internet versus face-to-face groups warrants further investigation.

Neve et al (2010) reported a high-quality meta-analytic review [32]. All 18 studies met our inclusion criteria. Random effects meta-analysis of 3 studies demonstrated a significant difference between an enhanced Web-based intervention (involving self-monitoring activities and individual email feedback) and an education-only Web-based intervention with less weight regained in the enhanced Web-based intervention group post intervention (weighted mean difference 2.24; 95% CI 1.27-3.21; *I²*=20.9%) [46-48]. Two weight maintenance studies combined in a meta-analysis also demonstrated less weight regain in participants involved in a Web-based intervention compared to a minimal intervention or usual care control group (weighted mean difference –0.30; CI –0.34 to –0.26; *I²=*0%) [49,50]. Although these meta-analyses supported the efficacy of Internet interventions, only 3 of the studies reported to achieve clinical weight loss of 5%. Neve et al (2010) were unable to draw generalizable conclusions due to the small numbers of comparable interventions.

In a narrative review judged to be of medium quality, Manzoni et al (2011) updated Neve et al’s (2010) review of 18 Internet-based studies, including 8 additional studies [38]. All studies met our inclusion criteria and focused primarily on teenage women. Interventions lasted from 6 weeks to 2 years. Manzoni et al (2011) confirmed previous findings suggesting that Internet interventions including feedback are more effective than those providing information alone. For example, Bennett et al (2009) randomized 101 participants to an Internet-based intervention including counseling sessions, behavior change goals, and self-monitoring compared to “usual care”. After 3 months, the intervention group lost 2.3 kg compared to a gain of 0.28 kg in the usual care group [51]. Overall, however, Manzoni et al (2011) judged available evidence to be inconclusive because of heterogeneity in duration and intensity of interventions, and variation in the type of feedback and social support tools used.

Manzoni et al (2011) also attempted to assess the cost-effectiveness of Internet-based interventions. Two studies suggested that Internet-based interventions could be effective and less expensive than alternative interventions [52,53]. For example, Booth, Nowson, and Matters (2008) estimated that, over 12 weeks, Internet-based interventions could save up to US $155 compared to in-person interventions [52]. In addition, the authors reported further savings in travel time and travel costs after the 12-week period. However, only 2 studies provided cost-effectiveness data. Thus, further studies are needed to clarify how much less expensive Internet-based interventions could be when compared to standard weight loss interventions.

In a high-quality review, Reed et al (2011) identified 11 RCTs of Internet weight loss interventions, including email counseling and handheld, self-monitoring computer devices [26]. Seven of these studies, focusing on teenage women, met our inclusion criteria. Random effects meta-analyses of 6 of these studies found that adding a computer-based intervention to standard weight loss treatment significantly increased the amount of weight lost between 2 and 12 months (weighted mean difference −1.48 kg, 95% CI −2.52 to –0.43; *I2=*0%; *P=*.01) [54-58]. However, 4 of these studies were not primarily self-delivered interventions and so did not meet our inclusion criteria [54,55,57]. A meta-analysis of 5 exclusively self-directed computer-based interventions found that computer-based groups lost less weight than the standard treatment groups (using paper-based materials) (weighted mean difference 1.47 kg, 95% CI 0.13-2.81; *I²*=0%; *P<*.001) [59-62]. The authors concluded that Internet-based interventions were effective only when used in conjunction with a standard weight loss intervention, but the amount of weight lost (<1.5 kg) was too small to be clinically relevant for overweight and obese populations.

In a low-quality narrative review, Arem et al (2011) reviewed 9 RCTs, 8 of which met our inclusion criteria. These 8 studies reported modest weight loss ranging from 0.8-4.9kg across studies [12]. For example, Hunter et al (2008) reported a 1.3 kg (SD 4.1) weight loss in 446 military participants who took part in an Internet-based intervention compared to a weight gain of 0.6 kg (SD 3.4) for those in a “usual care” group [63]. Rothert et al (2006) randomized 2862 participants to an online personalized information group and an online information-only group. After 6 months, the online personalized group lost significantly more weight (2.8 kg [SD 0.3] vs 1.1 kg [SD 0.4], respectively) [64]. Nonetheless, Arem et al (2011) judged the data to be inconclusive due to the high attrition rates and variability/incompatibility of intervention methods. The most promising interventions identified in this review were in-person treatments followed by online weight maintenance, and only this combination achieved 5% weight loss. It is unclear, therefore, how effective Internet weight loss interventions are without personal contact/support.

Wieland et al (2012) reported a high-quality review examining the effectiveness of interactive computer-based interventions on weight loss and weight maintenance in obese or overweight adults [20]. All 18 studies reviewed met our inclusion criteria. These studies involved 4140 participants from the community, and 14 included weight loss as a primary outcome. For example, at 3 months, a meta-analysis of five weight loss trials found that computer-based intervention participants lost more weight than those in the minimal control group (eg, printed material or no treatment conditions; weighted mean difference –2.5 kg; 95% CI –3.4 to –1.6; *I*2=44%) [51,56,65-67]. Four studies focused on weight maintenance (as opposed to initial weight loss) [43,45,49,50]. Participants using the computer-based interventions regained less weight than those in the minimal treatment or no treatment control at 6 months (mean difference –0.7 kg; 95% CI –1.2 to –0.2; two trials) [45,50] and at 12 months (mean difference –0.8kg; 95% CI –1.4 to –0.2; three trials) [45,49,50]. One trial (Harvey-Berino 2002) compared a computer-based intervention to an intensive in-person intervention (involving contact every 2 weeks over 12 months). Participants in the computer-based intervention regained more weight during the first 6 months (weighted mean difference 2.2 kg; 95% CI 0.3-4.1), and at 12 months lost less weight than the in-person group (weighted mean difference 4.7 kg; 95% CI 1.7-7.7) [43]. Overall, the authors of this high-quality meta-analytic review concluded that, compared to no intervention or minimal interventions, computer-based interventions are effective in prompting weight loss and in supporting maintenance of weight loss. However, computer-based interventions result in less weight loss and greater weight regain than in-person interventions. So, for example, while computer-based interventions may result in approximately 2.5 kg loss over 3 months, in-person interventions can achieve up to 10% of weight loss at up to 26 months [68].

### eHealth Interventions

Reviews used the term “eHealth” to refer to interventions delivered using electronic devices including smartphones and Internet-based computer interventions. Thus, the 3 reviews considered in this delivery category include primary evaluation studies that could also have been included in reviews of Internet intervention studies (as above).

In a narrative review judged to be of medium quality, Norman et al (2007) summarized 49 eHealth and Internet studies [39]. All studies targeted both dietary and physical activity behavior change, and interventions lasted 4-12 months. These studies were of variable quality, and only 12 met our criteria with 33 failing to include a weight-related outcome. Norman et al (2007) drew few conclusions but recommended that future studies focus on underlying mechanisms and change techniques that promote dietary and physical activity behavior change.

In a narrative review judged to be of medium quality, Enwald and Huotari (2010) evaluated electronic interventions for the prevention of obesity and its associated health problems [24]. Of the 23 included studies, 21 were RCTs and 2 employed quasi-experimental designs. However, only 5 studies met our inclusion criteria with 17 failing to include a weight-related outcome. Interventions included emails, use of websites, electronic feedback, CD-ROM, and newsletters and lasted between 1 and 12 months. Results showed that dietary interventions had a greater influence on weight than physical activity programs. Interestingly, tailoring was reported to be more effective when applied in the context of dietary interventions and less effective in physical activity programs.

By contrast, Harris et al (2011) conducted a high-quality meta-analytic review of 43 studies, of which 22 met our inclusion criteria; 21 did not include weight loss outcomes [31]. Across 40 adult studies participant ages ranged from 40-49 years. 27 of these studies used the Food Frequency Questionnaire, and others used a variety of outcomes. Interventions lasted between 1 and 6 months, and participants interacted with the intervention either daily or weekly for 10-45 minutes. Based on dietary behaviors outcomes, in particular intake of fruit, vegetable, fat, and fiber, this review found no evidence that eHealth was more effective or cost-effective than in-person interventions. Four self-delivered interventions reported mean weight [48,69-71], and three reported mean change in weight [49,50,58]. Random effects meta-analyses of both groups, that is, (1) the former four (weighted mean difference 0.6 kg; 95% CI –3.5 kg to 4.6 kg; *P=*.78) and (2) the latter three, found no evidence of intervention effect (weighted mean difference –0.07 kg; 95% CI –1.8 kg to 1.6 kg; *P=*.94). However, large heterogeneity of effect sizes casts some doubt on the applicability of these average results across intervention evaluations. In conclusion, however, this high-quality meta-analytic review found no evidence of effectiveness of self-delivered eHealth weight loss interventions in comparison with other approaches.

### Home-Based Print and Multicomponent Interventions

Three reviews summarized intervention evaluation studies, many of which were referred to as “home-based” [25,27,35]. These, together with interventions reviewed by 4 other reviews, typically included mailed instructions or advice on dietary and physical activity (eg, brochures, leaflets, health professional advice), self-monitored physical activity using electronic devices (eg, pedometers, accelerometers), promotion of diaries, and provision of various written materials—or a combination of the above [34,36,37,40].

 In a narrative review judged to be low quality, Hemmingsson et al (2001) included 7 studies of physical activity, 2 of which met our inclusion criteria [35]. For example, Perri, Martin, Leermakers, and Notelovitz (1997) compared a “home-based”, individual walking intervention with an organized group-based walking intervention. At 12 months, participants in the individual intervention reported 20.8 minutes more walking per week than those in the group intervention. Those in the home-based group also lost more weight after 15 months (11.65 kg [SD 8.99] vs 7.01 kg [SD 8.23]) [72]. However, this was based only on a small sample of 49 obese women enrolled in a behavioral modification program. Further investigation of the potential of individual walking interventions is warranted.

In a narrative review of weight management interventions for postpartum women, judged to be low quality, Keller et al (2008) included 6 studies of which 3 met our inclusion criteria [25]. All 6 demonstrated significant changes in body composition with a reported weight loss range of 1.6-7.8 kg in 3 studies. For example, Leermakers, Anglin, and Wing (1998) found that the behavioral weight loss intervention group involving telephone contact and 16 written lessons on exercise, nutrition, and behavior change strategies lost more weight than the no treatment control group involving healthy eating and exercise informational brochures, after 6 months (7.8 kg vs 4.9 kg, respectively) [73].

In another narrative review judged to be low quality, Lemmens et al (2008) included 9 studies of interventions with adults of which 3 met our inclusion criteria [27]. The 9 interventions included home-based exercises, written materials, emails, and face-to-face sessions. Only one of these found a small but statistically significant weight loss difference of 1.6 kg.

In a high-quality narrative review, Loveman et al (2011) included 12 studies of multicomponent interventions that involved home-based weight loss schemes [37]. Of these, 10 met our inclusion criteria. Many of these studies reported small, average weight loss. However, variability in intervention duration, intensity, addition of subsequent weight maintenance intervention components, and length of follow-up prevented drawing of meaningful conclusions regarding common elements associated with effectiveness.

In a low-quality narrative review focused on weight gain prevention interventions, Lombard et al (2009) included 9 studies [36]. In general, low intensity multicomponent interventions combining physical activity, diet, and behavior change content were found to be effective for preventing weight gain. Weight loss range was 1-1.9kg for 7 studies matching our inclusion criteria. However, only 5 demonstrated significant findings. For example, Lombard, Deeks, Jolley, Ball, and Teede (2008) examined an intervention consisting of four group-based behavior change sessions followed by text messages and monthly mail contact over a 1-year period. They found a difference of –1.01 kg (*P*=.03) of weight loss between the intervention and a control group (involving group-based education sessions) [74]. Overall, only a few studies assessed the effectiveness of interventions designed to prevent weight gain, and like other multicomponent reviews, intervention content varied across trials making it difficult to compare effect sizes and to generate robust conclusions.

Gordon, Watson, and Avenell (2011) reported a low-quality narrative review focusing on pharmaceutical and in-person weight loss treatment [34]. Two of the 10 included studies were primarily self-delivered and matched our inclusion criteria. For example, Ahrens et al (2003) compared an intervention incorporating personalized information sheets and tailored exercise advice to a reduced calorie diet group among 95 participants. After 6 months, no significant difference in weight loss was reported between groups [75]. Again variability across interventions made it difficult to draw conclusions about intervention components associated with effectiveness.

In a narrative review judged to be high quality, Tuah et al (2011) identified studies that applied the transtheoretical model (TTM) to weight loss, but only 2 of the 5 studies in this review were primarily self-delivered [40]. While these 2 studies reported a small change in weight, this was not sustained over 24 months. The authors concluded that “trials that used stages of change as an assessment and intervention framework, rather than just as a tool to assign and assess stage of change, reported minimal weight loss” (Tuah, 2011, p. 18).

### Text Message Interventions

In a high-quality narrative review, Cole-Lewis and Hershaw (2010) summarized 12 studies of SMS text messaging (short message service, SMS) interventions promoting a range of health behaviors including smoking cessation, diabetes, and asthma management [33]. Only 2 of these studies met our inclusion criteria. Both reported effective text messaging interventions with a weight loss range of 2.9-4.5kg. For example, Haapala et al (2009) randomized 126 overweight adults aged 25-44 years to a text message or a no-contact control group. After 12 months, the intervention group lost more weight than the control group (4.5 kg/m² vs 1.1 kg/m², *P*=.006, respectively) [76]. Weight loss occurred mostly in the first 3 months when usage of the text message program was high, so the longer-term effects of text messaging were unclear.

### Change Mechanisms and Theoretical Frameworks

None of the 20 reviews drew conclusions regarding the usefulness of particular theories or mechanisms of change. However, some reviews did highlight theories underpinning intervention design.

Enwald and Huotari (2010) reported that the most commonly mentioned theory in the evaluation studies in their review was the transtheoretical model (TTM), which guided 14 of 23 studies [24]. Other theories used included the Elaboration Likelihood Model, the Precaution Adoption Model, the Theory of Reasoned Action, the Theory of Planned Behavior, Goal Setting Theory, and the Health Promotion Model. Enwald and Huotari (2010) did not relate the theoretical foundation of interventions to effectiveness.

Tuah et al (2011) identified two interventions applying TTM to weight loss, both of which resulted in small losses in weight that were not sustained over 24 months [40]. The authors reported that TTM-based interventions using feedback, self-monitoring, anthropometric measurements, and counseling resulted in significant effects on weight loss.

Harris (2011) considered use of theory and change mechanisms in relation to changes in fruit, vegetable, fiber, and fat intake [31]. Of the 13 effective interventions, they found only one study that employed theory to identify change mechanisms. Anderson, Winett, Wojcik, Winett, and Bowden (2001) reported that self-efficacy and outcome expectancies in relation to physical activity mediated greater consumption of fruit, fiber, vegetables, and fat [77]. However, no meditational analyses were conducted.

### Change Techniques and Delivery Formats

Only Wieland et al (2012) provided meta-analyses linking specific intervention components with effectiveness [20]. At 3 months, meta-analysis of 3 trials demonstrated that participants receiving Internet-based interventions supplemented with individualized feedback experienced greater weight loss than participants in an Internet-based intervention without individualized feedback (weighted mean difference –2.1 kg; 95% CI –2.9 to –1.4; *P*<.001) [46,48,78]. A similar effect was also found for participants using email counseling in 3 trials (weighted mean difference –2.3 kg; 95% CI –3.1 to –1.5; *P*<.001) [46,48,78] and automated feedback in one trial (weighted mean difference –1.8 kg; 95% CI –3.2 to –0.5; *P=*.009) [48] when compared to an Internet-intervention delivered alone.

At 3 months, non-directive email counseling did not induce significant weight loss in one trial (weighted mean difference –0.3 kg; 95% CI –2.2 to 1.7; *P*=.80) [78]. Similarly, no effect was found at 4 months for a group chat intervention delivered in conjunction with online self-monitoring (weighted mean difference 1.5 kg; 95% CI –0.7 to 3.7; *P=*.18). However, this was based on only one trial with no follow-up assessment beyond 4 months [79]. The authors concluded computer-based feedback delivered in conjunction with an Internet-based intervention enhances weight loss.

Brief descriptions of the intervention content identified in narrative reviews are included in Multimedia Appendix 2. The most commonly mentioned mechanism-based change “techniques” [17] across reviews were self-monitoring, feedback, and goal setting. Interventions including these change techniques were generally more effective than information only interventions. Reminders were used in a number of effective interventions as were self-efficacy enhancement techniques [18] and provision of counseling opportunities.

Manzoni et al (2011) noted that most effective interventions promoting weight loss and maintenance incorporated tailored feedback via email, e-counseling, food diaries, and self-monitoring of physical activity, diet, and weight [38]. However, in the absence of meditational analyses, it is unclear which combination of techniques and delivery formats enhanced effectiveness. Lombard et al (2009) observed that “self-monitoring of weight was a component of three [effective] interventions. Four interventions used self-monitoring of diet or physical activity, but the form or reason for monitoring was not always clear” (p. 2243) [36].

Neve et al (2010) explored intervention components within individual studies and concluded that social support, peer support contact, and online bulletin boards increased website usage but no meditational analyses were presented [32]. Similarly, Weinstein et al (2006) noted that effective interventions included “social” components such as e-counseling from a therapist and an online bulletin, but whether these components are directly linked to effectiveness requires further investigation [30].

Behavior change techniques were delivered by means of a variety of “delivery formats” including Internet sites, emails, text messaging, CDs, telephone calls, pedometers, paper questionnaires and diaries, manuals, pamphlets, booklets, brochures, and workbooks. However, reviews did not allow firm conclusions to be drawn regarding these delivery formats. Internet programs appear to be effective, especially in comparison with no intervention or minimal-contact interventions and have the capacity to enhance the effectiveness of in-person programs. Personal tailoring of programs may also enhance the effectiveness of self-directed weight loss interventions.

## Discussion

### Findings

To our knowledge, this is the first systematic review of reviews to examine the effectiveness of self-directed weight loss interventions. Twenty reviews including 99 primary evaluations met our inclusion criteria. Only 7 of 20 reviews were high quality according to criteria specified by OQAQ but given the paucity of available evidence, we summarized evidence from all 20 reviews. The reviews identify a variety of potentially effective, self-directed weight loss interventions delivered by means of the Internet, mobile electronic devices, print media, and combinations of these delivery formats.

Three reviews focusing on Internet-based interventions and one focusing on eHealth interventions conducted meta-analyses to determine which intervention type, duration, and intensity were the most effective. Of these 4 meta-analytic reviews, the strongest evidence comes from Wieland et al (2012), where all studies met our inclusion criteria [20]. For example, a meta-analysis of 5 trials demonstrated that self-delivered interactive computer-based programs were more effective than minimal interventions (eg, printed newsletters) or no treatment, for short-term weight loss and weight maintenance. This finding corresponds to that reported by Neve et al (2010) [32]. However, most trials included in these reviews did not examine weight outcomes beyond 1-year follow-up, so the impact of computer or Internet-based interventions on long-term weight loss is unclear.

Our first research question concerned the effectiveness of self-directed weight loss interventions. Reed et al (2011) and Wieland et al (2012) suggest that computer or Internet-based interventions are less effective than in-person treatment, but further trials are needed to clarify whether the greater weight loss observed following in-person treatments is replicable, clinically significant, and cost effective [26,20]. Reed et al (2011) concluded that computer-based interventions delivered in conjunction with standard treatment enhance weight loss compared to standard treatment delivered alone. However, this meta-analysis included just 6 trials and the magnitude of weight lost advantage was small (<1.5 kg).

 Overall, weight loss (kg) across all relevant studies reported in 7 reviews ranges from 0.8-7.8kg. Caution is advised in the interpretation of these figures as wide variations were found in intervention content and delivery. For example, most reviews did not report intervention intensity and frequency and of those that did, this varied from 1 week to 1 year. Five Internet-based studies within 2 reviews achieved a percentage weight loss of 5% [12,32], which has been used as a benchmark associated to health benefits [80,81]. However, most reviews did not report whether interventions achieve 5% weight loss. Therefore, it is unclear how many interventions achieved clinically significant weight loss.

Enhanced Web-based intervention involving self-monitoring activities and email feedback appear to be more effective than information-provision alone, but this conclusion was supported by only one meta-analysis including only 3 primary studies including 375 participants [32]. Currently no meta-analyses have been conducted examining text message, home-based print, and multicomponent delivery formats. Two primary studies reviewed by Cole-Lewis et al (2010) present promising findings in relation to short-term weight loss following text messaging interventions [33]. Narrative reviews of home-based print and multicomponent delivery formats are inconclusive, in part because of the heterogeneity of content found across these interventions.

Our second research aim was to investigate whether effectiveness is enhanced by inclusion of particular behavior change techniques. We found that underlying components within self-directed interventions that contribute to weight loss success were largely unexplored at both study and review level. No meta-analyses were available assessing associations between included techniques and weight loss. Reviewing single trials, Wieland et al (2012) observed that Internet-based interventions including individualized feedback or email counseling had been found to be more effective than Internet-based interventions that did not employ these techniques [20]. Conversely, interventions including non-directive email, group chat, and online self-monitoring had been found to be less effective than Internet-based interventions that did not employ these techniques.

Narrative reviews described the content of effective interventions and found that these tended to employ self-monitoring, feedback, and goal setting. However, these reviews did not examine whether such techniques were associated with enhanced weight loss or weight maintenance. No review presented evidence on dose-response data for included change techniques, so it remains unclear whether mere inclusion or frequency of technique use is important to efficacy.

Our third research aim was to investigate whether effectiveness is enhanced by using particular delivery formats. We found that definitive conclusions could not be drawn regarding the most effective delivery format for self-directed weight loss interventions. This may depend on target audience. A greater number of primary studies of Internet-based interventions are available, and these are found to be more effective than minimal interventions (such as provision of leaflets). Trials of other delivery formats, such as eHealth interventions and text messaging, suggest that such interventions can be effective. The advantages of all such interventions include personal tailoring of information, 24-hour availability, anonymity, online social support, and affordability. These characteristics imply that, when effective, such interventions are likely to be cost-effective. Unfortunately, many available evaluation studies are pilot or efficacy trials, rather than definitive trials, and few cost-effectiveness studies have been undertaken. Further evaluation studies using large samples with long-term weight loss follow up and cost-effectiveness analyses are needed.

### Strengths and Limitations

Our review identified a range of reviews including primary evaluation studies of self-directed interventions designed to reduce weight. Every effort was made to reduce bias in the search, selection of reviews, data extraction, and data analysis. This review provides an overview of what is currently known in this rapidly expanding research area.

Nonetheless, several challenges affecting our selection and interpretation of available evidence must be acknowledged. We relied on descriptions of interventions provided by reviewers, and these varied considerably in form and detail. Reviews also varied in their methods and in the quality of the review methodology employed with only 7 of 20 scoring highly on the OQAQ. In addition, the literature may well contain more primary evaluation studies that would meet our inclusion criteria than the 99 included in these 20 reviews. Furthermore, we found no reviews that used meta-regression [16] to examine relationships between intervention content and weight loss effectiveness, so suggestions rather than conclusions emerged in relation to our second and third research questions concerning the association between inclusion of particular behavior change techniques and use of particular modes of delivery and weight loss.

### What Further Research is Needed?

#### *Comprehensive Review of Primary Evaluations*

A comprehensive review of primary evaluations of self-directed weight loss intervention evaluation studies is needed. Such a review would capture studies beyond the 99 primary evaluations included in our 20 reviews. Such a review should compare interventions using similar delivery formats, taking account of the potentially varying content of comparison groups and relate techniques and materials to effectiveness.

Such a review should use a quality assessment tool to assess review methods. Some reviews identified here used the Cochrane Collaboration Risk of Bias Tool. This comprises questions divided into seven areas: generation of the allocation sequence, concealment of the allocation sequence, blinding, attrition and exclusions, other generic sources of bias, biases specific to the trial design (crossover or cluster randomized trials), and biases. Only one review used the Effective Public Health Practice Project Tool, designed for use in public health and including questions concerning eight specific areas: selection bias, study design, confounders, blinding, data collection methods, withdrawals and dropouts, intervention integrity, and analyses. Both tools are useful. The latter may be more appropriate when reviewing large scale population intervention evaluation studies.

#### Further Meta-Analyses Focusing on Intervention Components

As part of a comprehensive review of primary evaluation studies of self-directed weight loss interventions, meta-analyses focusing on high-quality evaluation studies could be used to identify common intervention components in studies segmented by delivery format. This would generate quantitative answers to questions such as “What content works best for website-based weight loss interventions?” and “What content works best for weight loss mobile phone applications?” [82]. This would extend the work of the 4 meta-analyses identified in our review [20,26,31,32] and provide clear answers to the second and third research questions we addressed. In addition, meta-regression, controlling for co-occurrence of change techniques across interventions, could clarify whether theory-based combinations of techniques enhance weight loss effectiveness [16]. Finally such a review should consider the varying content of comparison conditions (such as usual care or alternative interventions), as such control content has demonstrable effects on the observed efficacy of interventions [83,84].

#### *Further High-Quality Primary Evaluations Comparing Different Modes of Delivery*

Further high-quality primary evaluations that compare different modes of delivery for the same (or very similar) interventions within particular populations are needed. Such studies should be reported in accordance with CONSORT guidelines [85] and include lists and specification of behavior change techniques included in the intervention content design. Results could recommend whether particular approaches such as Internet site, text messages, or mixed methods home delivery are most likely to be effective. Such studies should clearly specify the nature of comparison groups, specifying what constitutes control conditions.

#### *Further High-Quality Primary Evaluations Using Objective Measures of Weight Loss at Longer-Term Follow-Up*

Further high-quality primary evaluations that use objective measures of weight loss should be used at longer-term follow-up to assess maintenance of weight loss. These should follow the recommendations above and include multiple weight assessments lasting over 1 or, ideally 2 or more years. Such evaluations, conducted to scale, could provide population effectiveness data rather than the efficacy data on initiation of weight loss provided by most current intervention evaluation studies.

### Conclusion

A systematic search identified 20 reviews including 99 primary evaluations of self-directed interventions designed to reduce weight. The evidence reviewed suggests that self-directed interventions can independently promote weight loss and can augment interventions involving personal contact. Some reviews identified techniques and delivery formats used in effective interventions, such as self-monitoring, feedback, self-efficacy enhancement, and social and peer support. However, it was not possible to infer which techniques or delivery modes are most strongly associated with increased weight loss for whom and in what contexts. Further primary evaluations of self-delivered weight loss interventions that clearly specify the behavior change techniques and materials employed are needed, especially with long-term follow-up. Further meta-analytic reviews focusing on weight loss intervention content and efficacy within delivery mode could provide better guidance for intervention designers and commissioners.

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### Conflicts of Interest

None declared.

### Abbreviations

BMI: body mass index

OQAQ: Overview Quality Assessment Questionnaire

RCT: randomized controlled trial

TTM: transtheoretical model

References

1. Allender S, Peto V, Scarborough P, Boxer A, Rayner M. Coronary Heart Disease Statistics: British Heart Foundation: London, 2006.

2. Whitlock G, Lewington S, Sherliker P, Clarke R, Emberson, J, Halsey, J, et al. Body-mass-index and cause-specific mortality in 900000 adults:collaborative analyses of 57 prospective studies. The Lancet 2009 Mar;373:1083-1096. [doi:10.1016/S0140-6736(09)60318-4]

3. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults 1999-2008*.* JAMA 2010 Jan;303(3):235-241. PMID: 20071471

4. Christensen R, Kristensen PK, Bartels EM, Bliddal H, Astrup A. Efficacy and safety of the weight-loss drug rimonabant:a meta-analysis of randomized trials. The Lancet 2007 Nov 17;370:1706-1713. PMID: 18022033

5. Hills JO, Peters JC. Environmental contributions to the obesity epidemic*.* Science 1998 May 29;280:1371-1374. PMID: 9603719

6. Jeffery RW, Wing RR, Sherwood NE, Tate DF. Physical activity and weight loss: does prescribing higher physical activity goals improve outcome? Am J Clin Nutr 2003 Apr 14;78:684-689. PMID: 14522725

7. Lench HC, Flores SA, Bench SW. Discrete emotions predict changes in cognition, judgement, experience, behavior, and physiology:A meta-analysis of experimental emotion elicitations*.* Psychological Bulletin 2011 Sep;137(5):834-855. PMID: 21766999

8. Kessler, D. The End of Overeating: Taking Control of the Insatiable American Appetite: Rodale Books. NY; 2009. ISBN-10: 014104781X

9. National Institute for Health and Clinical Excellence (2006). NICE clinical guidelines, No. 43. Obesity: The prevention, identification, assessment and management of overweight and obesity in adults and children. National Institute for Health and Clinical Excellence, London 2006. PMID: 22497033

10. Muñoz RF, Mendelson T. Toward evidence-based interventions for diverse populations:The San Francisco General Hospital prevention and treatment manuals*.* Journal of Consulting and Clinical Psychology 2005 Oct;73(5):790-799. PMID: 16287379

11. Greaves CJ, Sheppard KE, Abraham C, Hardeman W, Roden M, Evans PH, Schwarz P. Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions*.* BMC Public Health 2011 Feb 18;11:119. PMID: 21333011

12. Arem H, Irwin M. A review of web-based weight loss interventions in adults. Obesity Reviews 2011 May;12(5):236-243. PMID: 20804523

13. Eysenbach G. The law of attrition. Journal of Medical Internet Research, 2005 Mar 31;**7**(1):e11. PMID: 15829473

14. Free C, Knight R, Robertson S, Whittaker R, Edwards P, Zho W, et al. Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomized trial. Lancet 2011 Jul 2; 378(9785):49-55. PMID: 21722952

15. Muñoz RF, Lenert LL, Delucchi K, Stoddard J, Perez JE, Penilla C, et al. Toward evidence-based Internet interventions: a Spanish/English web site for international smoking cessation trials. Nicotine and Tobacco Research 2006 Feb;8(1):77-87. PMID: 16497602

16. Michie S, Abraham C, Whittington C, McAteer J, Gupta S. Effective techniques in healthy eating and physical activity interventions:A meta-regression. Health Psychology 2009 Nov;28(6):690-701. PMID: 19916637

17. Abraham C, Michie, S. A taxonomy of behavior change techniques used in interventions. Health Psychology 2008 May;27(3):379-387. PMID: 18624603

18. Abraham C. Mapping change mechanisms and behavior change techniques: A systematic approach to promoting behavior change through text. In: C. Abraham, & M. Kools (eds).Writing Health Communication: An Evidence-Based Guide. London: SAGE Publications Ltd; 2012, pp 99-115. ISBN:978-1-84787-185-5

19. Davidson KW, Goldstein M, Kaplan RM, Kaufmann PG, Knatterud GL, Orleans CT, et al. Evidence-based behavioral medicine: What is it and how do we achieve it?Annals of Behavioral Medicine 2003 Dec;26(3):161-171. PMID: 14644692

20. Wieland LS, Falzon L, Sciamanna CN, Trudeau KJ, Brodney S, Schwartz JE Davidson KW.Interactive computer-based interventions for weight loss or weight maintanance in overweight or obese people*.* Cochrane Database of Systematic Reviews 2012 Aug 15;8. PMID: 22895964

21. Kohl LF, Crutzen R, de Vries NK. Online prevention aimed at behaviors: a systematic review of reviews. J Med Internet Res 2013 Jul 16;15(7):e146. PMID: 23859884

22. Davies CA, Spence JC, Vandelanotte C, Caperchione CM, Mummery WK. Meta-analysis of internet-delivered interventions to increase physical activity levels. Int J Behav Nutr Phys Act 2012 April 30;9:52. PMID: 22546283

23. Oxman AD, Guyatt GH. Validation of an index of the quality of review articles. J Clin Epidemiol 1991;44(11):1271-1278. PMID: 1834807

24. Enwald HP, Huotari ML. Preventing the obesity epidemic by second generation tailored health communication: an interdisciplinary review*.* J Med Internet Res 2010 Jun 28;12(2):e24. PMID: 20584698

25. Keller C, Records K, Ainsworth B, Permana P, Coonrod DV. Interventions for weight management in postpartum women. Journal of Obstetric, Gynecologic and Neonatal Nursing 2008 Jan-Feb;37(1):71-79. PMID: 18226159

26. Reed VA, Schifferdecker KE, Rezaee ME, O'Connor S, Larson RJ. The effect of computers for weight loss: a systematic review and meta-analysis of randomized trials. Journal of General Internal Medicine 2011 Jan;27(1):99-108. PMID: 21805218

27. Lemmens VEPP, Oenema A, Klepp KI, Henriksen HB, Brug J. A systematic review of the evidence regarding efficacy of obesity prevention interventions among adults. Obesity Reviews 2008 Sep;9(5):446-455. PMID: 18298429

28. Saperstein SL, Atkinson NL, Gold RS. The impact of Internet use for weight loss. Obesity Reviews 2007 Sep;8(5):459-465. PMID: 17716303

29. Kroeze W, Werkman A, Brug J. A systematic review of randomized trials on the effectiveness of computer-tailored education on physical activity and dietary behaviors*.* Ann Behav Med 2006 Jun;31(3):205-223. PMID: 16700634

30. Weinstein PK. A review of weight loss programs delivered via the Internet. Journal of Cardiovascular Nursing 2006 Jul-Aug;21(4):251-260. PMID: 16823276

31. Harris J, Felix L, Miners A, Murray E, Michie S, Ferguson E, *et al*. Adaptive e-learning to improve dietary behavior: A systematic review and cost-effectiveness analysis. Health Technol Assess 2011 Oct;15(37):1-160. PMID: 22030014

32. Neve M, Morgan PJ, Jones PR, Collins CE. Effectiveness of web-based interventions in achieving weight loss and weight loss maintenance in overweight and obese adults: A systematic review with meta-analysis. Obesity Reviews 2010 Apr;11(4):306-321. PMID: 19754633

33. Cole-lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management*.* Epidemiol Rev 2010 Apr;32(1):56-69. PMID: 20354039

34. Gordon J, Watson M, Avenell A. Lightening the load? A systematic review of community pharmacy-based weight management interventions*.* Obesity Reviews 2011 Nov;12(11):897-911. PMID: 21883869

35. Hemmingsson E, Page A, Fox K, Rossner S. Influencing adherence to physical activity behavior change in obese adults. Scandinavian Journal of Nutrition 2001;45:114-119.

36. Lombard CB, Deeks AA, Teede HJ. A systematic review of interventions aimed at the prevention of weight gain in adults. Public Health Nutrition 2009 Nov;12(11):2236-2246. PMID: 19650959

37. Loveman E, Frampton GK, Shepherd J, Picot J, Cooper K, Bryant J, Clegg A. The clinical effectiveness and costeffectiveness of long-term weight management schemes for adults:A systematic review. Health Technology Assessment 2011 Jan;15(2):1-182. PMID: 21247515

38. Manzoni GM, Pagnini F, Corti S, Molinari E, Castelnuovo G. Internet-based behavioral interventions for obesity:an updated systematic review*.* Clinical Practice & Epidemiology in Mental Health 2011 Mar 4;**7**:19-28. PMID: 21552423

39. Norman GJ, Zabinski MF, Adams MA, Rosenberg DE, Yaroch AL, Atienza AA. A review of e-health interventions for physical activity and dietary behavior change*.* Am J Prev Med 2007;33(4):336-345. [doi:10.1016/j.amepre.2007.05.007]

40. Tuah NA, Amiel C, Qureshi S, Car J, Kaur B, Majeed A. Transtheoretical model for dietary and physical exercise modification in weight loss management for overweight and obese adults. Cochrane Database of Systematic Reviews 2011 Oct 5;10. PMID: 21975777

41. Turk MW, Yang K, Hravnak M, Sereika SM, Ewing LJ, Burke LE. Randomized clinical trials of weight loss maintenance: a review. Journal of Cardiovascular Nursing 2009 Jan-Feb;24(1):58-80. PMID: 19114803

42. Harvey-Berino J, Pintauro S, Buzzell P, Gold EC. Effect of Internet support on the long-term maintenance of weight loss*.* Obes Res 2004 Feb;12(2):320-329. PMID: 14981225

43. Harvey-Berino J, Pintauro SJ, Gold EC. The feasibility of using Internet support for the maintenance of weight loss. Behav Modif 2002 Jan;26(1):103-116. PMID: 11799651

44. Harvey-Berino J, Pintauro S, Buzzell P, DiGiulio M, Casey-Gold B. Moldovan C, Ramirez E. Does using the internet facilitate the maintenance of weight loss? Int J Obes Relat Metab Disord 2002 Sep;26(9):1254–1260. PMID: 12187404

45. Wing RR, Tate DF, Gorin AA, Raynor HA, Fava JL. A self-regulation program for maintenance of weight loss. N Engl J Med 2006 Oct 12;355(15):1563-1571. PMID: 17035649

46. Tate DF, Wing RR, Winett RA. Using internet technology to deliver a behavioral weight loss program. JAMA 2001 Mar 7;285(9):1172–1177. PMID: 11231746

47. Tate DF, Jackvony EH, Wing RR. Effects of Internet behavioral counseling on weight loss in adults at risk for type 2 diabetes: a randomized trial. JAMA 2003 Apr 9;289(14):1833-1836. PMID: 12684363

48. Tate DF, Jackvony EH, Wing RR. A randomized trial comparing human e-Mail counseling, computer-automated tailored counseling and no counseling in an Internet weight loss program. Arch Intern Med 2006 Aug 14-28;166(15):1620–1625. PMID: 16908795

49. Cussler EC, Teixeira PJ, Going SB, Houtkooper LB, Metcalfe LL, Blew RM, et al. Maintenance of weight loss in overweight women through the internet. Obesity 2008 May;16(5):1052–1060. PMID: 18309301

50. Svetkey LP, Stevens VJ, Brantley PJ, Appel LJ, Hollis JF, Loria CM, et al. Comparison of strategies for sustaining weight loss: the weight loss maintenance randomized controlled trial. JAMA 2008 Mar 12;299(10):1139–1148. PMID: 18334689

51. Bennett GG, Herring SJ, Puleo E, Stein EK, Emmons KM, Gillman MW. Web-based weight loss in primary care: a randomized controlled trial. Obesity 2010 Feb;18(2):308–313. PMID: 19696764

52. Booth AO, Nowson CA, Matters H. Evaluation of an interactive Internet-based weight loss program: a pilot study. Health Educ Res 2008 Jun;23(3):371-381. PMID: 18349032

53. McConnon A, Kirk SF, Cockroft JE, Harvey EL, Greenwood DC, Thomas JD, et al. The internet for weight control in an obese sample: results of a randomized controlled trial. Health Serv Res 2007 Dec;**7**:206. PMID: 18093289

54. Agras WS, Taylor CB, Feldman DE, Losch M, Burnett KF, et al. Developing computer-assisted therapy for the treatment of obesity. Behavior Therapy Win 1990;21(1):99–109. [doi: 10.1016/S0005-7894(05)80191-1]

55. DeLucia JL, Kalodner CR, Horan JJ. The effect of two nutritional software programs used as adjuncts to the behavioral treatment of obesity. J Subst Abuse 1988;1(2):203–208. PMID: 2980870

56. Morgan PJ. Lubans DR, Collins, CE, Warren JM, Lubans DR. The SHED-IT randomized controlled trial: evaluation of an internet-based weight-loss program for men. Obesity 2009 Nov;17(11):2025–2032. PMID: 19343018

57. Polzien KM, Jakicic JM, Tate DF, Otto AD. The efficacy of a technology-based system in a short-term behavioral weight loss intervention. Obesity 2007 Apr;15(4):825–830. PMID: 17426316

58. Wylie-Rosett J, Swencionis C, Ginsberg M, Cimino C, Wassertheil-Smoller S, Caban, A, et al. Computerized weight loss intervention optimizes staff time: The clinical and cost results of a controlled clinical trial conducted in a managed care setting. J Am Diet Assoc 2001 Oct;101(10):1155–1162. PMID: 11678486

59. Shay LE, Seibert D, Watts D, Sbrocco T, Pagliara, C, et al. Adherence and weight loss outcomes associated with food-exercise diary preference in a military

weight management program. Eat Behav 2009 Dec;10(4):220–227. PMID: 19778751

60. Jones KS, Burkett LN. A comparison of instructional methods for weight loss in women. Health Promot Pract 2002 Oct;3:501–506. [doi: 10.1177/152483902236720]

61. Van Wier MF, AriÎns GA, Dekkers JC, Hendriksen IJ, Smid T,Van Mechelen W. Phone and e-mail counselling are effective for weight management in an overweight working population: a randomized controlled trial. BMC Public Health 2009 Jan 9;9:6. PMID: 191134171

62. Womble LG, Wadden TA, McGuckin BG, Sargent SL, Rothman RA, Krauthamer-Ewing ES. A randomized controlled trial of a commercial internet weight loss program. Obes Res 2004 Jun;12(6):1011-1018. PMID: 15229342

63. Hunter CM, Peterson AL, Alvarez LM, Poston WC, Brundige AR, Haddock CK, et al. Weight management using the internet a randomized controlled trial. Am J Prev Med 2008 Feb;34(2):119–126. PMID: 18201641

64. Rothert K, Strecher VJ, Doyle LA, Caplan WM, Joyce JS, Jimison HB, et al. Web-based weight management programs in an integrated health care setting: a randomized, controlled trial. Obesity 2006 Feb;14(2):266–227. PMID: 16571852

65. Morgan PJ, Collins CE, Plotnikoff RC, Cook AT, Berthon B, Mitchell S, et al. Efficacy of a workplace-based weight loss program for overweight male shift workers: the Workplace POWER (Preventing ObesityWithout Eating like a Rabbit) randomized controlled trial. Preventive Medicine 2011 May;52(5):317–25. PMID: 21300083

66. Schroder KE. Computer-assisted dieting: effects of a randomized controlled intervention. Psychology and Health 2010 June;25(5):519–534. PMID: 20204974

67. Threlfall WE. Computer-assisted bibliotherapy for weight control. Dissertation Abstracts International 1984;45(6-A):1697–1698. [doi:oclc/83267895]

68. Foster GD, Makris AP, Bailer BA. Behavioral treatment of obesity. American Journal of Clinical Nutrition 2005 Jul;82:230–235. PMID: 16002827

69. Cook RF, Billings DW, Hersch RK, Back AS, Hendrickson A. A field test of a web-based workplace health promotion program to improve dietary practices, reduce stress, and increase physical activity: randomized controlled trial. J Med Internet Res 2007 Jun 19;9(2):e17. PMID: 17581811

70. Sternfeld B, Block C, Quesenberry CP, Block TJ, Husson G, Norris JC, et al. Improving diet and physical activity with ALIVE: a worksite randomized trial. Am J Prev Med 2009 Jun;36(6):475–83. PMID: 19460655

71. Turnin MC, Bourgeois O, Cathelineau G, Leguerrier AM, Halimi S, Sandre-banon D, et al. Multicenter randomized evaluation of a nutritional education software in obese patients.Diabetes Metab 2001 Apr;27:139–47. PMID: 11353880

72. Perri MG, Martin AD, Leermakers EA, Notelovitz M.Effects of group versus home-based exercise in the treatment of obesity. J Consult Clin Psychol, 1997 Apr;65(2):278-285. PMID: 9086691

73. Leermakers EA, Anglin K, Wing RR. Reducing postpartum weight retention through a correspondence intervention. International Journal of Obesity and Related Metabolic Disorders 1998 Nov;22(11):1103-1109. PMID: 9822949

74. Lombard C, Deeks A, Jolley D, Ball K, Teede H. A low intensity lifestyle intervention prevents weight gain in adult women: a randomized controlled community based intervention. Int J Obes 2008 Jul 13;32:1. PMID: 20627974

75. Ahrens RA, Hower M, Best AM. Effects of weight reduction interventions by community pharmacists*.* J Am Pharm Assoc 2003 Sep-Oct;43(5):583–589. PMID: 14226750

76. Haapala I, Barengo NC, Biggs S, Surakka L, Manninen P. Weight loss by mobile phone: a 1-year effectiveness study. Public Health Nutr 2009 Dec;12(12):2382–2391. PMID: 19323865

77. Anderson ES, Winett RA, Wojcik JR, Winett SG, Bowden TA. Computerized social cognitive intervention for nutrition behavior: direct and mediated effects on fat, fiber, fruits, and vegetables, self-efficacy, and outcome expectations among food shoppers. Ann Behav Med 2001;23(2):88–100. PMID: 11394559

78. Gabriele JM, Carpenter BD, Tate DF, Fisher EB. Directive and nondirective e-coach support for weight loss in overweight adults. Annals of Behavioral Medicine 2011 Apr;41(2):252–63. PMID: 21108032

79. Webber KH, Tate DF, Michael Bowling J. A randomized comparison of two motivationally enhanced Internet behavioral weight loss programs. Behavior Research and Therapy 2008 Sep;46(9):1090–1095. PMID: 18675402

80. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM,Walker EA, Nathan DM. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med2002 Feb;346(6):251–260. PMID: 11832527

81. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hämäläinen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001 May;344(18):1343-1350. PMID: 1133399080.

82. Albarracín D, Gillete JC, Earl AN, Glasman LR, Durantini MR, Ho MH. A test of major assumptions about behavior change: A comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. Psychological Bulletin 2005 Nov;131(6):856-897. PMID: 16351327

83. de Bruin M, Viechtbauer W, Schaalma HP, Kok G, Abraham C, Hospers HJ. Standard care impact on effects of highly active antiretroviral therapy adherence interventions: A meta-analysis of randomized controlled trials. Archives of Internal Medicine 2010 Feb 8;170(3):240-250. PMID: 20142568

84. Abraham C, Graham-Rowe E. Are worksite interventions effective in increasing physical activity? A systematic review and meta-analysis. Health Psychology Review 2009;3:108-144. [doi:10.1080/17437190903151096]

85. Boutron I, Moher D, Altman DG, Schulz KF, Ravaud P. Extending the CONSORT statement to randomized trials of nonpharmacologic treatment: explanation and elaboration. Ann Int Med 2008 Feb 19;148(4):295-309. PMID: 18283207

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| **Multimedia Appendix 1**Selection of the final 20 reviews applying inclusion criteria |
| Author(s) | Date | Review Superseded | SystematicReview | Included interventions assessed Weight related outcome | Included interventions were self-directed | Reviewed interventions including interactive and self-regulatory components |
| ***1. Arem, H & Irwin, M*** | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes***  | ***Yes*** |
| 2. Berkel, L. A & Carlos-Poston, W. S | 2005 | No | No | Yes | Yes | Yes |
| ***3. Cole-Lewis, H & Kershaw, T***  | ***2010*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***4. Enwald, H. P & Huotari, M. L*** | ***2010*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 5. Galani, C & Schneider, H | 2007 | No | Yes | Yes | No | No |
| 6. Garaulet, M & Perez de Heredia, F | 2009 | No | No | Yes | Yes | Yes |
| ***7. Gordon, J & Watson, M*** | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***8. Harris, J & Felix, L*** | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***9. Hemmingsson, E & Page, A*** | ***2001*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 10. Holt, J & Warren, L  | 2006 | No | No | Yes | No | Yes |
| ***11. Keller, C & Records, K*** | ***2008*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***12. Kroeze, W & Wekman, A*** | ***2006*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***13. Lemmens, V. E & Oenema, A*** | ***2008*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***14. Lombard, C. B & Deeks, A. A*** | ***2009*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***15. Loveman, E & Frampton, G. K***  | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***16. Manzoni, G. M & Pagnini, F*** | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 17. Maon, S & Edirippulige, S | 2012 | No | Yes | No | Yes | No |
| 18. Miller, Y. D & Dunstan, D. W | 2004 | No | Yes | Yes | No | No |
| ***19. Neve & Morgan*** | ***2010*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 20. Norris, S. L & Zhang, X | 2005 | No | Yes | No | No | No |
| ***21. Norman, G. J & Zabinski, M. F***  | ***2007*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 22. Perry, K. J & Hickson, M | 2011 | No | Yes | Yes | No | Yes |
| ***23. Reed, V. A & Schifferdecker, K. E***  | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***24. Saperstein, S. L & Atkinson, N. L*** | ***2007*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 25. Shaw, K. A & Gennat, H. C | 2006 | No | Yes | Yes | No  | No |
| 26. Shaw, K. A & O’Rourke, P | 2005 | No  | Yes | Yes | No | Yes |
| ***27. Tuah, N. A & Amiel, C*** | ***2011*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***28. Turk, M. W & Yang, K*** | ***2009*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 29. Volpe, S. L | 2006 | No | Yes | No | No | No |
| ***30. Weinstein, P. K*** | ***2006*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| ***31. Wieland, L. S*** | ***2012*** | ***No*** | ***Yes*** | ***Yes*** | ***Yes*** | ***Yes*** |
| 32. Winett, R. A & Tate, D. F | 2005 | No  | No | Yes | Yes | Yes |

Note. Selected reviews that meet inclusion criteria are highlighted in **Bold**.

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| **Multimedia Appendix 2.** Review Characteristics |
| **First Author, Year** | **Type of review, intervention mode, search period & OQAQ score** |  **Aim** | **Selection criteria** | **No of interventions, participants & sample type** | **Key outcomes** | **Reported intervention content and interactive components**  | **Results and conclusions** |
| Arem (2011) | DescriptiveInternet-based2001 to Jan 2009OQAQ=10 | To examine the strengths and weaknesses of internet-based interventions  | Inclusion: RCT; overweight or obese adults; weight loss or maintenance; web-based interventions  | Interventions = 9N= 4282Sample = community; 79% female; predominately white | Weight loss and maintenance | Online tailoring; personalized emails on progress; self-monitoring diaries; individual feedback; structured weight loss lessons | 8/9 relevant studies. No statistical pooling. High attrition rate. Effectiveness of internet interventions remains unclear |
| Cole-Lewis (2011) | DescriptiveText messaging (mobile phones)May and June 2009OQAQ=14 | To investigate the effectiveness of text messaging for disease prevention and management  | Inclusion: Randomized or quasi-experimental controlled trials; text messaging for disease prevention or management; measures in health behavior, health outcomes, and/or clinical outcomes using pre post-tests; peer reviewed | Interventions = 12N= 2365Sample = predominately community; in 3 studies, women were greatly over-represented | Weight change. Most studies targeted other health behaviors | Text messaging; automated messaging; tailored messages | 2/12 relevant studies. Weight loss of 2.9 and 4.5kg. Text messaging effective in weight loss and diabetes management  |
| Enwald (2010) | DescriptiveE-healthNot restricted by publication dateOQAQ=12 | Evaluation of second generation interventions to prevent obesity and its associated problems | Inclusion: RCT or Quasi-experimental; second generation technology; health behavior associated to nutrition; weight management and physical activity assessed using physiological or behavioral outcomes | Interventions = 23N= 12417Sample = unclear; gender NS; predominately white | Weight change | Personalized feedback as the tailoring mechanism used in most studies | 5/23 relevant studies. Only two studies reporting weight loss of 4.1 and 5.3kg. Nutrition interventions more effective than PA promotion programs. Tailoring more effective in nutrition interventions than physical activity and weight management  |
| Gordon (2011) | DescriptiveCommunity pharmacy-based Jan 1999 to June 2009OQAQ=10 | To assess the cost-effectiveness and effectiveness of community pharmacy weight management interventions | Inclusion: Community pharmacy setting; weight management as primary focus | Interventions = 10N= 2583Sample = service users | Weight change | Self-monitoring and goal setting; questionnaires; diaries; information sheets | 2/10 relevant studies. Did not synthesize quantitative data. Weight loss in one study at 3 and 6 months. Effectiveness remains unclear |
| Harris (2011) | Meta-analysisE-healthJan 1990 to Nov 2009OQAQ=17  | To assess the effectiveness and cost-effectiveness of e-health interventions for dietary behavior change and to determine the effective components and mechanisms  | Inclusion: RCT; adolescents and adults; interactive and tailored software; dietary behaviors and clinical outcomes  | Interventions = 43N= Not statedSample = unclear;  | Dietary behavior and clinical outcomes | Tailored software with goal setting and feedback components; personalized emails; self-monitoring diaries; personal digital assistant and automated telephone service; computer; CD-ROM; kiosks; minitel | 22/43 relevant studies. Effectiveness and cost-effectiveness of e-health interventions inconclusive |
| Hemmingsson (2001) | DescriptiveInternet-based1966 to 2001 OQAQ=8 | A summary of physical activity behavior change adherence influences | Inclusion: Overweight and obese adults; contain PA behavior change adherence information  | Interventions = 7N= 651Sample = unclear | Physical activity levels and weight/fat loss | Insufficient description of intervention content; peer support; telephone social support and logins described in two relevant studies | 2/7 relevant studies. Did not synthesize quantitative data. Various factors influencing PA behavior change. Evidence not conclusive and warrants further research |
| Keller (2008) | DescriptiveHome/gym based exercises for postpartum womenMay 2007OQAQ=9 | A description of intervention studies for guiding weight management interventions | Inclusion: Weight loss or body composition outcome; PA interventions; postpartum women; RCT  | Interventions = 6N= 298Sample = community; 100% female; predominately white  | Weight and fat loss  | Food and activity diaries for self-monitoring and goal setting; Harris-benedict equation; target heart rate percentage; motivational interviewing; informational brochure; written lessons; telephone contact | 3/6 relevant studies. Weight loss range of 1.6 to 7.8kg. Significant changes in body composition in women found in relevant studies. No significant changes in weight loss. Effectiveness remain unclear |
| Kroeze (2006) | DescriptiveComputer-based1965 to Sep 2004OQAQ=12 | A review of the efficacy of nutrition education and expert-driven computer-tailored physical activity interventions | Inclusion: Computer tailored interventions targeting PA or diet; RCT with pre and post-test; adults; studies in English; delivered in a “nonpersonal” way without person-to-person counselling  | Interventions = 31N= 84-1,317Sample = unclear | Change in health behavior (PA and diet) and weight loss | Tailored and interactive feedback;computer-tailored letters; pamphlets; brochures; multimedia (text and video); computer-tailored print materials | 2/31 relevant studies. Did not synthesize quantitative data. Evidence for computer-tailored interventions is strong. However, small effect size in most studies. Follow up periods only up to 6 months |
| Lemmens (2008) | DescriptiveHome-based; group; face to face; written materials and emails 1998 to 2008OQAQ=9 | To examine the efficacy of obesity prevention interventions and to identify the effective components for intervention development | Inclusion: Dietary intake; PA or both; overweight individuals; RCT; non-RCT or interrupted time series designs; minimum 3 months follow up | Interventions = 9N= not statedSample = community; predominately white; 20-79 years old | BMI and weight loss | Emailed exercise and dietary programmes; self-monitoring | 3/9 relevant studies. Only one study targeting diet and PA demonstrated significant weight loss of 1.6kg. Inconclusive findings for the effectiveness of home-based interventions  |
| Lombard (2009) | DescriptiveIncludes a range of delivery including face to face; groups; mail; newsletters and phone1998 to 2008 OQAQ=10 | To summarize weight gain prevention interventions to identify the key elements contributing to intervention success  | Inclusion: Adults; weight gain prevention; comparison group; duration of 3 months or over; follow-up < 3 months; family studies targeting adults | Interventions = 8N= 2282Sample = unclear | Weight loss | Self-monitoring; tailored advice; social support; problem solving; goal setting; stress and time management; relapse prevention; self-weighing; cognitive and behavior change strategies; personalized contact; newsletters; email and phone contact; incentives; booklet; pedometer | 7/9 relevant studies. Small differences in weight lost between treatment groups. Weight loss range of 1 to 1.9 kg. Five studies reported significant weight loss. Few trials on weight gain prevention.Low intensity multicomponent interventions identified as most effective |
| Loveman (2011) | DescriptiveMulticomponentNo restrictions (from inception to 2009)OQAQ=18 | To evaluate the long-term cost and clinical effectiveness of multicomponent weight management interventions for weight loss and maintenance  | Inclusion: RCT; adults (≥ 18 years); overweight or obese; structured multicomponent weight management programmes; diet, PA or both; lifestyle behavior change strategy | Interventions = 12N= 59-1191Sample = predominately white females. However, some studies did not mention participant characteristics  | Weight loss | Self-monitoring; goal setting; individual based problem solving; incentives; stages of change; rewards; stress management; modelling; assertiveness training; cognitive behavioral strategies; relapse prevention model; pocket diaries; lotteries to encourage attendance; questionnaires | 10/12 relevant studies. Did not synthesize quantitative data. Weight lost in overweight and obese adults, but not clinically significant. Effectiveness remains unclear. No UK RCT studies in review |
| Manzoni (2011) | DescriptiveInternet-based18 studies from previous review (Neve et al. 2010) and 2008 to 2011 for own reviewOQAQ=13 | To examine the effectiveness of web-based interventions for weight loss and maintenance | Inclusion: RCT; publication in a peer reviewed journal; overweight or obese adults; internet-based; weight loss or maintenance outcomes | Interventions = 26N= 8324Sample = community; 77% female | Weight loss and maintenance | Individual e-mail feedback; self-monitoring of weight and diet; exercise diaries | 25/25 relevant studies. Heterogeneity found in most studies including duration of intervention, type of feedback, and social support tools. Findings inconclusive |
| Neve (2010) | Meta-analysisWeb-based1995 to 2010OQAQ=15 | To examine the effectiveness of internet-based interventions for weight loss and weight maintenance and to identify the underlying components influencing weight control | Inclusion: RCT with one web-based intervention study arm; targets weight loss or maintenance; dietary or PA behavior change; 18 years or over; overweight or obese  | Interventions = 20N= 5700Sample = 77% female (3.7% unclear) | Percentage change in body weight | Behavioral therapy; individually tailored web-based programme; email feedback; motivational interviewing; telephone follow-up; human email counselling | 18/18 relevant studies. Three of six studies reported 5% or greater weight lost. Heterogeneity between studies. Effectiveness remains unclear. Require studies providing detailed descriptions of intervention content for meta-analyses  |
| Norman (2007) | DescriptiveE-health technologyNo restrictions (from inception to 2007)OQAQ=13 | To provide a descriptive evaluation of interactive second generation e-health interventions to promote weight loss | Inclusion: RCT and quasi-experimental; published in scientific journal; PA; dietary behavior or a combination of both; baseline and follow-up measures; intervention feasibility or effectiveness; e-health | Interventions = 47N=PA = 28-655; diet = 72-1578; combination = 35-2121Sample = unclear but female participantsPA = 64-100%; diet = 70-100%; combination = 49-100%; predominately white females | Weight loss and BMI | Motivational tips; educational information; internet tailored newsletters; computerized assessment and feedback; electronic self-monitoring forms; diet analysis; chat room; bulletin board; therapist-led internet video sessions; online meetings and support; buddy program; animated fitness instructor; 24- hour help desk; e-mail reminders; goal setting; interactive multi-media (IMM); CD-ROM; interactive phone technology | 12/49 relevant studies. Did not synthesize quantitative data. Small to medium effect sizes reported across e-health studies. Findings inconclusive. Require further studies to understand underlying mechanisms promoting dietary and physical activity behavior change |
| Reed (2011) | Meta-analysis Internet-basedNo restriction date reportedOQAQ=17 | To investigate the influence of computer technology on weight loss interventions | Inclusion: RCT; computer-based education or support; non-computer-based comparison group; overweight or obese adults; weight or BMI outcomes | Interventions = 13N= 1866Sample = means age = 49; 67% female; predominately white | Weight loss and BMI  | Paper diary; booklet; workbook; group therapy; in-person sessions; paper-based and phone counselling | 7/11 relevant studies. Computer-based interventions effective in weight loss but only when used in addition to standard weight loss programs. Sustaining weight loss over time remains unclear  |
| Saperstein (2007) | DescriptiveInternet-basedNot reportedOQAQ=9 | To investigate the efficacy of the internet as a mode of delivery to facilitate weight loss.  | Inclusion: RCT; internet-based weight lost programs; overweight or obese adults | Interventions = 6N= NSSample = unclear | Weight and waist circumference | Online logins; food diaries; online programs targeting dietary and PA changes, through cognitive and behavior strategies; personalized feedback and support | 6/6 relevant studies. Did not synthesize quantitative data. Internet-based tools could be effective for weight loss. Particularly, structured, personalized programs that include cognitive behavioral strategies |
| Tuah (2011) | DescriptiveRange of methods incorporating the Transtheoretical Model and Stages of Change TTM SOCNo restriction (from inception to 2011)OQAQ=18 | To examine the effectiveness of PA and dietary programs that use the transtheoretical model (TTM) to facilitate weight loss | Inclusion: RCT; 18 years or over; overweight or obese; healthy adults; co-morbidities including diabetes, heart diseases and hypertension; use of TTM SOC model; tailored lifestyle modification strategies | Interventions = 5N= 3910Sample = age range from 25-75, predominately white | Weight loss | TTM SOC; self-monitoring; feedback; personalized assessment report quarterlytelephone; newsletters; manuals; pedometers; face to face counselling | 2/5 relevant studies. Interventions utilising TTM SOC induced small weight change, but weight lost unsustainable over time. Heterogeneity across outcomes and interventions with small to medium samples. TTM SOC ineffective for weight loss |
| Turk (2009) | DescriptiveClinical, therapy and self-delivered modality1984 to 2007OQAQ=11 | To summarize the findings of RCT interventions that assess strategies for maintenance of weight and the viability of these programs | Inclusion: RCT; weight maintenance; adult population; English language; true experimental design; randomly assigned at maintenance | Interventions = 40N= unclearSample = predominately white | Weight maintenance | Self-monitoring; self-weighing; chatroom; weekly weights online; 3-day food diaries; healthy diet educational materials; pedometers | 8/40 relevant studies. Mixed results. No difference in weight maintenance when compared to in-person interventions in two relevant studies |
| Weinstein (2006) | DescriptiveInternet-based1995 to 2006OQAQ=12 | To investigate the efficacy of weight loss programs delivered via the internet | Inclusion: RCT; publication in peer reviewed journal; overweight or obese adults; internet-based interventions; weight loss  | Interventions = 8N= 418Sample = age range from 30-62; 55% female; predominately white | Weight loss and maintenance | Weekly feedback; email; bulletin board support; email from therapist; e-counselling; food diaries; tailored health information and phone support | 8/8 relevant studies. No quantitative synthesis. Weight loss range of 0.8 to 2.2kg across 5 studies. Internet weight-loss effectiveness similar to standard weight loss programs |
| Wieland (2012) | Meta-analysisComputer-basedFrom inception to 2011OQAQ=18 | To examine the effectiveness of interactive computer-based interventions for weight loss or weight maintenance  | Inclusion: RCT and quasi-randomized trials; computer-based interventions; interactive programs; overweight or obese adults | Interventions = 18N = 4140Sample = predominately white | Weight loss and maintenance | Interactive;weekly online chats;weekly email feedback; electronic bulletin board; e-mailed individualized feedback; e-mail counselling; online self-monitoring; online education or online behaviortherapy; message boards | 18/18 relevant studies. Interactive computer-based interventions are more effective than minimal (usual care, pamphlets) or no interventions |