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# Smartphone Applications for Promoting Healthy Diet and Nutrition: A Literature Review

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## Abstract

**Background—**Rapid developments in technology have encouraged the use of smartphones in health promotion research and practice. Although many applications (apps) relating to diet and nutrition are available from major smartphone platforms, relatively few have been tested in research studies in order to determine their effectiveness in promoting health.

**Methods—**In this article, we summarize data on the use of smartphone applications for promoting healthy diet and nutrition based upon bibliographic searches in PubMed and CINAHL with relevant search terms pertaining to diet, nutrition, and weight loss through August 2015.

**Results—**A total of 193 articles were identified in the bibliographic searches. By screening abstracts or full-text articles, a total of three relevant qualitative studies and 9 randomized controlled trials were identified. In qualitative studies, participants preferred applications that were quick and easy to administer, and those that increase awareness of food intake and weight management. In randomized trials, the use of smartphone apps was associated with better dietary compliance for lower calorie, low fat, and high fiber foods, and higher physical activity levels ($p=0.01-0.02$) which resulted in more weight loss ($p=0.042-<0.0001$).

**Discussion—**Future studies should utilize randomized controlled trial research designs, larger sample sizes, and longer study periods to better establish the diet and nutrition intervention capabilities of smartphones. There is a need for culturally appropriate, tailored health messages to increase knowledge and awareness of health behaviors such as healthy eating. Smartphone apps

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are likely to be a useful and low-cost intervention for improving diet and nutrition and addressing obesity in the general population. Participants prefer applications that are quick and easy to administer and those that increase awareness of food intake and weight management.

### Keywords

Accuracy; Smartphone Applications; Cell Phones; Diet; Nutrition; Obesity; Randomized Controlled Trials; Weight Loss

## Introduction

In the U.S., approximately 35% of adults and 17% of youths are obese [1]. The increasing prevalence of obesity and its association with cardiovascular disease, several forms of cancer, diabetes, and other chronic illnesses have prompted interest in identifying effective ways to promote healthy eating and weight control. There has been increasing attention to use of cell phone text messaging and smartphone applications (apps) to promote healthy eating and support weight loss [2]. Smartphone platforms have lowered costs, reduce the burden to participants, and overcome some limitations of traditional in-person behavioral weight loss programs [2,3]. Established interventions for weight loss are resource-intensive, a factor that poses barriers for full participation and widespread dissemination. Smartphone apps provide a useful and low-cost way to disseminate information about proper diet and nutrition to the general population and to particular at-risk populations such as cancer survivors and people who are overweight or obese.

A variety of apps relating to diet, nutrition, and weight control are available from major smartphone platforms such as iPhone, Android, Nokia, and BlackBerry. Common techniques include providing feedback, goal-setting for healthy eating, healthy cooking, grocery or restaurant decision making, self-monitoring of energy and nutrient intake, weight tracking, and planning social support and change [4]. However, relatively few have been tested in order to determine their effectiveness in promoting health. In addition, few of these apps are based on theories of health behavior change, most do not include evidence-based features such as reinforcement, and evidence-based recommendations for diet and nutrition are rarely adhered to [5].

In this article, we review published studies on the acceptability and effectiveness of smartphone apps designed to promote proper diet and nutrition or to lose weight. Of particular interest were randomized control trials of the effectiveness of smartphone apps to promote healthy eating. Also examined were the results of qualitative studies and evaluations of the accuracy of diet and nutrition measurements derived by smartphone apps.

## Materials and Methods

The present review is based upon bibliographic searches in PubMed and CINAHL and relevant search terms. Articles published in English through August 2015 were identified using the following MeSH search terms and Boolean algebra commands: ((diet weight) or (dietary) or (diet weight loss) or (dietary intake) or (nutritional) or (health nutrition) or (cancer nutrition)) and smartphones). The following search terms and commands were also used: ((weight loss) or (weight gain) or (body weight) or (exercise weight) or (weight management) and smartphones). The searches were not limited to words appearing in the title of an article. Studies that focused on patients with chronic diseases other than obesity were excluded. Information obtained from bibliographic searches (title and topic of article, information in abstract, geographic locality of a study, and key words) was used to determine whether to retain each article identified in this way. In addition, we identified reports included in Cochrane reviews (http://community.cochrane.org/cochrane-reviews) and reviewed the references of reports and published review articles. A total of 193 article citations were identified in the bibliographic searches as detailed in Figure 1. Most of the published articles having to do with smartphones and healthy diet and nutrition appeared after 2011. After screening the abstracts or full texts of these articles, three qualitative studies and 10 randomized controlled trials of the effectiveness and acceptability of smartphone apps to promote healthy eating and to control body weight were identified. The present review extends upon the work of earlier authors by including studies published in the last few years and by summarizing the results of both qualitative studies and randomized controlled trials.

## Results

The selected reports included qualitative research studies involving focus groups and randomized control trials of the effectiveness of smartphone apps to improve diet and nutrition and control weight. Some studies also examined the accuracy of diet and nutrition measurements involving smartphone devices and personal data assistants (PDAs).

## Qualitative Research Studies

Vandelanotte et al. [6] conducted a qualitative study to examine the opinions and perceptions of middle-aged men in Australia regarding the use of Internet and mobile phone-delivered interventions to improve nutrition and physical activity (Table 1).

The researchers conducted six focus groups (n = 30). The analyses identified six themes: (a) Internet experience, (b) website characteristics, (c) Web 2.0 applications, (d) website features, (e) self-monitoring, and (f) mobile phones as a delivery method.

The men involved supported use of the Internet to improve and self-monitor dietary behaviors and physical activity on the condition that the website-delivered interventions were quick and easy to use. Commitment levels to engage in online tasks were low. Participants also indicated that they were reluctant to use normal mobile phones to change health behaviors; although smartphones were more acceptable.

Robinson et al. [7] developed and tested the feasibility of a smartphone-based attentive eating intervention. The feasibility of the app was tested in a non-randomized 4-week trial that involved 12 overweight and obese volunteers who were university staff members. The participants self-reported that the app raised their awareness of what they were eating and that it was easy to use [7].

Morrison et al. [8] used a mixed-methods design to examine (a) individual variations in the impact of a weight management app (POWeR Tracker) on self-reported goal engagement (i.e., motivation, self-efficacy, awareness, effort, achievement), when provided alongside a Web-based weight management intervention (POWeR), and (b) participant usage and views of the weight management app. Thirteen adults were provided-access to POWeR and were monitored over a 4-week period. Access to POWeR Tracker was provided in 2 alternate weeks. The self-reported goal engagement of participants was recorded daily. Usage of POWeR and POWeR Tracker was automatically recorded. Telephone interviews were conducted and analyzed using thematic analysis to explore experiences of participants using POWeR and POWeR Tracker. The researchers found that access to POWeR Tracker was associated with an increase in participants' awareness of their food intake (P=0.04) varied between individual participants. The participants used the POWeR website for similar amounts of time during the weeks when POWeR Tracker was (mean 29 minutes, SD 31 minutes) and was not available (mean 27 minutes, SD 33 minutes). The qualitative data indicated that nearly all participants agreed that it was more convenient to access information on-the-go via their mobile phones than with a computer [8].

## Randomized Controlled Trials

Although there have been studies of short message service (SMS) text message-based interventions for weight control, few randomized controlled trials have been conducted of stand-alone smartphone apps for weight control and healthy-eating. In a randomized trial involving 40 participants (20 per group), Gasser et al. [9] compared the effectiveness of a smartphone app to a Web-based application for tracking diet and physical activity. Over the 4 weeks of the trial, the smartphone group had a more regular usage pattern than the Web-based group. No significant differences in physical activity goals or nutrition goals were observed across groups [9].

Wharton et al. [10] conducted an eight-week weight loss trial in which participants tracked their dietary intake using one of three methods: a smartphone app ("Lose It!"), the feature on a smartphone, or a conventional paper-based method. Although all three groups lost weight over the course of the study (P=0.001), there were no significant differences in weight loss between groups [10]. Smartphone app users (n=19) recorded dietary data more consistently than the paper-based group (n=15; P=0.042) but not the memo group (n=13).

To evaluate the feasibility, acceptability, and efficacy of a behavioral intervention delivered by smartphone technology, Allen et al. [3] randomized 68 obese adults (average age 45 years, 78% female, 49% African American) to receive one of 1) intensive counseling, 2) intensive counseling plus smartphone, 3) a less intensive counseling plus smartphone, and 4) smartphone intervention only. The outcome measures of weight, body mass index (BMI), waist circumference, and self-reported dietary intake and physical activity were assessed at baseline [3]. Participants in the intensive counseling plus self-monitoring smartphone group and less intensive counseling plus self-monitoring smartphone group tended to lose more weight than other groups (5.4 kg and 3.3 kg, respectively).

In a pilot study, Martin et al. [11] examined the efficacy of a smartphone-based weight loss intervention (SmartLoss). Adult participants (25 ≤ BMI ≤ 35 kg/$m^2$ , mean age 44.4 years, 82.5% female) were randomized to a SmartLoss group (n = 20) or a health education control group (n = 20). The SmartLoss participants were prescribed a 1,200 to 1,400 kilocalorie per day diet and were provided with a smartphone, body weight scale, and accelerometer that wirelessly transmitted, to a website, data on body weight and number of steps. In the SmartLoss group, mathematical models quantified dietary adherence based on body weight, and counselors remotely delivered treatment recommendations based on these data. The health education group received health tips via smartphone [11]. Weight loss was greater ($P < 0.001$) in the SmartLoss group (least squares mean ± SEM: −9.4 ± 0.5%) compared with the Health Education group (−0.6 ± 0.5%).

Carter et al. [12] conducted a 6-month pilot study to examine the acceptability and feasibility of a self-monitoring weight management intervention delivered via a smartphone app, compared to a website and paper diary. Overweight volunteers (n=128) were randomized to receive a weight management intervention delivered by one of three methods. The smartphone app (My Meal Mate), was developed using an evidence-based behavioral approach. The app incorporated goal setting, self-monitoring of diet and activity, and feedback via weekly text messages. The website group used a commercially available slimming website from a company called Weight Loss Resources, who also provided the paper diaries. The comparison groups received a similar self-monitoring intervention as the smartphone app, but by different modes of delivery. Participants were recruited from large local employers by email, intranet, newsletters, and posters. The intervention and comparison groups were self-directed, with no ongoing human input from the research team. The only face-to-face interactions were at baseline enrollment and brief follow-up sessions at 6 weeks and 6 months to take anthropometric measures and administer questionnaires. The retention rates at 6 months were 40/43 (93%) in the smartphone group, 19/42 (55%) in the website group, and 20/43 (53%) in the diary group. Adherence was higher for the smartphone group, with a mean of 92 days (SD 67) of dietary recording compared to 35 days (SD 44) for the website group and 29 days (SD 39) for the diary group ($P<.001$). In all groups, self-monitoring declined over time. In an intention-to-treat analysis, mean weight change at 6 months was −4.6 kg (95% CI −6.2 to −3.0) for the smartphone app group, −2.9 kg (95% CI −4.7 to −1.1) for the diary group, and −1.3 kg (95% CI −2.7 to 0.1) for the website group. The change in BMI at 6 months was −1.6 kg/$m^2$ (95% CI −2.2 to −1.1) for the smartphone group, −1.0 kg/$m^2$ (95% CI −1.6 to −0.4) for the diary group, and −0.5 kg/$m^2$ (95% CI −0.9 to 0.0) for the website group. Change in body fat was −1.3% (95% CI −1.7 to −0.8) for the smartphone group, −0.9% (95% CI −1.5 to −0.4) for the diary group, and −0.5% (95% CI −0.9 to 0.0) for the website group.

To promote healthy eating and physical activity in middle-aged men, Duncan et al. [13] conducted a randomized trial (the ManUP study) to examine the effectiveness of a nine-month web-based and mobile phone-based intervention compared to a print-based intervention. The participants, who were recruited offline (e.g., newspaper ads), were randomized into either an information technology (IT)-based or print-based intervention arm on a 2:1 basis in favor of the fully automated IT-based arm. The participants were adult males aged 35-54 years living in cities in Queensland, Australia, who could access the

Internet, owned a mobile phone, and were able to increase their activity level. The intervention, ManUp, was based on social cognitive and self-regulation theories and was designed to target males. Educational materials were provided, and self-monitoring of physical activity and nutrition behaviors was promoted. The intervention content was the same in both intervention arms, but the delivery mode differed. The physical activity, dietary behaviors, and health literacy of the participants were measured by use of online surveys at baseline, three months, and nine months. A total of 301 participants completed baseline assessments, 205 in the IT-based arm and 96 in the print-based arm; 124 participants completed all three assessments. There were no significant between-group differences in physical activity and dietary behaviors (P≥0.05). Participants reported an increased number of minutes and sessions of physical activity at three months (exp(β)=1.45, 95% CI 1.09-1.95; exp(β)=1.61, 95% CI 1.17-2.22) and 9 months (exp( β)=1.55, 95% CI 1.14-2.10; exp(β)=1.51, 95% CI 1.15-2.00). Overall dietary behaviors improved at 3 months (exp(β)=1.07, 95% CI 1.03-1.11) and 9 months (exp(β)=1.10, 95% CI 1.05-1.13). The proportion of participants in both groups consuming high-fiber bread and low-fat milk increased at 3 months (exp(β)=2.25, 95% CI 1.29-3.92; exp(β)=1.65, 95% CI 1.07-2.55). The participants in the IT-based arm were less likely to report that 30 minutes of physical activity per day improves health (exp(β)=0.48, 95% CI 0.26-0.90) and more likely to report that vigorous intensity physical activity 3 times per week is essential (exp(β)=1.70, 95% CI 1.02-2.82). The researchers concluded that the ManUp intervention was effective in improving physical activity and dietary behaviors with no significant differences between IT- and print-based delivery modes [13].

In the Mobile Pounds Off Digitally (Mobile POD) randomized weight-loss intervention, Turner-McGrievy and Tate [14] determined if a combination of podcasting, mobile support communication, and mobile diet monitoring can assist adults in losing weight. In this six-month, minimal contact intervention, overweight individuals (n=96) were recruited through television advertisements and email listserves and randomly assigned to Podcast-only or Podcast+Mobile groups. Both groups received two podcasts per week for three months and two minipodcasts per week for months three-six. In addition to the podcasts, the Podcast +Mobile group was also instructed to use a diet and physical activity monitoring app on their mobile device and to interact with study counselors and other participants on Twitter. At six months, weight loss did not differ between the two groups: mean −2.7% (SD 5.6%) Podcast +Mobile, n = 47; mean −2.7% (SD 5.1%) Podcast, n = 49; P = 0.98. Podcast+Mobile participants were 3.5 times more likely than the Podcast group to use an app to monitor diet (P = 0.01), whereas most Podcast participants reported using the Web (14/41, 34%) or paper (12/41, 29%). The number of podcasts participants reported downloading over the 6-month period was moderately correlated with weight loss in both the Podcast+Mobile (r = −0.46, P = 0.001) and the Podcast (r = −0.53, P < 0.001) groups. More Podcast participants relied on friends (11/40, 28% vs 4/40, 10%; P = 0.045), whereas Podcast+Mobile participants tended to rely on online sources (10/40, 25% vs 0/40; P = 0.001).

Turner-McGrievey et al. [15] conducted a post hoc analysis of data from the Mobile POD trial to assess the relationship between diet (mobile app, website, or paper journal) and physical activity (mobile app vs no mobile app) self-monitoring and dietary and physical activity behaviors. The participants in both randomized groups were collapsed and categorized by their chosen self-monitoring method for diet and physical activity. All participants received a behavioral weight loss intervention delivered via podcast and were encouraged to self-monitor dietary intake and physical activity. Adjusting for randomized group and demographics, user of the physical activity app self-monitored exercise more frequently over the 6-month study (2.6±0.5 days/week) and reported greater intentional physical activity (196.4±45.9 kcal/day) than non-app users (1.2±0.5 days/week physical activity self-monitoring, p<0.01; 100.9±45.1 kcal/day intentional physical activity, p=0.02). At six months, users of the physical activity app also had a lower BMI (31.5±0.5 kg/$m^2$) than non-users (32.5±0.5 kg/$m^2$; p=0.02). The frequency of self-monitoring did not differ by self-monitoring method (p=0.63); however, at six months, app users consumed less energy (1437±188 kcal/day) than paper journal users (2049±175 kcal/day; p=0.01).

Rabbi et al. [16] developed a smartphone app (MyBehavior) designed to track eating and physical activity data and to provide personalized, low-effort suggestions to promote healthy behaviors. The app was designed to: 1) use a combination of automatic and manual logging to track food, physical activity (e.g., walking running, gym), and user location; 2) automatically analyze food and physical activity logs to identify behaviors; and 3) to use a machine-learning, decision making algorithm to generate personalized suggestions that ask users to continue, avoid, or make small changes in behaviors to help them reach behavioral goals. In a randomized pilot study conducted over three weeks, the researchers asked participants (n=17) to receive either personalized suggestions from MyBehavior or nonpersonalized suggestions from a smartphone. In a post-intervention, in-person survey, users reported that MyBehavior suggestions were highly actionable and that they intended to follow the suggestions. Between- group differences in consumption of lower-calorie foods were not significant (P=0.15). Over the course of the trial, however, MyBehavior users walked more than the control group (P=0.05).

## Studies of the Accuracy of Diet and Nutrition Measurements

Smartphones (and other electronic devices such as PDAs and lap-top and personal computers) have the potential to improve the accuracy and completeness of self-monitored dietary intake in weight-control interventions [17, 18]. Smartphone technologies reduce the burden of monitoring dietary intake using traditional paper-based records and can also be used to scan bar codes. In epidemiologic and health intervention studies involving dietary self-monitoring and assessment of energy and nutrient intakes, smartphones and PDAs have been successfully used to allow research participants to select food and portion size from databases and to photograph food selection and send the images to a server for food intake estimation [18-20]. Validation studies of the use of smartphones to record food intake have generally found moderate to good correlations of energy and nutrient intake measurements with those obtained using traditional methods such as 24-hour dietary recall interviews and paper-based food records [18, 19]. A variety of input methods and functionalities have been utilized in smartphone technologies, including allowing users to list their favorite foods, enter consumed food type and quantity, search a food database, and produce graphical displays [20].

In a seven-day validation study involving 50 volunteers, Carter et al. [21] compared diet measures recorded using the My Meal Mate smartphone app with information obtained using 24-hour dietary recall interviews. During this period, the participants were contacted twice at random to conduct 24-hour dietary recall interviews. Daily totals for energy (kJ) and macronutrients recorded using the smartphone app were compared against the corresponding day of recall using t tests for group means and Pearson's correlations. Energy (kJ) recorded using the app correlated well with the recalls (day 1: r 0.77 (95 % CI 0.62 to 0.86), day 2: r 0.85 (95 % CI 0.74 to 0.91)) and had a small mean difference (day 1 (smartphone app - recall): −68 kJ/d (95 % CI −553, 418 kJ) (−16 kcal/d, 95 % CI −127, 100 kcal); day 2 (smartphone app - recall): −441 kJ/d (95 % CI −854, −29 kJ) (−105 kcal/d, 95 % CI −204, −7 kcal)).

Hutchesson et al. [17] evaluated the acceptability and accuracy of three different 7-day food record methods (online accessed via computer, online accessed via smartphone, and paper-based). Young women (N=18; mean age 23.4 years; BMI 24.0±2.2) completed the food records in random order with 7-day washout periods between each method. Total energy expenditure (TEE) was derived from resting energy expenditure (REE) measured by indirect calorimetry and physical activity level (PAL) derived from accelerometers. The accuracy of the three methods was assessed by calculating absolute and percentage differences between self-reported energy intake (EI) and TEE. Acceptability was assessed via questionnaire. No significant differences were found between absolute and percentage differences between EI and TEE for the three methods: computer, −510±389 kcal/day (78%); smartphone, −456±372 kcal/day (80%); and paper, −503±513 kcal/day (79%). Half of the participants (n=9) preferred computer recording, 44.4% preferred smartphone recording, and 5.6% preferred paper-based records.

## Discussion

The number of randomized controlled trials of the effectiveness of smartphone apps in improving diet and nutrition and controlling weight is still modest, and some trials are limited by small sample sizes. Differences in study design (e.g., choice of a comparison group, outcome measures) and smartphone app functionalities also increase the difficulty of drawing firm conclusions about the effectiveness of apps in modifying behaviors. The results of this review indicate that the magnitude of the intervention effect (e.g., decrease in BMI) is likely to be modest.

Nevertheless, smartphone apps have several advantages. The results of this review indicate that apps can be effective in promoting healthy eating and weight loss and that they are likely to be a useful and low-cost intervention for improving diet and nutrition and addressing obesity in the general population. In validation studies, the accuracy of diet and nutrition measurements obtained using mobile devices has generally been found to be good [22].

Rapid technological advances have led to the emergence of smartphones that combine the voice and text messaging functions of cell phones with powerful computing technology that can support third-party applications, Internet access, and wireless connectivity with other devices [23]. About 53% of adults in the U.S own a smartphone [24]. All major smartphone platforms provide third-party developers with application programming interfaces that can be used to build special purpose applications referred to as native apps [23]. In April 2012, there were an estimated 13,600 consumer health apps for the iPhone.

Additional research is needed to examine the effectiveness of intervention components in smartphone technology [2]. Future studies should utilize randomized controlled trial research designs, larger sample sizes, and longer study periods to better explore the diet and nutrition measurement and intervention capabilities of smartphones. There is a need for culturally appropriate, tailored health messages to increase knowledge and awareness of health behaviors such as healthy eating. There are currently no culturally tailored, research-tested smartphone apps suitable for non-English speakers or for persons with low health literacy. Health promotion messages that are culturally tailored for a group address the unique needs of individuals, increase their motivation, tend to be perceived as more personally relevant, and lead to a greater likelihood of behavior change. The tailoring of health promotion messages to cultural groups increases the relevance of the messages to members of the target audience.

## Conclusions

Smartphone apps are likely to be a useful and low-cost intervention for improving diet and nutrition and addressing obesity in the general population. The accuracy of diet and nutrition measurements obtained using mobile devices has generally been found to be good. Participants prefer applications that are quick and easy to administer and those that increase awareness of food intake and weight management. Research-tested smartphone apps are needed that are culturally tailored and appropriate for persons with lower health literacy and for non-English speakers.

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## Abbreviations

| | |
|---|---|
| **Apps** | Applications |
| **BMI** | Body Mass Index |
| **CINAHL** | Cumulative Index To Nursing And Allied Health Literature |
| **EI** | Energy Intake |
| **IT** | Information Technology |
| **MeSH** | Medical Subject Headings |
| **PAL** | Physical Activity Level |
| **PDAs** | Personal Data Assistants |
| **RES** | Resting Energy Expenditure |

| | |
|---|---|
| **SMS** | Short Message Service |
| **SEM** | Standard Error of the Mean |
| **TEE** | Total Energy Expenditure |

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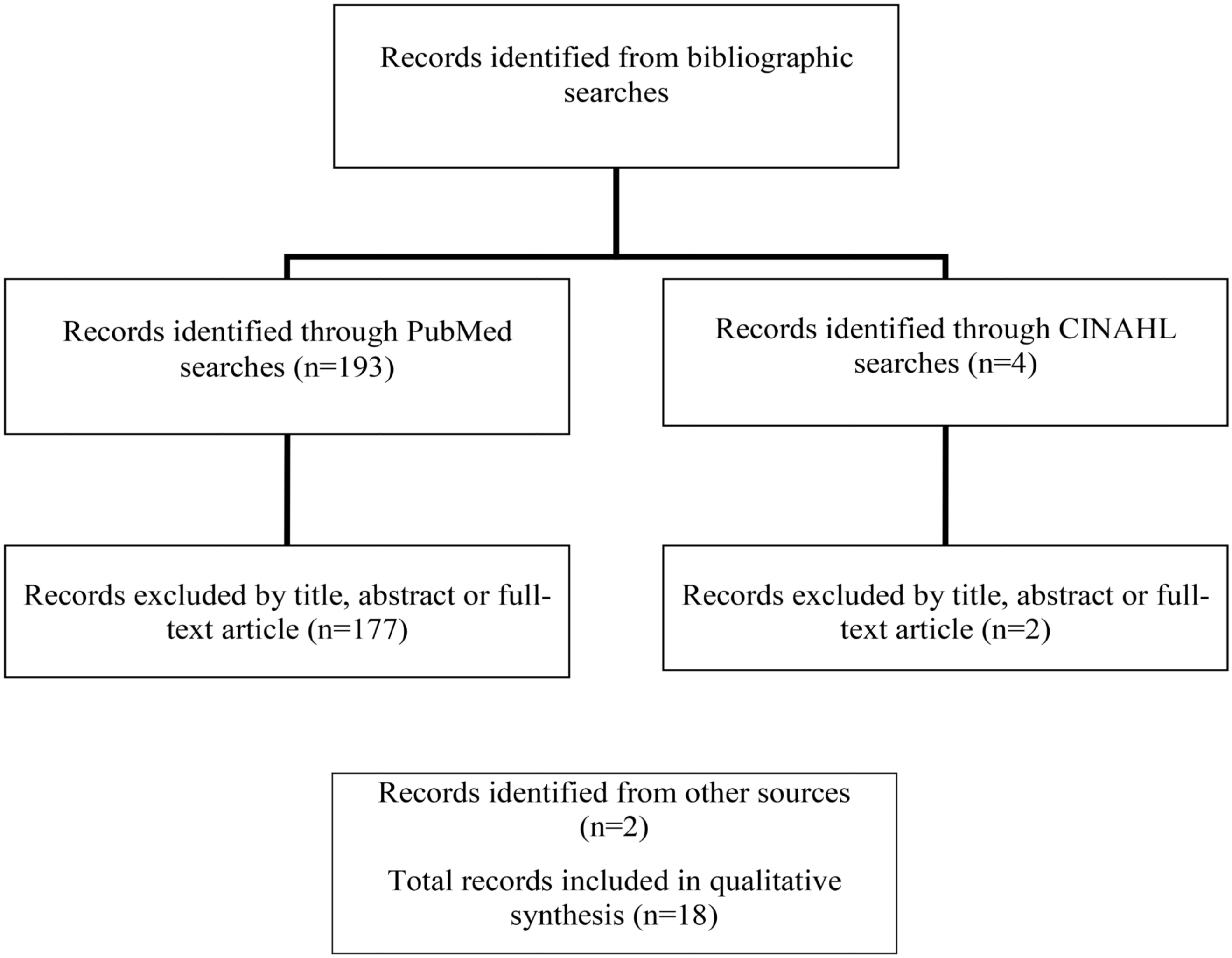


**Figure 1.**
Summary of search and exclusion process.

**Table 1**

Qualitative studies and randomized controlled trials of smartphone applications for promoting healthy diet and nutrition.

| Study | Sample | Design | Results | Limitations |
|---|---|---|---|---|
| Vandelanotte et al. [6] | 30 middle-aged men in Australia | Focus groups | The men supported use of the Internet to improve and self-monitor dietary behaviors and physical activity provided the website-delivered interventions were quick and easy to use. Smartphones were more acceptable than regular mobile phones. | |
| Robinson et al. [7] | 12 overweight and obese volunteers who were university staff members | Non-randomized 4-week trial | The participants self-reported that the app raised their awareness of what they were eating and that it was easy to use. | Non-randomized design, small sample size |
| Morrison et al. [8] | 13 adult volunteers | Mixed-methods design | The POWER Tracker app was associated with an increase in awareness of participants' food intake (P=0.04) and physical activity goals (P=0.03). | Small sample size, short duration of trial |
| Gasser et al. [9] | 40 volunteers (20 per group) | 4-week randomized trial that compared smartphone app to a Web-based app | The smartphone group had a more regular usage pattern than the Web-based group. No significant differences in nutrition goals or physical activity goals were observed across groups. | Small sample size |
| Wharton et al. [10] | 47 volunteers | 8-week randomized controlled trial with three groups: smartphone app (n= 19), paper-based (n=15), and memo (n=13) | All three groups lost weight. Smartphone app (Lose It!) users recorded dietary data more consistently than the paper-based group but not the memo group. | Small sample size |
| Allen et al. [3] | 68 obese adults (mean age 45 years, 78% female, 49% African American | Randomized controlled trial with four groups: 1) intensive counseling, 2) intensive counseling plus smartphone, 3) less intensive counseling plus smartphone, and 4) smartphone app only | Participants in the intensive counseling plus self-monitoring smartphone group tended to lose more weight than the other groups (5.4 kg and 3.3 kg, respectively). | |
| Martin et al. [11] | 40 adult volunteers | Randomized controlled trial with SmartLoss smartphone group (n=20) and a health education control group (n=20) | Weight loss was greater in the SmartLoss group compared with the health education group (P<0.001). | Small sample size |
| Carter et al. [12] | 128 overweight volunteers | 6-month randomized controlled trial with three groups: My Meal Mate smartphone app, website group, and diary group | Mean weight change at 6 months was −4.6 kg (95% CI −6.2 to −3.0) for the smartphone app group, −2.9 kg (95% CI −4.7 to −1.1) for the diary group, and −1.3 kg (95% CI −2.7 to 0.1) for the website group. The change in BMI at 6 months was −1.6 kg/m$^2$ (95% CI −2.2 to −1.1) for the smartphone group, −1.0 kg/m$^2$ (95% CI −1.6 to −0.4) for the diary group, and −0.5 kg/m$^2$ (95% CI −0.9 to 0.0) for the website group. Change in body fat was −1.3% (95% CI −1.7 to −0.8) for the smartphone group, −0.9% (95% CI −1.5 to −0.4) for the diary group, and −0.5% (95% CI −0.9 to 0.0) for the website group. | |
| Duncan et al. [13] | 301male volunteers in Queensland, | 9-month randomized controlled trial (the ManUP Study) that compared web- and mobile phone-based intervention with a print-based intervention | Participants reported an increased number of minutes and sessions of physical activity at three months and 9. Overall dietary behaviors improved at 3 months and 9 months. The proportion of participants in both groups consuming high-fiber bread and low-fat milk increased at 3 months. | |
| Turner-McGrievay and Tate [14] | 96 volunteers | 6-month randomized controlled trial [Mobile Pounds Off Digitally | At six months, weight loss did not differ between the two groups (P = 0.98. Podcast+Mobile participants were 3.5 times more likely than the | |

| Study | Sample | Design | Results | Limitations |
|---|---|---|---|---|
| | | (POD) Study] with two groups: podcast only group and podcast+mobile | Podcast group to use an app to monitor diet (P = 0.01), whereas most Podcast participants reported using the Web or paper. The number of podcasts participants reported downloading over the 6-month period was moderately correlated with weight loss in both the Podcast+Mobile (P = 0.001) and the Podcast (P < 0.001) groups. | |
| Turner-McGrievey et al. [15] | 96 volunteers | Post hoc analysis of data from Mobile POD Study | Adjusting for randomized group and demographics, smartphone app users self-monitored exercise more frequently over the 6-month study and reported greater intentional physical activity than non-app users (P<0.01). App users also had a lower BMI at six months than non-users (p=0.02), and consumed less energy than paper journal users (P=0.01). | |
| Rabbi et al. [16] | 17 volunteers | Randomized controlled trial that compared personalized suggestions from the MyBehavior smartphone app with nonpersonalized suggestions from a smartphone | Between- group differences in consumption of lower-calorie foods were not significant (P=0.15). Over the course of the trial, however, MyBehavior users walked more than the control group (P=0.05). | Small sample size |