mHealth Technologies to Influence Physical Activity and Sedentary Behaviors: Behavior Change Techniques, Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Authors' contributions

AD contributed to the conception, design, research, analyses, interpreted the data, and led the writing of the article. AD, EC and JR contributed to acquisition of data. RM participated in the conceptualisation of the study, data extraction and resolution of discrepancies. All authors provided feedback on the manuscript, and have read and approved the final version.

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Abstract

Background: mHealth programs offer potential for practical and cost-effective delivery of interventions capable of reaching many individuals.

Purpose: To: 1) compare the effectiveness of mHealth interventions to promote physical activity (PA) and reduce sedentary behavior (SB) in free living young people and adults with a comparator exposed to usual care/minimal intervention; 2) determine whether, and to what extent, such interventions affect PA and SB levels; 3) use the taxonomy of behavior change techniques (BCTs) to describe intervention characteristics.

Methods: A systematic review and meta-analysis following PRISMA guidelines was undertaken to identify randomized controlled trials (RCTs) comparing mHealth interventions with usual or minimal care among individuals free from conditions that could limit PA. Total PA, moderate-to-vigorous intensity physical activity (MVPA), walking, and SB outcomes were extracted. Intervention content was independently coded following the 93-item taxonomy of BCTs.

Results: Twenry-one RCTs (1701 participants - 700 with objectively measured PA) met eligibility criteria. SB decreased more following mHealth interventions than after usual care (standardised mean difference (SMD) -0.26, 95% confidence interval (CI) -0.53 to -0.00). Summary effects across studies were small to moderate and non-significant for total PA (SMD 0.14, 95% CI -0.12 to 0.41), MVPA (SMD 0.37, 95% CI -0.03 to 0.77), and walking (SMD 0.14, 95% CI -0.01 to 0.29). BCTs were employed more frequently in intervention (mean = 6.9, range 2 to 12) than in comparator conditions (mean = 3.1, range 0 to 10). Of all BCTs, only 31 were employed in intervention conditions.

Conclusions: Current mHealth interventions have small effects on PA/SB. Technological advancements will enable more comprehensive, interactive and responsive intervention delivery. Future mHealth PA studies should ensure that all the active ingredients of the intervention are reported in sufficient detail.

Keywords: mobile health; behavior change techniques; physical activity; sedentary behavior; meta-analysis.

mHealth Technologies to Influence Physical Activity and Sedentary Behaviors: Behavior Change Techniques, Systematic Review and Meta-Analysis of Randomized Controlled Trials

Despite the established health benefits of regular physical activity (PA) in preventing and attenuating the consequences of many non-communicable diseases (1) (e.g. cardiovascular disease, obesity, diabetes, cancer, hypertension, depression, and osteoporosis) and premature death (2), worldwide data show 31.1% of adults (30.9 to 31.2 95% CI) and 80.3% of adolescents (80.1 to 80.5 95% CI) fail to meet PA guidelines (3).

Even though physical activity is a modifiable behavior and there is evidence of success for interventions aiming to promote PA when individual- and/or group-tailored support is offered (4), face-to-face approaches have high resource requirements and are impractical for widespread implementation. Other delivery methods offer advantages in terms of resource use, reach and dissemination. Interventions for promoting PA delivered via remote and web technologies, such as when the Internet and telephone are used to provide feedback and support behavior change, have shown moderate sized positive effects (5). Finding cost-effective and easy to disseminate methods to promote PA is required to alleviate an already burdened healthcare system.

Remote technologies offer a novel delivery mode for promoting PA. Among these, is the use of mobile technologies, such as phones, tablets and tracking devices to aid and improve public health practice (termed mHealth) (6). By 2015, global mobile penetration was 125.7% and 93% in developed and developing countries, respectively (7). Among mobile phone owners in the United States, smartphone ownership increased from 35% in 2011 to 64% in 2014 (8) and, importantly, 62% of those have used their smartphone to look for help

and information about a health condition (8). Thus, mHealth interventions for promoting PA may be a cost-effective and feasible way to reach the population.

Previous systematic reviews investigating mHealth interventions aimed at influencing PA reported positive effects, but these predominantly included studies where mHealth devices were mostly used to aid data collection (e.g. measurement of PA) and/or as a supplement to other intervention components (9). A systematic review investigating the effectiveness of mHealth delivered interventions to promote PA found some support for such interventions to increase PA levels, particularly for those using text-messaging communication and/or promoting self-monitoring (10). Despite text-messaging interventions being the main mHealth technology explored in systematic reviews and meta-analysis (11), texting is only one of many functionalities of mobile phones and a basic functionality of smartphones. A more recent review assessing mHealth delivered interventions' effectiveness on obesity-related outcomes in young people found that most studies describe the feasibility and acceptability of these approaches, but there are few effects on outcomes such as increases in PA (12). Although earlier reviews have explored the use of mHealth technologies for the promotion of PA, none have specifically focussed on randomized controlled trials (RCTs), and there is no effect estimate from meta-analytical procedures of this study design type.

In summary, the evidence of effectiveness in PA outcomes is inconsistent. Inconsistency is likely due to the large variation in study design (e.g. technologies employed, comparator groups) and methodological quality (e.g. study design, instruments to measure outcomes assessed). Differences in intervention content, including the behavior change techniques (BCTs) employed, is also likely a factor. BCTs are "observable, replicable, and irreducible" (13) components of interventions designed aimed at behavior change. Extracting information about intervention content using an established taxonomy will provide insight

into the active ingredients of mHealth interventions and may help guide future intervention development. Finally, it is unclear whether mHealth interventions can also reduce sedentary time. Therefore, the primary aim of this systematic review and meta-analysis was to determine the effectiveness of mHealth on PA and SB outcomes in free living individuals. Since self-report PA questionnaires are succeptible to bias through social desirability(14) and have been shown to correlate poorly with accelerometer-measured PA (15-17), the secondary aims were to investigate the relationship between the effect size and the nature of PA/SB outcomes (i.e. measured objectively or self-reported) and to describe the behavior change techniques used in the interventions using the behavior change techniques taxonomy.

Methods

Selection Criteria

The criteria for considering studies for this review and the outcomes of interest, as well as the methods for data extraction, assessing risk of bias, and statistical analysis were pre-specified (a protocol was not published). Eligible studies were RCTs that compared mHealth interventions with usual care, minimal or no intervention, among free-living individuals (young people ≤ 18 years and adults ≥ 18 years) with no pre-existing medical conditions or contraindications that could limit participation in PA (e.g. CVD, heart failure, pulmonary conditions). mHealth technology-based interventions were considered according to the definition of the Global Observatory for eHealth as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices."(6) Studies were accepted if they used short messaging service (SMS) and more complex functionalities, such as bluetooth technology and smartphone applications. The intervention had to be primarily mobile phone-based (i.e. mHealth device was the main mode of delivery (e.g. a multi-component school

based intervention involving face-to-face sessions where the mobile phone was used to support the main intervention was not included (18)), and utilised either as a stand-alone program or as part of the intervention package, of any dose, intensity and/or length. The comparison conditions permitted were usual or minimal care, such as a different treatment not involving mobile phone technologies (e.g. print-based materials), or a different mHealth technology (e.g. application x different app). PA and SB outcomes of interest were duration (e.g. total minutes sitting, MVPA time) or an estimate of energy expenditure. Outcomes could be either objectively measured (e.g. by accelerometers, pedometers) or self-reported. Studies with health promotion or prevention goals (e.g. weight management, cardiovascular risk reduction) were included if PA and/or SB related outcomes were reported.

Search Methods

Seven electronic databases were searched from inception through 11 January 2015: The Ovid Cochrane Central Register of Controlled Trials, CINAHL, Ovid Embase, Ovid MEDLINE, Ovid PsycINFO, ISI Web of Science and PubMed. Search strategies were based on a previous Cochrane systematic review of PA interventions (5). We adjusted the search strategy to each database by combining search terms for three topic areas: intervention (e.g. mobile device*, smartphone*, text messag*), outcomes (e.g. physical activity, inactiv*, sedentar*) and design (e.g. random sample, clinical trial). Full specific search details per database are included on Electronic Supplementary Material 1). Searches were limited to human studies, with no restrictions on date (up to January 2015), sample size, age, gender, race or ethnicity. Only English language published studies were accepted. Review articles and the reference lists of selected studies were searched for additional articles. Studies were excluded if: 1) the intervention reported was not primarily mHealth based, 2) researchers used non-random group allocation, 3) allocation procedure was not reported, 4) outcomes

were only assessed at follow-up or baseline, or 5) studies included participants with unstable medical status or other issues (e.g. pregnancy, depression) that contraindicated or confounded the intervention. When studies measured physical activity at several time points, the measurement taken before or immediately after the end of the intervention period was included in analysis.

Study Selection

The citations and abstracts of all retrieved articles were imported into EndNote X6 and all duplicates were removed. Two authors (AD, JR) independently screened the titles and abstracts of the search results to identify articles that met inclusion criteria. Full-text articles were retrieved if the information provided in the title, abstract and descriptors/MeSH headings met the inclusion criteria or if there was uncertainty about eligibility. The retrieved full-text articles were then scanned by two authors (AD, JR) independently in an unblinded manner. If differences between reviewers persisted a third author (RM) reviewed the study and discrepancies were resolved by discussion until a consensus was reached.

Data Extraction

Data were extracted using a standardized extraction form informed by the PRISMA (Transparent Reporting of Systematic Reviews and Meta-analyses) guidelines (19) and the Cochrane Handbook for Systematic Reviews of Interventions (20). For each included study, reviewers (AD, EC or JR) independently extracted data including: 1) study background information (publication year, acronym, country, authors); 2) sample-related information (eligibility, number of participants, participants' characteristics); 3) intervention-related information (detailed description, devices/technologies, behavior change techniques, duration, intensity, setting); 4) comparator-related information; 5) outcomes-related information (primary and secondary outcomes of interest such as PA levels, energy

expenditure); and 6) internal validity related information (randomization process, allocation concealment, blinding of outcome assessment, attrition, intention-to-treat analysis). Intervention details, including BCTs employed, were coded using intervention information available in published papers (appendices, protocols, results) and clinical trial registries. Coders (AD, EC) were trained on BCT taxonomy v1 (13, 21). Discrepancies were resolved by discussion. When multiple reports from the same intervention were found, relevant data were extracted from all reports. Authors were contacted via email when additional unpublished information was required.

Risk of Bias Assessment

The internal validity of the included studies was appraised (AD, RM) using the Cochrane Collaboration's tool for assessing risk of bias on each of the domains: selection, performance/detection, attrition and reporting. A judgement of high risk, low risk, or unclear risk was given to the following sources of bias: 1) sequence generation, 2) allocation concealment, 3) blinding of personnel and outcome assessors, 4) incomplete outcome data, 5) selective outcome reporting, 6) other sources of bias (i.e. groups comparable at baseline, validated outcome measures, analysis adjusted for baseline PA levels, intention-to-treat analysis). Unclear risk of bias was assigned when there was lack of information or uncertainty. Bias was assessed at the study level. For studies with health promotion or prevention goals where PA/SB related outcomes were reported but were not the primary outcome, risk of bias was assessed for the PA/SB outcome.

Measures of Effect

Continuous outcomes were transformed to uniform measurement scales (e.g. minutes in MVPA/week was transformed to minutes/day; body mass was transformed to kg (1 lb = 0.45359 kg). We emailed corresponding authors requesting data where studies reported only

one physical activity intensity. Where different intensities of activity were reported separately, we computed measures of total PA or MVPA by combining the intensities. When a study had more than one relevant arm for the review, using methods outlined in the Cochrane Handbook for Systematic Reviews of Interventions (section 16.5), we included each pair-wise comparison separately by including the intervention groups of interest and split the shared control group into two groups with an even, smaller sample size (mean and standard deviation left unchanged) (22). We did not combine different arms of intervention groups to create a single pair-wise comparison as the characteristics of the intervention arms differed, nor did we select a single arm of multiple intervention groups within a study as such approach results in loss of information and is not recommended (20).

Because a wide range of measurement tools were used (different models of pedometers, accelerometers and self-report instruments), the units of the outcomes of interest (i.e. total PA, MVPA, walking, and SB) differed across studies. Given these are continuous variables, we calculated the standardised mean difference (SMD) between the post-intervention values of the study arms as a summary statistic.

Data Synthesis

To estimate an overall summary effect size (and 95% confidence intervals) for total PA, MVPA, walking and SB, we used a random effects model to incorporate heterogeneity between studies (Review Manager v5.3.5, The Nordic Cochrane Centre, Copenhagen) following established Cochrane methods (23). Overall, a standardised mean difference of approximately 0.2 is classified as small, 0.5 as moderate, and 0.8 is large (24). To assess heterogeneity qualitatively we visually inspected forest plots and compared study characteristics; quantitatively we used the I^2 statistic. Causes of heterogeneity were explored

by conducting a posteriori subgroup analyses for hypothesis generation purposes. To assess publication bias we examined funnel plots for asymmetry.

Meta-analyses were performed with subgroups by type of outcome measurement to distinguish effects between objectively measured and self-reported outcomes.

Results

Literature Search

A total of 1850 study reports were identified from the database search and other sources, of which 815 were duplicates, leaving 1035 articles that were screened for eligibility. A total of 902 were deemed not relevant based on a review of the information provided in the title, abstract, and descriptors/MeSH headings. 133 full-text articles were assessed for eligibility. After exclusion of 112 that did not meet the review inclusion criteria, 21 studies (25-45) were considered eligible and included in the review (see Figure 1).

Description of Studies

Included articles were published between April 2007 and October 2014. Studies varied in size, duration, intervention, and comparator type. The number of participants providing measures of PA in each study ranged from 20 to 301 (mean = 81, total = 1701); follow-up duration ranged from 1 to 52 weeks (median = 9 weeks). mHealth PA promotion interventions were compared against minimal contact / usual care groups using technology (e.g. podcast, pedometer) in eight studies (25, 28, 31, 33, 35, 37, 38, 46) and to non-technology-based treatments (e.g. print materials, counselling) in ten studies (26, 29, 30, 32, 36, 40-43, 45). Only one study compared mHealth PA to no intervention (34). Two studies had no “pure” comparator groups (i.e. all conditions were interventions) (39, 44) and were not included in the meta-analysis – data are presented narratively. Twelve studies used a two-

arm, parallel RCT design, and nine studies used a multi-arm design (30-32, 34, 36, 39, 40, 44, 46); data were only extracted if the arm met eligibility criteria. Studies were conducted in the United Kingdom (25, 30, 31), United States (26-28, 32, 33, 35-40), Australia (29, 41, 43), Austria (34), Portugal (45) , Ireland (42) and Canada (44). Interventions were primarily delivered at an individual level, with no direct supervision of PA. mHealth technologies employed were, PDA(26), mobile phones/SMS (25, 27, 29-31, 34, 35, 38, 40, 43, 45), biosensors (25, 32, 44), smartphones/apps (28, 33, 36, 39, 41-43), tablet computers (37), and websites (25, 40, 41, 43). A summary of overall study characteristics is presented in Table 1. Specific study characteristics are presented in Electronic Supplementary Material 2.

Description of Participants

Participants were recruited from community and primary health care settings. The median age of the 1701 participants with post-intervention data was 40.1 years (range 8.4-71.7), 1089 were female and 612 male. One study each included females (29) and males only (41), and 19 included both females and males. Of the latter, the proportion of females ranged from 36% to 90%, median 70%.

Outcome Measures

Of the 21 eligible studies, seven (30, 32-34, 38, 41, 43) reported a measure of total PA (e.g. total PA duration, total energy expenditure, MET), nine (26, 28, 29, 31, 32, 40, 43, 45, 46) reported MVPA (e.g. MVPA duration, exercise duration), eight (28-30, 32, 35, 37, 38, 42) reported walking (e.g. walking duration, step count) and five (27, 28, 40, 43, 45) reported a measure of SB (e.g. sitting duration, TV viewing duration). Nine (25, 32, 34, 35, 37, 38, 42-44) studies measured outcomes objectively (e.g. accelerometry, pedometers), twelve (26-31, 33, 36, 39-41, 45) used self-report measures and four (25, 38, 43, 44) employed both. We emailed the corresponding authors requesting additional data where a publication reported

measurement of PA using an instrument that allowed computation of other PA outcomes besides those reported. Four authors provided additional unpublished data. Baseline and post-intervention outcome data for the included studies is presented in Electronic Supplementary Material 3 in Tables 2 and 3, respectively.

Risk of Bias

Assessments about each risk of bias item for each included study are presented in Figure 2 (support for judgement is presented in Electronic Supplementary Material 2). Four studies had published protocols (32, 40-42), and eight studies were registered in a clinical trial registry (28, 32, 33, 35, 38, 40-42). Incomplete reporting of methods hindered risk of bias judgement for several studies. All studies used an RCT design, and most described adequate approaches to allocation sequence generation with the exception of one (38). The remaining studies were classified as having an unclear risk of bias (28, 34, 36, 40). Allocation concealment approaches were mainly judged at unclear risk of bias except on four studies (29, 31, 42, 45). Studies were judged at high risk of performance bias since it is impractical and very hard to blind participants to a PA behavior change intervention. Five studies described blinded outcome assessment (30-32, 37, 42), three described outcome assessors as not blinded to participants' allocation (28, 29, 33), and the majority did not provide sufficient information. Fourteen studies (25, 26, 28-30, 32, 34-36, 39-41, 43, 44) were judged as being at low risk of attrition bias, and three were judged as being at high risk of bias for either not reporting reasons for participant dropouts (45) or imbalanced dropout (27, 37). Attrition rates varied from 0% to 53%. Three studies had 100% retention (25, 26, 44), ten studies reported PA data analyses following intention-to-treat principles (28, 29, 32, 33, 35, 36, 38, 40, 41, 43), eight studies analysed completers only (27, 30, 31, 34, 37, 42, 45), and procedures were insufficiently described in one study (39). Most studies dealt with missing data at follow-up

by imputing replacement values (e.g. last observation carried forward). Five studies had a high risk for reporting bias, four for presenting a subset of the outcome variables recorded/specified (25, 30, 35, 45) and one for inconsistencies between the trial registry, protocol and results paper regarding secondary and tertiary outcomes (32). Other potential sources of bias considered were lack of a valid PA outcome measurement instrument (31, 45, 46), comparability of groups at baseline (29, 42), contamination between groups (36) and failure to adjust data analyses for baseline PA (34, 39, 40, 44).

Effects of Interventions

Total physical activity. Seven studies (n = 745 participants) (30, 32-34, 38, 41, 43) reported intervention effects on total PA related outcomes (kcals/day, min/day). Total PA did not differ significantly between mHealth and comparators. The pooled effect was positive and small (SMD = 0.14, CI – 0.12 to 0.41), and heterogeneity was statistically significant (I^2 = 60%; Chi^2 = 20.09; P = 0.01). Subgroup analyses showed PA levels did not differ between studies with objective (SMD = 0.20, CI –0.21 to 0.60) or self-reported measurement (SMD = 0.14, CI –0.20 to 0.48) following mHealth interventions (Figure 3).

Moderate-to-vigorous physical activity. Nine studies (n = 533 participants) (26, 28, 29, 31, 32, 40, 43, 45, 46) reported effects for MVPA related outcomes (kcals/day, min/day). The pooled effect was positive and moderate in size (SMD = 0.37, CI –0.03 to 0.77), but statistically non-significant. Heterogeneity was statistically significant (I^2 = 78%; Chi^2 = 50.74; P < .001). Subgroup analyses showed the SMD did not differ significantly between self-reported (SMD = 0.49, CI –0.04 to 1.01) or objectively measured (SMD = 0.03, CI –0.38 to 0.44) MVPA levels (Figure 4).

One study reported changes in PA from baseline and could not be included in the pooled analysis of SMD (23). Self-reported MVPA slightly increased for the smartphone-

only group while decreasing in the other groups of counselling with/without a smartphone (average increase was 0.19 hrs/week) (36). Another study where all conditions were interventions was not included in the pooled analysis. Self-reported MVPA significantly increased across three groups using smartphone apps. Post-intervention averages were 40.1, 45.5, and 38.2 min/day of MVPA for the respective analytical, social, and affect app conditions (39).

Walking. Eight studies (n = 703 participants) (28-30, 32, 35, 37, 38, 42) reported effects for walking related outcomes (steps/day, walking duration/day). The pooled effect was positive and small (SMD = 0.14, CI –0.01 to 0.29). There was no evidence of heterogeneity (I^2 = 0%; Chi^2 = 5.76; P = 0.76). Subgroup analyses showed walking levels did not differ significantly between studies with objective (SMD = 0.13, CI –0.07 to 0.34) or self-reported measurement (SMD = 0.15, CI –0.08 to 0.38) following mHealth interventions (Figure 5).

Two studies where all conditions were interventions were not included in the pooled analysis. In one, self-reported walking duration significantly increased across three groups using apps—post-intervention averages were 22.8, 28.5, and 25.6 min/day for the analytical, social, and affect app, respectively (39). In the other, pedometer-measured steps/day did not statistically increase for any of the three intervention groups using a mHealth package targeting either sedentary behavior, exercise, or both (44).

Sedentary behavior. Five studies (n = 226 participants) (27, 28, 40, 43, 45) reported effects for sedentary behavior related outcomes (sitting duration/day, screen time duration/day). Sedentary behavior level was statistically significantly lower following mHealth interventions compared with controls (SMD = –0.26, CI –0.53 to –0.00). There was no evidence of heterogeneity (I^2 = 0%; Chi2 = 0.28; P = 0.99). Subgroup analyses showed SB

level did not differ significantly between studies with objective (SMD = –0.24, CI –1.00 to 0.52) or self-reported measurement (SMD = –0.27, CI –0.55 to 0.01) following mHealth interventions (Figure 6).

One study reported changes from baseline and could not be included in the pooled analysis of SMD (23) —self-reported sitting time was significantly lower compared to the control group (average decrease was –5.9 hours/week; p = 0.03) (25). Another study where all conditions were interventions could not be included in the pooled analysis. Self-reported TV viewing duration significantly decreased across three groups using smartphone apps (post-intervention averages were 126.6, 175.1, and 150.6 min/day for the analytical, social, and affect app, respectively) (39).

Behavior Change Techniques

There was substantial heterogeneity in the terminology used to describe intervention (and comparator groups) content. Overall, studies included an average of 5.4 BCTs (SD = 2.6, range 0 to 12). More BCTs were employed with intervention groups (mean = 6.9, SD = 2.6, range 2 to 12) than with comparator groups (mean = 3.1, SD = 2.2 range 0 to 10). The percentage of inclusion of each one of the BCTs in intervention groups varied from 0 to 81%. Frequently employed BCTs in intervention groups were “goal setting (behavior)” (81% of the studies), “self-monitoring of behavior” (74%), “social support (unspecified)” (65%), “feedback on behavior” (55%), “instruction on how to perform the behavior” (55%), “adding objects to the environment” (48%), “information about health consequences” (45%) and “prompts/cues” (45%). Other BCTs, such as “discrepancy between current behavior and goal” (0%), “behavioral contract” (0%), “behavioral experiments” (0%), and “review of behavior goal(s)” (16%), were never or seldom reported. The percentage of inclusion of each one of the BCTs in comparator groups varied from 0% to 53%. Frequently employed BCTs

in comparator groups were "goal setting (behavior)" (53% of the studies), "instruction on how to perform the behavior" (47%), "information about health consequences" (37%), and "self-monitoring of behavior" (32%). Specific excerpts per study and per study group can be found in Electronic Supplementary Material 4.

Sensitivity Analysis

Post hoc exploratory sensitivity analysis indicated that one study (38) was the main source of heterogeneity between studies measuring total PA. A different study (47) was the main source of heterogeneity between those measuring MVPA. Heterogeneity decreased substantially after removing these studies (I^2 = 0%, P = 0.44; SMD = –0.03, CI –0.19 to 0.12; and I^2 = 0%, P = 0.91; SMD = 0.13, CI –0.06 to 0.32 for total PA and MVPA, respectively). Given between-study heterogeneity for total PA and MVPA outcomes and that small trials can be overweighted by a random effects model (48), we pooled studies using a fixed effects model to compare effect estimates. For total PA, the summary effect remained non-significant and its magnitude decreased (SMD = 0.02, CI –0.13 to 0.17), but for MVPA the summary effect became statistically significant (SMD = 0.27, CI 0.09 to 0.45).

There were no changes occurring on the direction of the summary effects; however, the meta-analysis results were not entirely robust to the inclusion of studies of young people. For MVPA outcomes, the summary effect differed in magnitude - based only on adult studies, SMD was 0.14 (CI –0.10 to 0.37). For SB outcomes, the summary effects estimate differed little but was no longer significant - based only on adult studies, SMD was –0.21 (CI –0.59 to 0.18).

Publication Bias

Despite the small number of included studies (n < 10) (48), funnel plots of the standardised mean differences showed little evidence of publication bias for walking and

sedentary behavior outcomes. However, for total PA and MVPA there was a somewhat asymmetric scatter consistent with publication bias.

Discussion

The effectiveness of mHealth interventions on PA and SB was examined in twenty-one RCTs. The main findings of this systematic review and meta-analysis, incorporating published and unpublished data from RCTs on 1700 participants, were that mHealth PA/SB interventions promote small decreases in free living individuals' SB. Results also indicated positive and small to moderate sized effects for PA and walking outcomes; however, differences between mHealth intervention groups and the comparators did not reach statistical significance. Notably, mHealth groups were compared against standard treatment/usual care, which typically has been improving throughout time. Comparator groups included components such as print-based PA guidelines, self-guided manuals that encouraged self-monitoring, or somewhat more interactive tools that allowed real time self-monitoring like a wrist watch. It is possible that such "active" comparator groups contributed to smaller intervention effects.

Strengths and Limitations

The current meta-analysis is the first to assess mHealth PA/SB interventions including only RCTs. A comprehensive search strategy based on Cochrane systematic reviews of PA interventions, adjusting terms to each electronic database was employed. Subgroup analyses were selected a priori, based on evidence showing discrepancies between objective and self-reported measurement of PA. Given the small number of studies included per outcome we did not perform meta-regression analyses to investigate effect moderation by study level covariates (e.g. age, BCTs included).

Limitations of this review were the small number of included studies, small sample sizes of the included studies, limited duration of included interventions, insufficient follow-up, and outcome measurement based on participants' self-report for many studies. While the review included 21 studies, less than half (9) measured PA/sedentary behavior outcomes objectively. All interventions were delivered in high-income countries. However, while most targeted educated white adults, the review also included studies of young people and two specifically focussed on a minority population. Given the lack of data from low and middle-income countries, caution is warranted generalizing the meta-analysis findings to other population groups. Heterogeneity in the terminology and insufficient reporting of intervention content impaired coding of BCTs. We did not evaluate intervention fidelity; assessment of BCTs followed the coding manual instructions and does not include evaluation of the quality of intervention implementation. For example, an intervention package may include BCTs, but it is unclear whether participants used these (e.g. web tutorials for seeking social support, positive self-statement (40)).

The small to moderate effects observed for PA outcomes (albeit statistically non-significant) is likely attributed to the short duration of interventions (median= 9 weeks), which may be insufficient to influence PA and SB outcomes. This short duration precludes assessment of the longer-term effectiveness of mHealth interventions on PA/SB outcomes. Attempts to address the heterogeneity on the pooled intervention effects for total PA and MVPA using a fixed effects model resulted in decreased magnitudes of effect. Although for MVPA the summary effect became statistically significant, the effect was still small and data must be interpreted with caution given its exploratory nature.

Although statistically non-significant, subgroup analysis of MVPA found a larger SMD for self-reported versus objectively measured activity (SMD = 0.49 vs. 0.03,

410 respectively). This is likely due to the larger number of studies that included self-report
411 measures and the fact that people tend to over-estimate intensity of PA (49, 50). For the other
412 PA outcomes, effect estimates differed little between subgroups where assessment was
413 performed via objective measurement or self-report.

414 **Comparisons With Other Work**

415 Our findings compare and contrast to previous reviews (9-12, 51). Generally, previous
416 systematic reviews have reported that mobile phone technologies are effective for promoting
417 PA (9-12, 51). The current meta-analysis contributes with important quantitative evidence of
418 the effects of mHealth in PA outcomes as the evidence of RCTs grows in this area. However,
419 given the short-duration of intervention and the wide confidence intervals observed, caution
420 in interpretation is warranted. In contrast, our meta-analysis is the first to show that mHealth
421 can reduce time spent sedentary. Furthermore, our description of the BCTs content of current
422 mHealth PA interventions highlights qualitative aspects to inform the replication, refinement,
423 and improvement of mHealth interventions in the future (52).

424 Despite having employed a more strict inclusion criteria for studies in that only RCTs
425 where the intervention was principally delivered using mHealth technologies, we found
426 considerable heterogeneity of intervention (and comparator) groups. There was substantial
427 variation in the number and type of BCTs included in intervention and comparator groups.
428 While we acknowledge that within a comprehensive taxonomy of BCTs not all will be useful
429 to influence PA/SB behavior related changes, among 93 BCTs, only 31 were employed in the
430 intervention groups. Moreover, 19 different BCTs were employed within comparator groups,
431 which demonstrates the “active” nature of the comparator groups included in this review.
432 Albeit the number of BCTs employed providing an indication of the behavior change
433 potential of the interventions, with previous eHealth research showing a positive association

with effectiveness (53), a different aspect is the type of BCT. In their meta-regression, Michie and colleagues (54) have shown five BCTs associated with greater intervention effectiveness for modifying PA and diet behaviors (i.e. self-monitoring, intention formation, specific goal setting, review of behavioral goals and feedback on performance). Likewise, Williams and French (55) found that action planning, provision of instructions, and effort reinforcement were associated with greater levels of both PA behavior and self-efficacy. However, BCTs such as problem solving, action planning, review of behavior goals, or graded tasks, which likely play key roles on the initial attempts of individuals' health-related behavior changes, were not frequently used in the studies included in the present review. Taken together, these findings highlight the potential to explore BCTs not commonly used that may contribute to increased effectiveness of interventions to promote PA behaviors, such as "review of behavioral goals" (54). Concurrently, many interventions employed the BCT "prompts/cues". This BCT illustrates how mHealth can be harnessed to promote not only the main part of an intervention, but also to conduct brief follow-up prompts beyond the intervention core, which has been associated with behavior maintenance (56).

Future Research / Implications

Research is necessary to investigate the long-term effectiveness and cost-effectiveness of mHealth interventions to promote PA/SB changes. mHealth approaches may be an important tool to address high resource demand and the extensive contact time of traditional face-to-face approaches. Investigation of the dose-response relationship between intervention exposure and outcomes would also be useful. In order to assess the impact of BCTs, the reporting of intervention content will need to be improved. Most interventions were based on SMS; however, advancements in technology will enable more comprehensive, interactive and responsive intervention delivery.

Conclusions

Current mHealth interventions have small effects on total PA, MVPA, walking and SB. Technological advancements will enable more comprehensive, interactive and responsive intervention delivery. Future mHealth PA studies should ensure that all the active ingredients of the intervention are reported in sufficient detail.

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Captions of Figures

Figure 1 – Flow diagram of the study selection process.

Figure 2 – Assessments about each risk of bias item for each included study.

Figure 3 – Forest plot for total physical activity; SWA: sensewear armband, GWL: group sessions, II: implementation intentions.

Figure 4 – Forest plot for moderate-to-vigorous intensity physical activity; SWA: sensewear armband, GWL: group sessions, II: implementation intentions.

Figure 5 – Forest plot for walking; SWA: sensewear armband, GWL: group sessions, II: implementation intentions.

Figure 6 – Forest plot for sedentary behavior.

Electronic Supplementary Material

Electronic Supplementary Material 1 – Full specific search details per database.

Electronic Supplementary Material 2 – Characteristics of included studies.

Electronic Supplementary Material 3 – Baseline and post-intervention outcome data of included studies.

Electronic Supplementary Material 4 – BCTs coding: excerpts per study and per study group.

Figure 1 PRISMA flow diagram

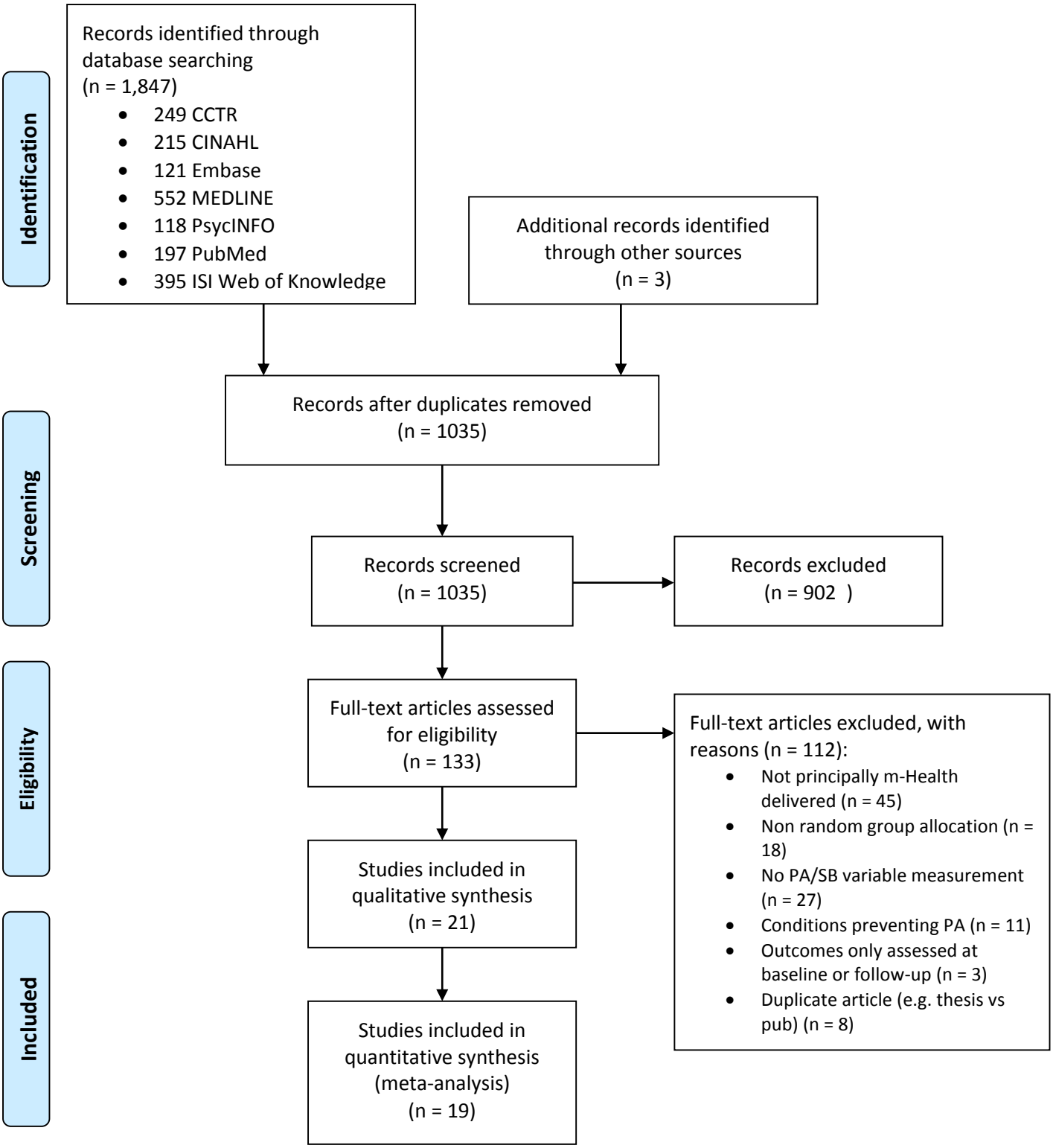

Figure 2 Risk of bias summary

Click here to download Figure Figure 2 - Risk of bias summary.png

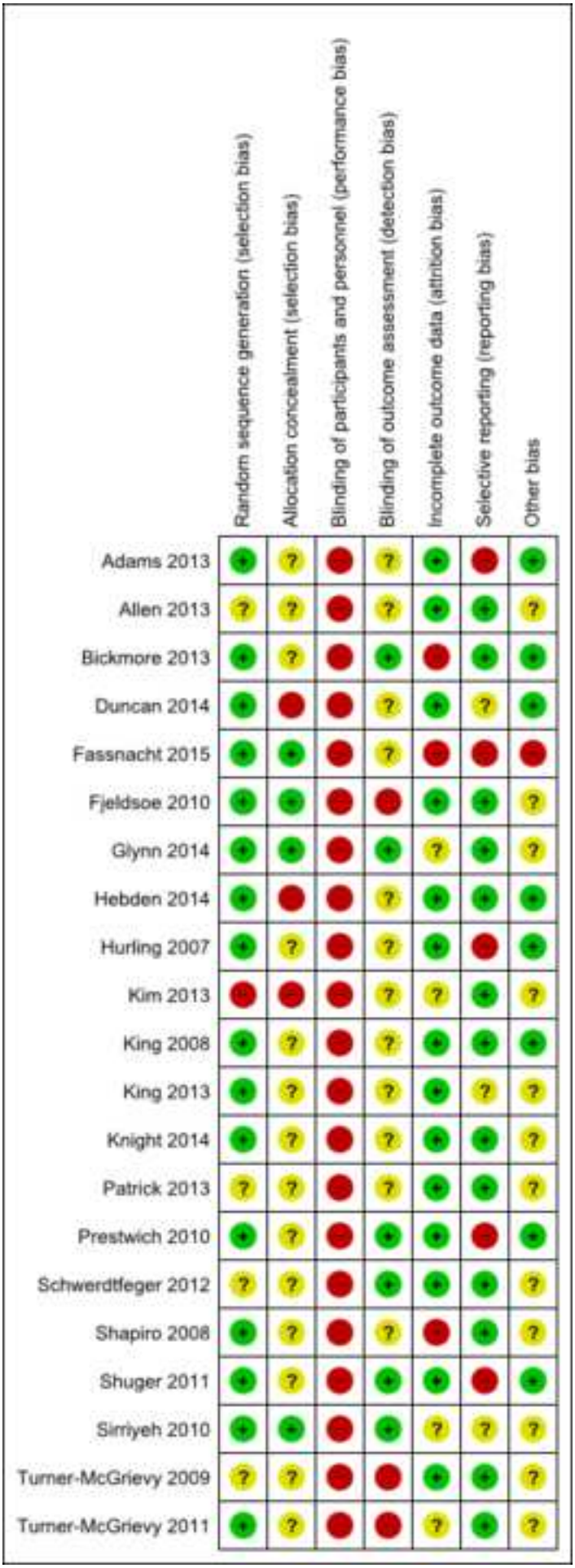

Figure 3 Forest plot PA

Click here to download Figure Figure 3 Forest plot PA.png

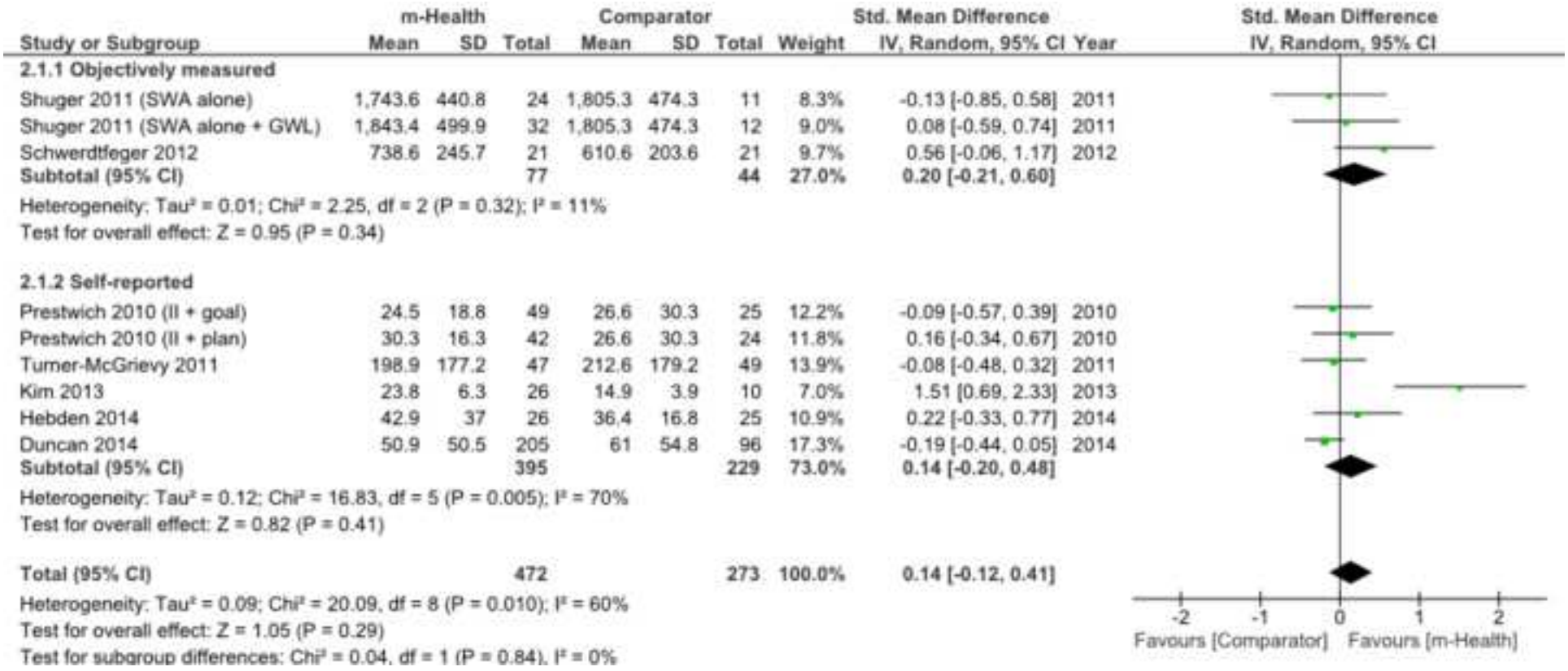

Figure 4 Forest plot MVPA

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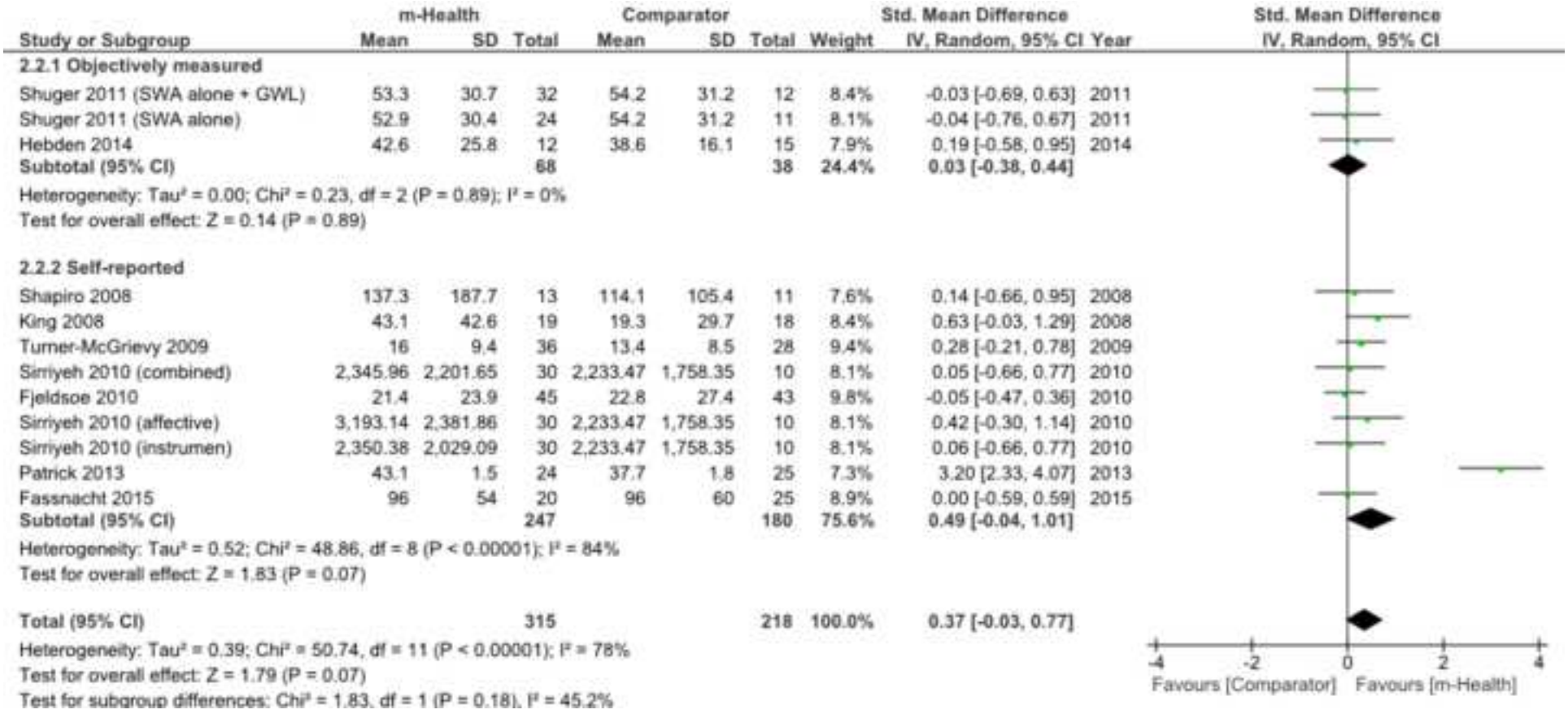

Figure 5 Forest plot Walking

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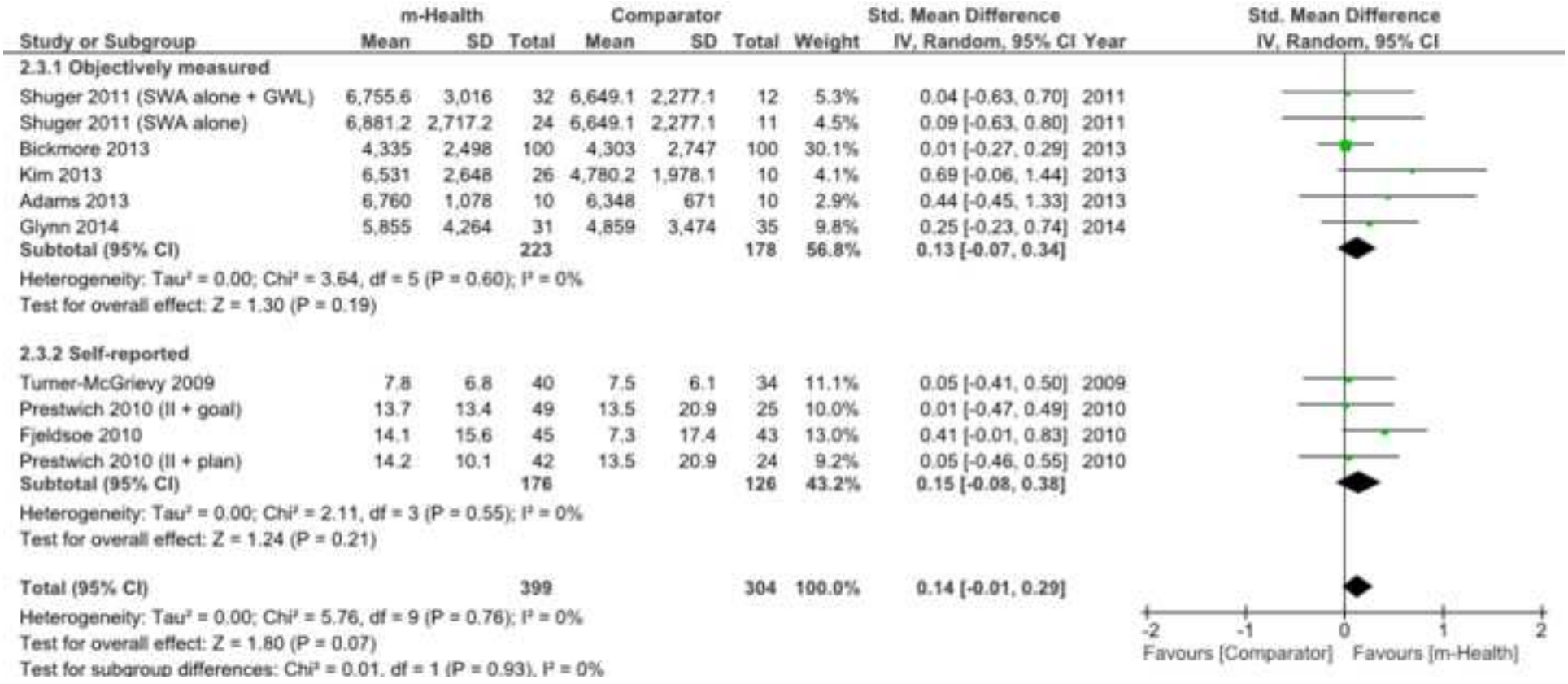

Figure 6 Forest plot SB

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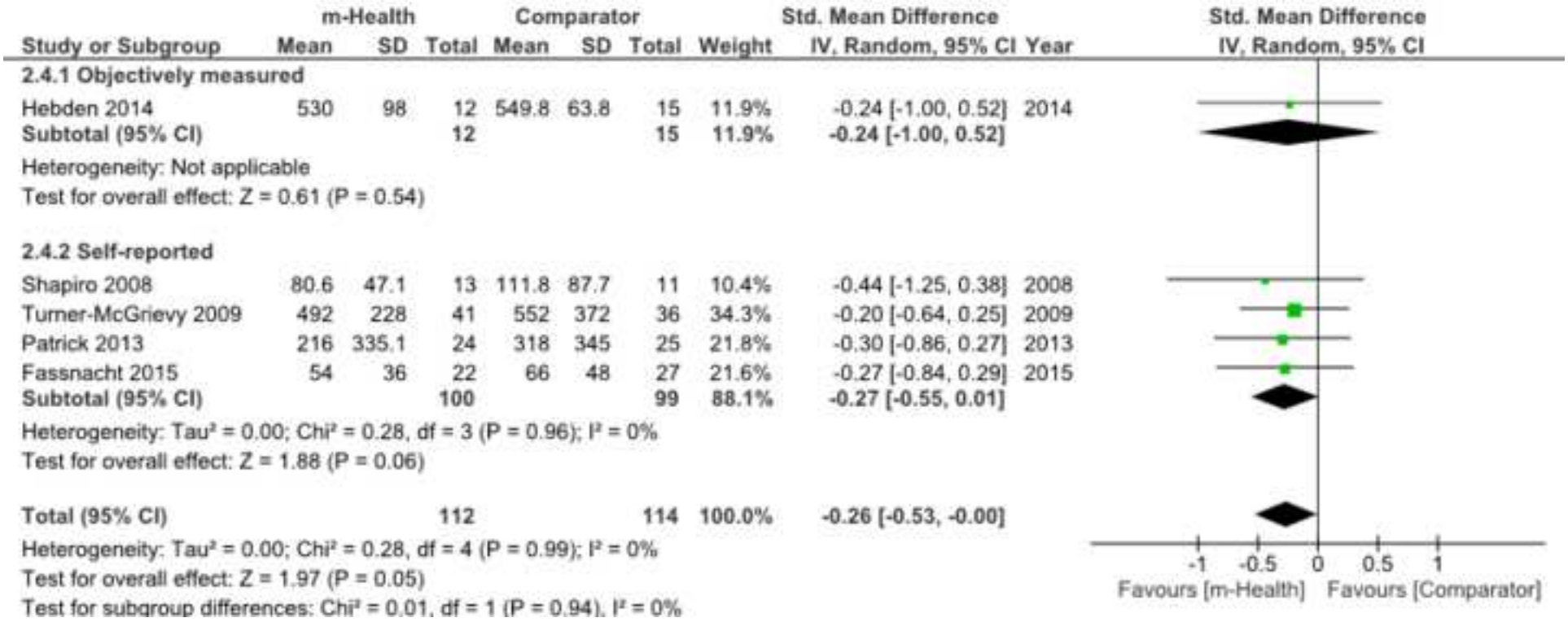

Table 1. Characteristics of intervention studies examining mHealth technologies to promote PA and reduce SB among free-living individuals, 2007-2015

Author, Year, Reference No.	N	Country	Design	Duration of study	PA/SB as Primary Outcome	Intervention Component(s)	Comparator	Intervention Frequency	Outcome	Outcome Measurement	Intention-to-Treat principle Analysis
Hurling, 2007	77	United Kingdom	Two arms RCT	9 weeks	Yes	Internet + SMS + actiwatch	Actiwatch only	Varied (as appropriate)	Overall PA and Leisure time PA (MET mins/week) (IPAQ-LF) + Sitting + MA Uniaxial accelerometer (wrist, 2min epochs/day)	SR + OB	Yes
King, AC, 2008	37	United States	Two arms RCT	8 weeks	Yes	PDA + Pedometer + printed materials	Standard educational printed materials	1 PDA assessment/day	MVPA (min/week) (CHAMPS)	SR	Yes
Shapiro, JR, 2008	24	United States	Three arms RCT (2 of interest)	8 weeks	No (acceptability)	Psychoeducational sessions + SMS + pedometer	Psychoeducational sessions + pedometer	1 session/week (total 3) + 2x SMS/day (1 self-monitoring + 1 feedback)	Exercise time + Screen time (not validated)	SR	No
Turner-McGrievy, 2009	77	United States	Two arms RCT	12 weeks	No (weight loss)	Theory-based podcast	Control podcast	2 podcasts/week	MVPA and Walking, (mins/week and days/week) (IPAQ-SF) + Sitting (hours/day)	SR	Yes
Fjeldsoe, 2010,	88	Australia	Two arms RCT	12 weeks	Yes	Consultation + printed materials + magnet + tailored SMS	Consultation + printed materials	3-5 SMS/week	MVPA and walking frequency (days/week) + MVPA and walking duration (min/week) (AWAS)	SR	Yes
Prestwich, 2010,	140	United Kingdom	Three arms RCT	4 weeks	Yes	Implementation intentions + SMS with plan reminders *OR* Implementation intention + SMS with goal reminders	Information on PA guidelines		No. days/week walked or exercised for ≥ 30 min (SWET)	SR	No
Sirriyeh, 2010,	120	United Kingdom	Four arms RCT	2 weeks	Yes	SMS affective *OR* SMS instrumental *OR* SMS combined	SMS neutral	1x SMS/day	MV MET min/week (IPAQ-SF)	SR	No
Shuger, SL, 2011	79	United States	Four arms RCT (3 of interest)	36 weeks	No (body weight)	SenseWear Armband & wrist watch alone *OR* SenseWear Armband + Group sessions	Standard care weight loss program manual + self-monitoring	Armband worn 16h/day, 7days/week; Group sessions 14x month 0-4 + 6x one-on-one	Steps/day, MVPA (mins/day), Total and MVPA EE (Kcal/day)(SenseWear Armband, tri-axial accelerometer)	OB	Yes

Author, Year, Reference No.	N	Country	Design	Duration of study	PA/SB as Primary Outcome	Intervention Component(s)	Comparator	Intervention Frequency	Outcome	Outcome Measurement	Intention-to-Treat principle Analysis
Turner-McGrievy, 2011	96	United States	Two arms RCT	24 weeks	No (weight loss)	Podcast + FatSecret's Calorie Counter App + Twitter	Podcast only + Printed material	telephone month 5-9 2 podcast/week month 0-3 + 2 minipodcasts/week months 3-6	PA EE (Kcals/day) (PPAQ)	SR	Yes
Schwerdtfeger AR, 2012	42	Austria	Three arms RCT (2 of interest)	1 week	Yes	Psychoeducational session + SMS	No intervention (besides PA assessment)	1x psychoeducational group session + 1 SMS/day	Uniaxial accelerometer (ankle) (counts/min)	OB	No
Adams, MA, 2013	20	United States	Two arms RCT	36 weeks	Yes	Adaptive intervention: SMS or email + pedometer	Static intervention: SMS or email + pedometer	1 SMS every 9 days; Adaptive intervention: new goal/day	Steps/day	OB	Yes
Allen, JK, 2013	43	United States	Four arms RCT	24 weeks	No (body weight)	Lose It! App *OR* Intensive counseling + Lose It! App *OR* Less intensive counseling + Lose It! App	Intensive counseling	App: as appropriate Intensive: 1x/week 0-1 month and 1x/2 weeks 2-6 months OR Less intensive: 2x/month 0-1 month and 1x/month 2-6 months	MVPA (hours/week) (Stanford 7-Day PA Recall)	SR	Yes (bu completers only reported)
Bickmore, TW, 2013	200	United States	Two arms RCT	8 weeks	Yes	Tablet with Embodied conversational agent (ECA) + pedometer	Pedometer + self-monitoring	1 "dialogue" with ECA/day	Steps/day	OB	Reports yes but appears completers only for step data
Kim, BH, 2013	36	United States	Two arms RCT	6 weeks	Yes	SMS + pedometer + printed material	Pedometer + printed material	3x, 3 days/week	Steps/day + total PA MET (Godin LTEQ)	OB + SR	Yes (but completers only reported)
King, AC, 2013	61	United States	Three arms RCT	8 weeks	Yes	Social app (social influence theory) *OR* Affective app (avatar) *OR* Analytical app (self-regulatory BCTs)	No comparator	Ad-libitum	Walking (min/week) + MVPA (min/week) (CHAMPS) + TV viewing (hours/day) (MOST)	SR	?

Author, Year, Reference No.	N	Country	Design	Duration of study	PA/SB as Primary Outcome	Intervention Component(s)	Comparator	Intervention Frequency	Outcome	Outcome Measurement	Intention-to-Treat principle Analysis
Patrick, K, 2013	49	United States	Four arms RCT (2 of interest)	52 weeks	No (BMI z-score)	Website + SMS	Printed materials + 3 group sessions	≥ 3x SMS/week	MVPA (min/week) (7-day PA recall interview) + SB (hours/day) (Robinson survey)	SR	Yes
Duncan, MJ, 2014	301	Australia	Two arms RCT	36 weeks	Yes	Website + mobile phone app with automated-feedback + interaction	Printed materials + self-monitoring	Ad-libitum	Total PA (min/week and sessions/week) (AAS)	SR	Yes ([1]completers only reported)
Fassnacht, D, 2015	49	Portugal	Two arms RCT	8 weeks	No (FV intake)	Educational sessions + SMS + pedometer	Group educational session	1 SMS prompt/day + reply	MVPA (hours/day) + Screen time (hours/day) (FEAHQ)	SR	No
Glynn, LG, 2014	66	Ireland	Two arms RCT	8 weeks	Yes	Accupedo-Pro Pedometer App + goal 10000 steps/day	Printed materials + goal walking 30min/day	Ad-libitum, carry phone during waking hours	Steps/day	OB	No
Hebden, L, 2014	51	Australia	Two arms RCT	12 weeks	No (body weight)	SMS + e-mails + research developed App + internet forum + printed materials	Printed materials	2 SMS + 2 e-mails/week + app to use ad-libitum	MVPA + LPA + Sedentary (min/day) + Total PA (min/week and MET-min/week) + Sitting (min/day) (Accelerometer GT1M + IPAQ)	OB + SR	Yes
Knight, E, 2014	45	Canada	Three arms RCT	12 weeks	Yes	Smartphone + pedometer + glucometer + blood pressure monitor to increase PA *OR* to decrease SB *OR* to increase PA and reduce SB	No comparator	Ad-libitum?	Steps/day	OB + SR	Yes

RCT: Randomized Controlled Trial; OB: objective; SR: Self-Reported; IPAQ: International Physical Activity Questionnaire; LF: Long-form; SF: Short-form; PDA: Portable-digital-assistant; SMS: Short Message Service; PA: Physical Activity; MVPA: Moderate-to-vigorous-intensity physical activity; MA: Moderate Activity; MV: Moderate-to-vigorous; MET: Metabolic Equivalent of Task; SB: Sedentary Behaviour; AWAS: Australian Women's Activity Survey; SWET: Self-Report Walking and Exercise Tables; PPAQ: Paffenbarger Physical Activity Questionnaire; LTEQ: Leisure Time Exercise Questionnaire; CHAMPS: Community Healthy Activities Model Program for Seniors; MOST: Measure of Older Adults' Sedentary Time; AAS: Active Australia Survey; FEAHQ: Family Eating and Activity Habits Questionnaire;

Electronic Supplementary Material 1 – Full specific search details per database

Databases:

Medline (OvidSP), PsycINFO (OvidSP), PubMed, ISI Web of Science, EBSCO CINAHL Plus, Embase (OvidSP), Cochrane databases: Central Register of Controlled Trials;

Search terms:

Search terms	
Intervention: m-Health Devices Technologies	1. Mobile device*; Handheld device*; PDA; Cellular phone*; Cell phone*; SMS; Short message service; text messag*; txt*; MMS; Multimedia message service; Mobile phone*; Mobile app*; Smartphone*; Smartphone app*; tablet computer*; iPad; iPod touch; Wireless technology; Wearable activity tracker; on-body mobile sensing; m-Health; mhealth; mobile health; telemedicine; telehealth;
	2. BodyMedia; Fitbit; LarkLife; Misfit Shine; Nike+ FuelBand; SYNC Burn; Up by Jawbone; Withings Pulse; Zamzee; AIRO band
(to account for studies using these technologies via mobile platforms)	3. ((Multimedia; Interactive media; Internet; Web; e-mail; Electronic mail) Pedometer*; Accelerometer*; gyroscope*; inclinometer*
(to account for types of intervention and settings)	4. Health Education; Patient education; Primary prevention; Health promotion; Behaviour Therapy; Cognitive Therapy; Primary Health Care; Workplace; Schools; Home; Program; Promotion; Education; Behaviour change
Outcomes: Physical Activity & Sedentary Behaviours	5. Physical activity; Exercise; Aerobic exercise; Physical fitness; Fitness; Active; Sedentar*; Inactiv*; Physical Exertion; Physical Education and Training; Sport*; Walk; Bicycle; Dancing; Exercise Therapy; Life style;
Design:	6. Randomized controlled trial; Random sample; Clinical trial; Quasi-Experimental Studies; placebo; trial; randomly; groups; crossover; factorial; allocation;

5 AND 4

(5 AND 4) AND 1

(5 AND 4 AND 1) OR 2

1 AND 3

(1 AND 3) AND (5 AND 4)

((5 AND 4 AND 1 OR 2) OR (1 AND 3 AND 5 AND 4)) AND 6

Database search strategies:

Database	#	Search Terms & Strategy
Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R)	01	exp Multimedia/
	02	Interactive media.mp.
	03	exp Cellular phone/
	04	mobile devices.mp.
	05	exp computers, handheld/
	06	exp Telemedicine/
	07	m-Health.mp.
	08	mhealth.mp.
	09	mobile health.mp.
	10	Telehealth.mp.
	11	exp internet/
	12	web.mp.
	13	exp electronic mail/
	14	SMS.mp.
	15	exp Text messaging/
	16	Short message service.mp.
	17	text messag*.mp.
/ = Subject heading;	18	txt.mp.
	19	MMS.mp.
.mp. = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier;	20	Multimedia message service.mp.
	21	Handheld device*.mp.
	22	Cell phone*.mp.
	23	Mobile phone*.mp.
	24	Mobile app*.mp.
	25	Smartphone*.mp.
	26	Smartphone app*.mp.
	27	tablet computer*.mp.
.tw. = Text Word includes Title (TI) and Abstract (AB);	28	iPad.mp.
	29	iPod touch.mp.
	30	exp Wireless Technology/
.sh. = MeSH Subject Heading - Medical Subject Headings used by indexers at the National Library of Medicine (NLM) to describe the content of an article. NLM's MeSH terms are organized in a hierarchy, or "tree" structure;	31	exp Monitoring, Ambulatory/
	32	exp Remote Sensing Technology/
	33	BodyMedia.mp.
	34	Fitbit.mp.
	35	LarkLife.mp.
	36	Misfit Shine.mp.
	37	Nike+ FuelBand.mp.
	38	SYNC Burn.mp.
.pt. – Publication Type classifications as reviews, clinical trials, directories and letters;	39	Up by Jawbone.mp.
	40	Withings Pulse.mp.
	41	Zamzee.mp.
	42	AIRO band.mp.
	43	Health Education/
	44	exp Health Promotion/
ADJn operator = records that contain your terms (in any order) within a specified number (n) of words of each other;	45	Primary prevention/
	46	Primary Health Care/
	47	Patient education as Topic/
	48	Behavior Therapy/
	49	Cognitive Therapy/
	50	Workplace/
	51	Schools/
	52	Home.mp.
* = unlimited right-hand truncation;	53	Program$.tw.
	54	Promot$.tw.
	55	Educat$.tw.
	56	Behavio?r change.mp.
	57	exp Motor activity/
	58	Physical Exertion/
	59	exp Exercise/
	60	exp Exercise Therapy/
	61	Physical fitness/
	62	exp "Physical Education and Training"/
	63	exp Sports/
	64	Dancing/
? = optional wild card stands for zero or one characters within a word or at the end of a word;	65	(physical$ adj5 (fit$ or train$ or activ$ or endur$ or exertion$)).tw.
	66	(exercis$ adj5 (train$ or physical$ or activ$)).tw.
	67	((exercise$ adj3 aerobic$) or aerobics).tw.
	68	sport$.tw.
	69	walk$.tw.
	70	Bicycl$.tw.

71	Sedentar*.mp.
72	exp Sedentary Lifestyle/
73	inactiv*.mp.
74	((lifestyle or life-style) adj5 physical$).tw.
75	((lifestyle or life-style) adj5 activ$).tw.
76	Randomized Controlled Trial.pt.
77	controlled clinical trial.pt.
78	randomi?ed.ab.
79	Randomly.ab.
80	Quasi-Experimental Stud*.mp.
81	Placebo.ab.
82	Trial.ab.
83	Groups.ab.
84	57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75
85	43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56
86	3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32
87	33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42
88	1 or 2 or 11 or 12 or 13
89	76 or 77 or 78 or 79 or 80 or 81 or 82 or 83
90	84 and 85
91	86 and 90
92	87 or 91
93	86 and 88
94	90 and 93
95	92 or 94
96	exp animals/ not humans.sh.
97	89 not 96
98	95 and 97

	Search Term	"Map Term to Subject Heading"	Database thesaurus info DECISION
Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R)	Multimedia	Multimedia/	exp Multimedia/
	Interactive media	Interactive tutorial/	Interactive media.mp
	Mobile devices	Cellular phone/; computers, handheld/	exp Cellular phone/ + mobile devices.mp.
	PDA	computers, handheld/	exp computers, handheld/
	Cellular Phone	Cellular phone/	(subject heading already included)
	m-Health	Telemedicine/	exp Telemedicine/ + m-Health.mp.
	mhealth	Telemedicine/	mhealth.mp.
	Mobile health	Telemedicine/	mobile health.mp.
	telemedicine	Telemedicine/	(subject heading already included)
	telehealth	Telemedicine/	Telehealth.mp.
	internet	Internet/	exp internet/
	web	Internet/	web.mp.
	e-mail	Electronic mail/	exp electronic mail/
	electronic mail	Electronic mail/	(subject heading already included)
	SMS		SMS.mp.
	Short message service	Text Messaging/	exp Text messaging/ + Short message service.mp.
	Text messag*	Text Messaging/	text messag*.mp.
	txt		txt.mp.
	MMS		MMS.mp.
	Multimedia message service	Text Messaging/; Cellular Phone/	Multimedia message service.mp.
	Handheld device*	Computers, handheld/	Handheld device*.mp.
	Cell phone*	Cellular phone/	Cell phone*.mp
	Mobile phone*	Cellular phone/	Mobile phone*.mp.
	Mobile app*	Cellular phone/; Computers, Handheld/; Software/; Medical Informatics Applications	Mobile app*.mp.
	Smartphone*.mp.	Cellular phone/; Computers, Handheld/;	Smartphone*.mp.
	Smartphone app*	Cellular phone/; Computers, Handheld/; Medical Informatics Applications/; Medical Informatics/	Smartphone app*.mp.

	tablet computer*	computers, handheld/	tablet computer*.mp.
	iPad	computers, handheld/	iPad.mp.
	iPod touch	computers, handheld/; Cellular Phone/	iPod touch.mp.
	Wireless Technology	Wireless Technology/	exp Wireless Technology/
	Wearable activity tracker	Monitoring, Ambulatory/; Telemedicine/	exp Monitoring, Ambulatory/
	sensing	Remote Sensing Technology/	exp Remote Sensing Technology
	Pedometer*	Monitoring, Ambulatory/	Pedometer*.mp.
	Accelerometer*	Accelerometry/	exp Accelerometry/ + Accelerometer*.mp.
	gyroscope*		gyroscope*.mp.
	inclinometer*		Inclinometer*.mp.
	BodyMedia	Monitoring, Ambulatory/; Life style/	BodyMedia.mp.
	Fitbit	Actigraphy/; Monitoring, Ambulatory/	exp Actigraphy/ + Fitbit.mp.
	LarkLife		LarkLife.mp.
	Misfit Shine		Misfit Shine.mp.
	Nike+ FuelBand		Nike+ FuelBand.mp.
	SYNC Burn		SYNC Burn.mp.
	Up by Jawbone		Up by Jawbone.mp.
	Withings Pulse		Withings Pulse.mp.
	Zamzee		Zamzee.mp.
	AIRO		AIRO.mp.
	Health Education	Health Education/	Health Education/
	Patient education	Patient education as Topic/	Patient education as Topic/
	Primary prevention	Primary prevention/	Primary prevention/
	Health promotion	Health Promotion/	exp Health Promotion/
	Behaviour Therapy	Behavior Therapy/	Behavior Therapy/
	Cognitive Therapy	Cognitive Therapy/	Cognitive Therapy/
	Primary Health Care	Primary Health Care/	Primary Health Care/
	Workplace	Workplace/	Workplace/
	Schools	Schools/	Schools/
	Home		Home.mp.
	Program	Healthy People Programs/ (already included if explode Health Promotion/	Program$.tw.
	Promotion	Health Promotion/	Promot$.tw.
	Education	Education/	Educat$.tw.
	Behaviour change	Health promotion/; Health education/	Behavio?r change.mp.
	Aerobic exercise	Exercise/	((exercise$ adj3 aerobic$) OR aerobics).tw.
	Physical Exertion	Physical Exertion/	Physical Exertion/
	Physical Education and Training;	Physical Education and Training/	exp Physical Education and Training/
	Physical activity	Motor activity/	Motor activity/ + (physical$ adj5 (fit$ OR train$ OR activ$ OR endur$ OR exertion$)).tw.
	Exercise	Exercise/	exp Exercise/ + (exercis$ adj5 (train$ OR physical$ OR activ$)).tw.
	Exercise Therapy	Exercise Therapy/	exp Exercise Therapy/
	Physical fitness	Physical fitness/	Physical fitness/
	Sport	Sports/	exp Sports/ + sport$.tw.
	Walk	Walking/	Walk$.tw.
	Bicycle	Bicycling/ (already includes in exploded Sports/)	Bicycl$.tw.
	Dancing	Dancing/	Dancing/
	Sedentar*	Exercise/	Sedentar*.mp.
	Inactivity	Sedentary Lifestyle/	exp Sedentary Lifestyle/ + inactiv*.mp.
	Life style	Life style/	((lifestyle OR life-style) adj5 physical$).tw. + ((lifestyle OR life-style) adj5 activ$).tw.
	Proof of concept		((proof adj concept) or (proof of adj concept)).mp.
	Pilot	Pilot projects/	exp Pilot projects/
	Usability		Usability.mp.
	acceptability		acceptability.mp.
	feasibility	Feasibility studies/	exp feasibility studies/
	evaluation	Evaluation Studies as Topic/	exp Evaluation Studies as Topic/
	Intervention	Intervention Studies/	exp Intervention Studies/
	Randomized controlled trial	Randomized Controlled Trial/	Randomized Controlled Trial.pt
	Controlled clinical trial		Controlled clinical trial.pt
	Random sample		randomi?ed.ab.
	Quasi-Experimental Stud*		Quasi-Experimental Stud*.mp.
	Placebo	Placebos/	Placebo.ab.

	Trial	Clinical Trial/; Controlled Clinical Trial/	Trial.ab.
	Randomly		Randomly.ab.
	groups		Groups.ab.

Database	#	Search Terms & Strategy
EBM Reviews - Cochrane Central Register of Controlled Trials	01	exp Multimedia/
	02	Interactive media.mp.
	03	exp Cellular phone/
	04	mobile devices.mp.
	05	exp computers, handheld/
	06	exp Telemedicine/
	07	m-Health.mp.
	08	mhealth.mp.
	09	mobile health.mp.
	10	Telehealth.mp.
	11	exp internet/
	12	web.mp.
	13	exp electronic mail/
	14	SMS.mp.
	15	exp Text messaging/
	16	Short message service.mp.
	17	text messag*.mp.
	18	txt.mp.
/ = Subject heading;	19	MMS.mp.
	20	Multimedia message service.mp.
.mp. = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier;	21	Handheld device*.mp.
	22	Cell phone*.mp.
	23	Mobile phone*.mp.
	24	Mobile app*.mp.
	25	Smartphone*.mp.
	26	Smartphone app*.mp.
	27	tablet computer*.mp.
.tw. = Text Word includes Title (TI) and Abstract (AB);	28	iPad.mp.
	29	iPod touch.mp.
.sh. = MeSH Subject Heading - Medical Subject Headings used by indexers at the National Library of Medicine (NLM) to describe the content of an article. NLM's MeSH terms are organized in a hierarchy, or "tree" structure;	30	exp Wireless Technology/
	31	exp Monitoring, Ambulatory/
	32	exp Remote Sensing Technology/
	33	BodyMedia.mp.
	34	Fitbit.mp.
	35	LarkLife.mp.
	36	Misfit Shine.mp.
	37	Nike+ FuelBand.mp.
.pt. – Publication Type classifications as reviews, clinical trials, directories and letters;	38	SYNC Burn.mp.
	39	Up by Jawbone.mp.
	40	Withings Pulse.mp.
	41	Zamzee.mp.
	42	AIRO band.mp.
ADJn operator = records that contain your terms (in any order) within a specified number (n) of words of each other;	43	Health Education/
	44	exp Health Promotion/
	45	Primary prevention/
	46	Primary Health Care/
	47	Patient education as Topic/
* = unlimited right-hand truncation;	48	Behavior Therapy/
	49	Cognitive Therapy/
	50	Workplace/
? = optional wild card stands for zero or one characters within a word or at the end of a word;	51	Schools/
	52	Home.mp.
	53	Program$.tw.
	54	Promot$.tw.
	55	Educat$.tw.
	56	Behavio?r change.mp.
	57	exp Motor activity/
	58	Physical Exertion/
	59	exp Exercise/
	60	exp Exercise Therapy/
	61	Physical fitness/
	62	exp "Physical Education and Training"/
	63	exp Sports/
	64	Dancing/
	65	(physical$ adj5 (fit$ or train$ or activ$ or endur$ or exertion$)).tw.
	66	(exercis$ adj5 (train$ or physical$ or activ$)).tw.
	67	((exercise$ adj3 aerobic$) or aerobics).tw.
	68	sport$.tw.
	69	walk$.tw.
	70	Bicycl$.tw.

71	Sedentar*.mp.
72	exp Sedentary Lifestyle/
73	inactiv*.mp.
74	((lifestyle or life-style) adj5 physical$).tw.
75	((lifestyle or life-style) adj5 activ$).tw.
76	57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75
77	43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56
78	3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32
79	33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42
80	1 or 2 or 11 or 12 or 13
81	76 and 77
82	78 and 81
83	79 or 82
84	78 and 80
85	81 and 84
86	83 or 85

		"Map Term to Subject Heading"	Database thesaurus info DECISION
EBM Reviews - Cochrane Central Register of Controlled Trials	Multimedia	Multimedia/	exp Multimedia/
	Interactive media	Interactive tutorial/	Interactive media.mp
	Mobile devices	Cellular phone/; computers, handheld/	exp Cellular phone/ + mobile devices.mp.
	PDA	computers, handheld/	exp computers, handheld/
	Cellular Phone	Cellular phone/	(subject heading already included)
	m-Health	Telemedicine/	exp Telemedicine/ + m-Health.mp.
	mhealth	Telemedicine/	mhealth.mp.
	Mobile health	Telemedicine/	mobile health.mp.
	telemedicine	Telemedicine/	(subject heading already included)
	telehealth	Telemedicine/	Telehealth.mp.
	internet	Internet/	exp internet/
	web	Internet/	web.mp.
	e-mail	Electronic mail/	exp electronic mail/
	electronic mail	Electronic mail/	(subject heading already included)
	SMS		SMS.mp.
	Short message service	Text Messaging/	exp Text messaging/ + Short message service.mp.
	Text messag*	Text Messaging/	text messag*.mp.
	txt		txt.mp.
	MMS		MMS.mp.
	Multimedia message service	Text Messaging/; Cellular Phone/	Multimedia message service.mp.
	Handheld device*	Computers, handheld/	Handheld device*.mp.
	Cell phone*	Cellular phone/	Cell phone*.mp
	Mobile phone*	Cellular phone/	Mobile phone*.mp.
	Mobile app*	Cellular phone/; Computers, Handheld/; Software/; Medical Informatics Applications	Mobile app*.mp.
	Smartphone*.mp.	Cellular phone/; Computers, Handheld/;	Smartphone*.mp.
	Smartphone app*	Cellular phone/; Computers, Handheld/; Medical Informatics Applications/; Medical Informatics/	Smartphone app*.mp.
	tablet computer*	computers, handheld/	tablet computer*.mp.
	iPad	computers, handheld/	iPad.mp.
	iPod touch	computers, handheld/; Cellular Phone/	iPod touch.mp.
	Wireless Technology	Wireless Technology/	exp Wireless Technology/
	Wearable activity tracker	Monitoring, Ambulatory/; Telemedicine/	exp Monitoring, Ambulatory/
	sensing	Remote Sensing Technology/	exp Remote Sensing Technology
	Pedometer*	Monitoring, Ambulatory/	Pedometer*.mp.
	Accelerometer*	Accelerometry/	exp Accelerometry/ + Accelerometer*.mp.
	gyroscope*		gyroscope*.mp.
	inclinometer*		Inclinometer*.mp.
	BodyMedia	Monitoring, Ambulatory/; Life style/	BodyMedia.mp.
	Fitbit	Actigraphy/; Monitoring, Ambulatory/	exp Actigraphy/ + Fitbit.mp.
	LarkLife		LarkLife.mp.
	Misfit Shine		Misfit Shine.mp.
	Nike+ FuelBand		Nike+ FuelBand.mp.
	SYNC Burn		SYNC Burn.mp.
	Up by Jawbone		Up by Jawbone.mp.
	Withings Pulse		Withings Pulse.mp.
	Zamzee		Zamzee.mp.
	AIRO		AIRO.mp.
	Health Education	Health Education/	Health Education/
	Patient education	Patient education as Topic/	Patient education as Topic/
	Primary prevention	Primary prevention/	Primary prevention/
	Health promotion	Health Promotion/	exp Health Promotion/
	Behaviour Therapy	Behavior Therapy/	Behavior Therapy/
	Cognitive Therapy	Cognitive Therapy/	Cognitive Therapy/
	Primary Health Care	Primary Health Care/	Primary Health Care/
	Workplace	Workplace/	Workplace/
	Schools	Schools/	Schools/
	Home		Home.mp.
	Program	Healthy People Programs/ (already included if explode Health Promotion/	Program$.tw.
	Promotion	Health Promotion/	Promot$.tw.
	Education	Education/	Educat$.tw.
	Behaviour change	Health promotion/; Health education/	Behavio?r change.mp.
	Aerobic exercise	Exercise/	((exercise$ adj3 aerobic$) OR aerobics).tw.
	Physical Exertion	Physical Exertion/	Physical Exertion/

	Physical Education and Training;	Physical Education and Training/	exp Physical Education and Training/
	Physical activity	Motor activity/	Motor activity/ + (physical$ adj5 (fit$ OR train$ OR activ$ OR endur$ OR exertion$)).tw.
	Exercise	Exercise/	exp Exercise/ + (exercis$ adj5 (train$ OR physical$ OR activ$)).tw.
	Exercise Therapy	Exercise Therapy/	exp Exercise Therapy/
	Physical fitness	Physical fitness/	Physical fitness/
	Sport	Sports/	exp Sports/ + sport$.tw.
	Walk	Walking/	Walk$.tw.
	Bicycle	Bicycling/ (already includes in exploded Sports/)	Bicycl$.tw.
	Dancing	Dancing/	Dancing/
	Sedentar*	Exercise/	Sedentar*.mp.
	Inactivity	Sedentary Lifestyle/	exp Sedentary Lifestyle/ + inactiv*.mp.
	Life style	Life style/	((lifestyle OR life-style) adj5 physical$).tw. + ((lifestyle OR life-style) adj5 activ$).tw.
	Proof of concept		
	Pilot		
	Usability		
	acceptability		
	feasibility		
	evaluation		
	Intervention		
	Randomized controlled trial		
	Controlled clinical trial		
	Random sample		
	Quasi-Experimental Stud*		
	Placebo		
	Trial		
	Randomly		
	groups		

Database	#	Search Terms & Strategy
Embase Classic+Embase OvidSP	01	exp Multimedia/
	02	Interactive media.mp.
	03	exp mobile phone/
	04	mobile devices.mp.
	05	exp microcomputer/
	06	Telemedicine/
	07	m-Health.mp.
	08	mhealth.mp.
	09	mobile health.mp.
	10	exp Telehealth/
	11	exp internet/
	12	web.mp.
	13	exp e-mail/
	14	SMS.mp.
	15	exp Text messaging/
	16	Short message service.mp.
	17	text messag*.mp.
/ = Subject heading;	18	txt.mp.
	19	MMS.mp.
.mp. = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier;	20	Multimedia message service.mp.
	21	Handheld device*.mp.
	22	Cell phone*.mp.
	23	Mobile phone*.mp.
	24	Mobile app*.mp.
	25	Smartphone*.mp.
	26	Smartphone app*.mp.
.tw. = Text Word includes Title (TI) and Abstract (AB);	27	tablet computer*.mp.
	28	iPad.mp.
	29	iPod touch.mp.
.sh. = MeSH Subject Heading - Medical Subject Headings used by indexers at the National Library of Medicine (NLM) to describe the content of an article. NLM's MeSH terms are organized in a hierarchy, or "tree" structure;	30	exp wireless communication/
	31	exp Monitoring, Ambulatory/
	32	exp biosensor/
	33	exp Remote Sensing/
	34	BodyMedia.mp.
	35	Fitbit.mp.
	36	LarkLife.mp.
	37	Misfit Shine.mp.
.pt. – Publication Type classifications as reviews, clinical trials, directories and letters;	38	Nike+ FuelBand.mp.
	39	SYNC Burn.mp.
	40	Up by Jawbone.mp.
	41	Withings Pulse.mp.
	42	Zamzee.mp.
ADJn operator = records that contain your terms (in any order) within a specified number (n) of words of each other;	43	AIRO band.mp.
	44	Health Education/
	45	Health Promotion/
	46	Primary prevention/
	47	Primary Health Care/
* = unlimited right-hand truncation;	48	Patient education/
	49	Behavior Therapy/
	50	Cognitive Therapy/
	51	Workplace/
? = optional wild card stands for zero or one characters within a word or at the end of a word;	52	School/
	53	Home/
	54	Program*.tw.
	55	Promot*.tw.
	56	Educat*.tw.
	57	exp Behavior change/
	58	exp "Physical activity, capacity and performance"/
	59	exp kinesiotherapy/
	60	fitness/
	61	Physical Education/
	62	exp Sports/
	63	Dancing/
	64	(physical* adj5 (fit* or train* or activ* or endur* or exert*)).tw.
	65	(exercise* adj5 (train* or physical* or active*)).tw.
	66	((exercise* adj3 aerobic*) or aerobic*).tw.
	67	sport*.tw.
	68	walk*.tw.
	69	Bicycl*.tw.
	70	Sedentar*.mp.

71	Sedentary Lifestyle/
72	inactiv*.mp.
73	((lifestyle or life-style) adj5 physical*).tw.
74	((lifestyle or life-style) adj5 activ*).tw.
75	Randomized Controlled Trial/
76	controlled clinical trial/
77	Random$.tw.
78	allocat$.tw.
79	Quasi Experimental Stud$.tw.
80	factorial$.tw.
81	cross over$.tw.
82	crossover$.tw.
83	cross-over$.tw.
84	Placebo$.tw.
85	(doubl$ adj blind$).tw.
86	(singl$ adj blind$).tw.
87	assign$.tw.
88	volunteer$.tw.
89	Crossover procedure/
90	58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74
91	44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57
92	3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33
93	34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43
94	1 or 2 or 11 or 12 or 13
95	75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89
96	90 and 91
97	92 and 96
98	93 or 97
99	92 and 94
100	96 and 99
101	(animal/ or nonhuman/) not human/
102	95 not 101
103	100 and 102

Embase Classic+Embase OvidSP	Search Term	"Map Term to Subject Heading"	Database thesaurus info DECISION
	Multimedia	Multimedia/	exp Multimedia/
	Interactive media		Interactive media.mp
	Mobile devices	mobile phone/	exp mobile phone/ + mobile devices.mp.
	PDA	microcomputer/ (used for handheld computer)	exp microcomputer/
	Cellular Phone	mobile phone/	(subject heading already included)
	m-Health	Telemedicine/	Telemedicine/ + m-Health.mp.
	mhealth	Telemedicine/	mhealth.mp.
	Mobile health	Telemedicine/	mobile health.mp.
	telemedicine	Telemedicine/	(subject heading already included)
	telehealth	Telehealth/	exp Telehealth/
	internet	Internet/	exp internet/
	web	Internet/	web.mp.
	e-mail	e-mail/	exp e-mail/
	electronic mail	e-mail/	(subject heading already included)
	SMS		SMS.mp.
	Short message service	Text Messaging/	exp Text messaging/ + Short message service.mp.
	Text messag*	Text Messaging/	text messag*.mp.
	txt		txt.mp.
	MMS		MMS.mp.
	Multimedia message service	Text Messaging/; Mobile Phone/	Multimedia message service.mp.
	Handheld device*	microcomputer/	Handheld device*.mp.
	Cell phone*	mobile phone/; telephone/	Cell phone*.mp
	Mobile phone*	mobile phone/	Mobile phone*.mp.
	Mobile app*	mobile phone/; microcomputer/; Medical Informatics/	Mobile app*.mp.
	Smartphone*	mobile phone/; microcomputer/	Smartphone*.mp.
	Smartphone app*	mobile phone/; microcomputer/; Medical Informatics/ ; wireless communication/	Smartphone app*.mp.
	tablet computer*	microcomputer/	tablet computer*.mp.
	iPad	microcomputer/	iPad.mp.
	iPod touch	microcomputer/	iPod touch.mp.
	Wireless Technology	wireless communication/	exp wireless communication/
	Wearable activity tracker	Ambulatory monitoring/; biosensor/	exp Monitoring, Ambulatory/ + exp biosensor/
	Remote sensing	Remote Sensing/	exp Remote Sensing/
	Pedometer*		
	Accelerometer*		
	gyroscope*		
	inclinometer*		
	BodyMedia	Actimetry/; Lifestyle/	BodyMedia.mp.
	Fitbit	Actimetry/;accelerometer/; monitoring/	Fitbit.mp.
	LarkLife		LarkLife.mp.
	Misfit Shine		Misfit Shine.mp.
	Nike+ FuelBand		Nike+ FuelBand.mp.
	SYNC Burn		SYNC Burn.mp.
	Up by Jawbone		Up by Jawbone.mp.
	Withings Pulse		Withings Pulse.mp.
	Zamzee		Zamzee.mp.
	AIRO band		AIRO band.mp.
	Health Education	Health Education/	Health Education/
	Patient education	Patient education/	Patient education/
	Primary prevention	Primary prevention/	Primary prevention/
	Health promotion	Health promotion/	Health Promotion/
	Behaviour Therapy	Behavior Therapy/	Behavior Therapy/
	Cognitive Therapy	Cognitive Therapy/	Cognitive Therapy/
	Primary Health Care	Primary Health Care/	Primary Health Care/
	Workplace	Workplace/	Workplace/
	School	School/	School/
	Home	Home/	Home/
	Program	Education program/; health program/	Program*.tw.
	Promotion	Health Promotion/	Promot*.tw.
	Education	Education/	Educat*.tw.
	Behaviour change	Behavior change/	exp Behavior change/
	Exercise	Exercise/; Physical activity, capacity and performance/ is a broader term	(exercise* adj5 (train* OR physical* OR active*)).tw.
	Aerobic exercise	Exercise/; Aerobic exercise/	((exercise* adj3 aerobic*) OR aerobic*).tw.

	Physical fitness	fitness/	fitness/
	Physical Exertion	Exercise/	
	Physical Education	Physical Education/	Physical Education/
	Physical activity	Physical activity, capacity and performance/	exp Physical activity, capacity and performance/ + (physical* adj5 (fit* OR train* OR activ* OR endur* OR exert*)).tw.
	Exercise Therapy	kinesiotherapy/	exp kinesiotherapy/
	Sport	Sports/	exp Sports/ + sport*.tw.
	Walk	Walking/	Walk*.tw.
	Bicycle	Bicycling/	Bicycl*.tw.
	Dancing	Dancing/	Dancing/
	Sedentar*	Sedentary lifestyle/; lifestyle/	Sedentary lifestyle/ + Sedentar*.mp.
	Inactivity	Physical activity/	inactiv*.mp.
	Life style	Lifestyle/	((lifestyle OR life-style) adj5 physical*).tw. + ((lifestyle OR life-style) adj5 activ*).tw.
	Proof of concept		
	Pilot		
	Usability		
	acceptability		
	feasibility		
	evaluation		
	Intervention		
	Randomized controlled trial	Randomized Controlled Trial/	Randomized Controlled Trial/
	Controlled clinical trial	Controlled clinical trial/ (randomized controlled trial is a narrower term)	Controlled clinical trial/
	Random sample	Random sample/	Random$.tw. + allocat$.tw.
	Quasi-Experimental Study	Quasi Experimental Study/	Quasi Experimental Stud$.tw. + factorial$.tw. + crossover$.tw. + cross over$.tw. + cross-over$.tw.
	Placebo	Placebo/	Placebo$.tw.
	Trial	Controlled Clinical Trial/	(doubl$ adj blind$).tw. + (singl$ adj blind$).tw. + assign$.tw. + volunteer$.tw.
	Crossover procedure	Crossover procedure/	Crossover procedure/

Database		#	Search Terms & Strategy
PsycINFO OvidSP	/ = Subject heading; .mp. = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier; .tw. = Text Word includes Title (TI) and Abstract (AB); .sh. = MeSH Subject Heading - Medical Subject Headings used by indexers at the National Library of Medicine (NLM) to describe the content of an article. NLM's MeSH terms are organized in a hierarchy, or "tree" structure; .pt. – Publication Type classifications as reviews, clinical trials, directories and letters; ADJn operator = records that contain your terms (in any order) within a specified number (n) of words of each other; * = unlimited right-hand truncation; ? = optional wild card stands for zero or one characters within a word or at the end of a word;	01	exp Multimedia/
		02	Human Computer Interaction/
		03	Interactive media.mp.
		04	exp mobile devices/
		05	exp microcomputers/
		06	exp Telemedicine/
		07	m-Health.mp.
		08	mhealth.mp.
		09	mobile health.mp.
		10	Telehealth.mp.
		11	exp internet/
		12	Websites/
		13	web.mp.
		14	Computer mediated communication/
		15	e-mail.mp.
		16	SMS.mp.
		17	exp Electronic Communication/
		18	Short message service.mp.
		19	text messag*.mp.
		20	txt.mp.
		21	MMS.mp.
		22	Multimedia message service.mp.
		23	Handheld device*.mp.
		24	Cell phone*.mp.
		25	Mobile phone*.mp.
		26	Mobile app*.mp.
		27	Smartphone*.mp.
		28	Smartphone app*.mp.
		29	tablet computer*.mp.
		30	iPad.mp.
		31	iPod touch.mp.
		32	Wireless Technology.mp.
		33	Wearable activity tracker.mp.
		34	Remote Sensing.mp.
		35	BodyMedia.mp.
		36	Fitbit.mp.
		37	LarkLife.mp.
		38	Misfit Shine.mp.
		39	Nike+ FuelBand.mp.
		40	SYNC Burn.mp.
		41	Up by Jawbone.mp.
		42	Withings Pulse.mp.
		43	Zamzee.mp.
		44	AIRO band.mp.
		45	Health Education/
		46	Health Promotion/
		47	prevention/
		48	Primary Health Care/
		49	Client education/
		50	Behavior Therapy/
		51	Cognitive Therapy/
		52	cognitive behavior therapy/
		53	Workplace*.tw.
		54	Schools/
		55	Home*.tw.
		56	Program*.tw.
		57	Promot*.tw.
		58	Educat*.tw.
		59	exp Behavior change/
		60	exp Exercise/
		61	(exercis* adj5 (train* or physical* or activ*)).tw.
		62	((exercise* adj3 aerobic*) or aerobic*).tw.
		63	Physical fitness/
		64	Physical Education/
		65	Physical activity/
		66	(physical* adj5 (fit* or train* or activ* or endur* or exert*)).tw.
		67	exp Sports/
		68	sport*.tw.
		69	walk*.tw.
		70	Bicycl*.tw.

71	Sedentar*.mp.
72	inactiv*.mp.
73	((lifestyle or life-style) adj5 physical*).tw.
74	((lifestyle or life-style) adj5 activ*).tw.
75	Clinical trials/
76	Random*.tw.
77	allocat*.tw.
78	Quasi Experimental Stud*.tw.
79	factorial*.tw.
80	cross over*.tw.
81	crossover*.tw.
82	cross-over*.tw.
83	Placebo*.tw.
84	Trial.ab.
85	(doubl* adj blind*).tw.
86	(singl* adj blind*).tw.
87	assign*.tw.
88	volunteer*.tw.
89	groups.ab.
90	60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74
91	45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59
92	1 or 2 or 3 or 11 or 12 or 13 or 14 or 15
93	35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44
94	4 or 5 or 6 or 7 or 8 or 9 or 10 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
95	75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89
96	90 and 91
97	94 and 96
98	93 or 97
99	92 and 94
100	96 and 99
101	98 or 100
102	95 and 101

	Search Term	"Map Term to Subject Heading"	Database thesaurus info DECISION
PsycINFO OvidSP	Multimedia	Multimedia/	exp Multimedia/
	Interactive media	Human Computer Interaction/;	Human Computer Interaction/ + Interactive media.mp.
	Mobile devices	Mobile Devices/	exp mobile devices/
	PDA	microcomputers/	exp microcomputers/
	Cellular Phone	Cellular Phones/	(mobile devices/ is a broader term)
	m-Health	Telemedicine/	exp Telemedicine/ + m-Health.mp.
	mhealth	Telemedicine/	mhealth.mp.
	Mobile health	Telemedicine/	mobile health.mp.
	telemedicine	Telemedicine/	(subject heading already included)
	telehealth	Telemedicine/	Telehealth.mp.
	internet	Internet/	exp internet/
	web	Internet/; websites/	Websites/ + web.mp.
	e-mail	Computer mediated communication/	Computer mediated communication/ + e-mail.mp.
	electronic mail	Computer mediated communication/	(subject heading already included)
	SMS		SMS.mp.
	Short message service	Electronic Communication/	exp Electronic Communication/ + Short message service.mp.
	Text messag*		text messag*.mp.
	txt	Electronic Communication/	txt.mp.
	MMS		MMS.mp.
	Multimedia message service		Multimedia message service.mp.
	Handheld device*	mobile devices/	Handheld device*.mp.
	Cell phone*	Cellular Phones/	Cell phone*.mp
	Mobile phone*	Cellular Phones/	Mobile phone*.mp.
	Mobile app*	Cellular Phones/; mobile devices/	Mobile app*.mp.
	Smartphone*	Cellular Phones/; mobile devices/	Smartphone*.mp.
	Smartphone app*	mobile phone/; microcomputer/; Medical Informatics/ ; wireless communication/	Smartphone app*.mp.
	tablet computer*	Human Computer Interaction/	tablet computer*.mp.
	iPad	Computer Assisted Instruction/	iPad.mp.
	iPod touch	Mobile Devices/	iPod touch.mp.
	Wireless Technology	Telemedicine/	Wireless Technology.mp.
	Wearable activity tracker		Wearable activity tracker.mp.
	Remote sensing		Remote Sensing.mp.
	Pedometer*		
	Accelerometer*		
	gyroscope*		
	inclinometer*		
	BodyMedia		BodyMedia.mp.
	Fitbit		Fitbit.mp.
	LarkLife		LarkLife.mp.
	Misfit Shine		Misfit Shine.mp.
	Nike+ FuelBand		Nike+ FuelBand.mp.
	SYNC Burn		SYNC Burn.mp.
	Up by Jawbone		Up by Jawbone.mp.
	Withings Pulse		Withings Pulse.mp.
	Zamzee		Zamzee.mp.
	AIRO band		AIRO band.mp.
	Health Education	Health Education/	Health Education/
	Patient education	Client education/	Client education/
	Primary prevention	Prevention/	prevention/
	Health promotion	Health promotion/	Health Promotion/
	Behaviour Therapy	Behavior Therapy/	Behavior Therapy/
	Cognitive Therapy	Cognitive Therapy/; cognitive behavior therapy/	Cognitive Therapy/ + cognitive behavior therapy/
	Primary Health Care	Primary Health Care/	Primary Health Care/
	Workplace		Workplace*.tw.
	School	Schools/	Schools/
	Home		Home*.tw.
	Program		Program*.tw.
	Promotion	Health Promotion/	Promot*.tw.
	Education	Education/	Educat*.tw.
	Behaviour change	Behavior change/	exp Behavior change/

	Exercise	Exercise/; Physical activity, capacity and performance/ is a broader term	exp Exercise/ + (exercis* adj5 (train* OR physical* OR activ*)).tw.
	Aerobic exercise	Exercise/; Aerobic exercise/ is a narrower term	((exercise* adj3 aerobic*) OR aerobic*).tw.
	Physical fitness	Physical fitness/	Physical fitness/
	Physical Education	Physical Education/	Physical Education/
	Physical activity	Physical activity/	Physical activity/ + (physical* adj5 (fit* OR train* OR activ* OR endur* OR exert*)).tw.
	Sport	Sports/	exp Sports/ + sport*.tw.
	Walk	Walking/	Walk*.tw.
	Bicycle		Bicycl*.tw.
	Dancing	Dance/	
	Sedentar*	lifestyle/	Sedentar*.mp.
	Inactivity	Activity Level/	inactiv*.mp.
	Life style	Lifestyle/	((lifestyle OR life-style) adj5 physical*).tw. + ((lifestyle OR life-style) adj5 activ*).tw.
	Proof of concept		
	Pilot		
	Usability		
	acceptability		
	feasibility		
	evaluation		
	Intervention		
	Randomized controlled trial	Clinical trials/	Clinical trials/
	Controlled clinical trial	Clinical trials/	
	Random sample	Random sampling/	Random*.tw. + allocat*.tw.
	Quasi-Experimental Study		Quasi Experimental Stud*.tw. + factorial*.tw. + crossover*.tw. + cross over*.tw. + cross-over*.tw.
	Placebo	Placebo/	Placebo*.tw.
	Trial		Trial.ab. + (doubl* adj blind*).tw. + (singl* adj blind*).tw. + assign*.tw. + volunteer*.tw. + groups.ab.

Database	#	Search Terms & Strategy
CINAHL Plus with Full Text EBSCO / = Subject heading; TX = All Text TI = Title AB = Abstract MH Exact Subject Heading Near Operator (N) - N5 finds the words if they are within five words of one another regardless of the order in which they appear. Within Operator (W) finds the words if they are within x words of one another and in the order in which you entered them. * = unlimited right-hand truncation; ? = optional wild card stands for zero or one characters within a word or at the end of a word; MH “xxxxx+” = explode term PT = publication type	01	(MH "Multimedia")
	02	"interactive media"
	03	"mobile devices"
	04	(MH "Computers, Hand-Held")
	05	(MH "Wireless Communications")
	06	"m-Health"
	07	"mhealth"
	08	"Mobile health"
	09	(MH "Telemedicine+")
	10	(MH "Telehealth+")
	11	(MH "Internet+")
	12	"web"
	13	(MH "Electronic Mail")
	14	"email"
	15	"SMS"
	16	(MH "Text Messaging")
	17	"short message service"
	18	"Text messag*"
	19	"txt"
	20	"MMS"
	21	"Multimedia message service"
	22	"Handheld device*"
	23	"Cell phone*"
	24	"Mobile phone*"
	25	"Mobile app*"
	26	"Smartphone*"
	27	"Smartphone app*"
	28	(MH "Computers, Portable+")
	29	"tablet computer*"
	30	"iPad"
	31	"iPod touch"
	32	"Wireless Technology"
	33	"Wearable activity tracker"
	34	"Remote sensing"
	35	"BodyMedia"
	36	"Fitbit"
	37	"LarkLife"
	38	"Misfit Shine"
	39	"Nike+ FuelBand"
	40	"SYNC Burn"
	41	"Up by Jawbone"
	42	"Withings Pulse"
	43	"Zamzee"
	44	"AIRO band"
	45	(MH "Health Education")
	46	(MH "Patient Education")
	47	(MH "Primary Health Care")
	48	(MH "Health Promotion")
	49	(MH "Behavior Therapy+")
	50	(MH "Work Environment")
	51	(MH "Schools")
	52	"Home"
	53	(TI promot* OR educat* OR program*) OR (AB promot* OR educat* OR program*)
	54	(MH "Behavioral Changes")
	55	(MH "Exercise+")
	56	(TI exercis* N5 (train* OR physical* OR activ*))
	57	(AB exercis* N5 (train* OR physical* OR activ*))
	58	(MH "Physical Fitness")
	59	(MH "Physical Education and Training")
	60	(MH "Exertion")
	61	(MH "Therapeutic Exercise+")
	62	(MH "Sports+")
	63	(MH "Dancing+")
	64	(TI physical* N5 (fit* OR train* OR activ* OR endur* OR exert*)) OR (AB physical* N5 (fit* OR train* OR activ* OR endur* OR exert*))
	65	(TI sport* OR walk* OR bicycl* OR exercis* OR aerobic*) OR (AB sport* OR walk* OR bicycl* OR exercis* OR aerobic*)
	66	(MH "Life Style, Sedentary")
	67	"Sedentar*"

68	"inactiv*"
69	(TI (lifestyle* OR life-style*) N5 (physical* OR activ*)) OR (AB (lifestyle* OR life-style*) N5 (physical* OR activ*))
70	(MH "Clinical Trials+")
71	PT clinical trial
72	TX (clinic* N1 trial?)
73	TX random*
74	(MH "Placebos")
75	TX placebo*
76	(MH "Quasi-Experimental Studies")
77	TX assign*
78	TX control*
79	TX allocat*
80	S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34
81	S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44
82	S1 OR S2 OR S11 OR S12 OR S13 OR S14
83	S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54
84	S55 OR S56 OR S57 OR S58 OR S59 OR S60 OR S61 OR S62 OR S63 OR S64 OR S65 OR S66 OR S67 OR S68 OR S69
85	S70 OR S71 OR S72 OR S73 OR S74 OR S75 OR S76 OR S77 OR S78 OR S79
86	S83 AND S84
87	S80 AND S86
88	S81 OR S87
89	S80 AND S82
90	S86 AND S89
91	S88 OR S90
92	S85 AND S91

	Search Term	"Suggest Subject Terms"	Database thesaurus info DECISION
CINAHL Plus with Full Text EBSCO	Multimedia	Multimedia	(MH "Multimedia")
	Interactive media		"Interactive media"
	Mobile devices		"Mobile devices"
	PDA	Computers, Hand-Held	(MH "Computers, Hand-Held")
	Cellular Phone	Wireless Communications	(MH "Wireless Communications")
	m-Health		"m-Health"
	mhealth		"mhealth"
	Mobile health		"Mobile health"
	telemedicine	Telemedicine; Telehealth	(MH "Telemedicine+") + (MH "Telehealth+")
	telehealth	Telemedicine; Telehealth	(subject heading already included)
	internet	Internet	(MH "Internet+")
	web	World Wide Web;	"web"
	e-mail	Electronic Mail	(MH "Electronic Mail") + "e-mail"
	electronic mail	Electronic Mail	(subject heading already included)
	SMS		"SMS"
	Short message service	Text Messaging	(MH "Text Messaging") + "short message service"
	Text messag*	Text Messaging	"Text messag*"
	txt		"txt"
	MMS		"MMS"
	Multimedia message service	Text messaging	"Multimedia message service"
	Handheld device*		"Handheld device*"
	Cell phone*	Wireless Communications;	"Cell phone*"
	Mobile phone*	Wireless Communications;	"Mobile phone*"
	Mobile app*		"Mobile app*"
	Smartphone*		"Smartphone*"
	Smartphone app*		"Smartphone app*"
	tablet computer*	Computers, Portable	(MH "Computers, Portable+") + "tablet computer*"
	iPad		"iPad"
	iPod touch		"iPod touch"
	Wireless Technology		"Wireless Technology"
	Wearable activity tracker		
	Remote sensing		"Remote sensing"
	Pedometer*		
	Accelerometer*		
	gyroscope*		
	inclinometer*		
	BodyMedia		"BodyMedia"
	Fitbit		"Fitbit"
	LarkLife		"LarkLife"
	Misfit Shine		"Misfit Shine"
	Nike+ FuelBand		"Nike+ FuelBand"
	SYNC Burn		"SYNC Burn"
	Up by Jawbone		"Up by Jawbone"
	Withings Pulse		"Withings Pulse"
	Zamzee		"Zamzee"
	AIRO band		"AIRO band"
	Health Education	Health Education	(MH "Health Education")
	Patient education	Patient education	(MH "Patient Education")
	Primary prevention	Primary Health Care	(MH "Primary Health Care")
	Health promotion	Health promotion	(MH "Health Promotion")
	Behaviour Therapy	Behavior Therapy	(MH "Behavior Therapy+")
	Cognitive Therapy	Cognitive Therapy (Behavior Therapy is broader)	
	Primary Health Care	Primary Health Care	(subject heading already included)
	Workplace	Work Environment	(MH "Work Environment")
	School	Schools	(MH "Schools")
	Home		"Home"
	Program		AB Program* + TI Program*
	Promotion	Health promotion	AB Promot* + TI Promot*
	Education	Education	AB Educat* + TI Educat*
	Behaviour change	Behavioral Changes	(MH "Behavioral Changes")
	Exercise	Exercise	(MH "Exercise+") + (TI exercis* N5 (train* OR physical* OR activ*)) + (AB exercis* N5 (train* OR physical* OR activ*))

	Aerobic exercise	Aerobic exercises (Exercise is a broader term)	
	Physical fitness	Physical fitness	(MH "Physical Fitness") (TI physical* N5 (fit* OR train* OR activ* OR endur* OR exert*)) OR (AB physical* N5 (fit* OR train* OR activ* OR endur* OR exert*))
	Physical Education	Physical Education and Training	(MH "Physical Education and Training")
	Therapeutic Exercise	Therapeutic exercise	(MH "Therapeutic Exercise+")
	Exertion	Exertion	(MH "Exertion")
	Dancing	Dancing	(MH "Dancing+")
	Sport	Sports	(MH "Sports+")
	Walk	Walking	(TI sport* OR walk* OR bicycl* OR exercis* OR aerobic*) OR (AB sport* OR walk* OR bicycl* OR exercis* OR aerobic*)
	Bicycle	Cycling	(already incorporated in previous)
	Sedentar*	Life Style, Sedentary	(MH "Life Style, Sedentary") + "Sedentar*"
	Inactiv*		"inactiv*"
	Life style	Life Style	(TI (lifestyle* OR life-style*) N5 (physical* OR activ*)) OR (AB (lifestyle* OR life-style*) N5 (physical* OR activ*))
	Proof of concept		
	Pilot		
	Usability		
	acceptability		
	feasibility		
	evaluation		
	Intervention		
	Randomized controlled trial	Randomized Controlled Trials (Clinical Trials is a broader term)	
	Controlled clinical trial	Clinical trials	(MH "Clinical Trials+") + PT clinical trial + TX (clinic* N1 trial?)
	Random sample	Random sample	TX random*
	Quasi-Experimental Study	Quasi-Experimental Studies	(MH "Quasi-Experimental Studies")
	Placebo	Placebos	(MH "Placebos") + TX placebo* + TX assign* + TX control* + TX allocat*

Database		#	Search Terms & Strategy
Web of Science - Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=All years	Only allows saving 40 sets of searches TS= Topic TI= Title Boolean Operators: AND, OR, NOT, SAME, NEAR	01	TS=(Multimedia OR interactive media OR Internet OR Web OR Electronic Mail OR email)
		02	TS=(mobile device* OR PDA OR Cellular Phone* OR m-Health OR mhealth OR Mobile health OR Telemedicine OR Telehealth OR SMS OR short message service OR Text messag* OR txt OR MMS OR Multimedia message service OR Handheld device* OR Cell phone* OR Mobile phone* OR Mobile app* OR Smartphone* OR Smartphone app* OR tablet computer* OR iPad OR iPod touch OR Wireless Technology OR Wearable activity tracker OR Remote sensing)
		03	TS=(BodyMedia OR Fitbit OR LarkLife OR Misfit Shine OR Nike+ FuelBand OR SYNC Burn OR Up by Jawbone OR Withings Pulse OR Zamzee OR AIRO band)
		04	TS=(Health educat* OR patient* educat* OR Primary prevent* OR Primary health care OR Cognitive Therap*)
		05	TS=(Health NEAR/2 Promot*)
		06	TS=((Behavior NEAR/2 Therap*) OR (Behaviour NEAR/2 Therap*))
		07	TS=(workplace*)
		08	TS=(school*)
		09	TS=(home)
		10	TI=(promot* OR educat* OR program*)
		11	TS=((Behavior NEAR/2 Chang*) OR (Behaviour NEAR/2 Chang*))
		12	TS=(physical* NEAR/5 (fit* OR train* OR activ* OR endur* OR exert*))
		13	TS=(exercis* NEAR/5 (train* OR physical* OR activ*))
		14	TS=((exercis* NEAR/2 aerobic*) OR aerobic*)
		15	TS=(exercis*)
		16	TS=(exercis* therap*)
		17	TS=(Physical* educat*)
		18	TS=(sport* OR danc* OR walk* OR bicycl*)
		19	TS=((Lifestyle* OR life-style*) NEAR/5 (active* OR physical* OR sedentar*))
		20	TS=(Sedentar*)
		21	TS=(inactiv*)
		22	TS=(trial* OR clinical trial* OR random* OR allocat* OR assign* OR blind* OR placebo* OR cross over* OR crossover OR cross-over* OR quasi-experimental stud*)
		23	#11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4
		24	#21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12
		25	#24 AND #23
		26	#25 AND #2
		27	#26 OR #3
		28	#2 AND #1
		29	#28 AND #25
		30	#29 OR #27
		31	#30 AND #22

Database	#	Search Terms & Strategy
Pubmed	01	"Multimedia"[Mesh]
	02	"Interactive media"[Text Word]
	03	"Mobile devices"[Text Word]
	04	"computers, handheld"[Mesh]
	05	"Cellular Phone"[Mesh]
	06	"mhealth"[Text Word]
	07	"m-Health"[Text Word]
	08	"mobile health"[Text Word]
	09	"Telemedicine"[Mesh]
	10	"Telehealth"[Text Word]
	11	"Internet"[Mesh]
	12	"Web"[Text Word]
	13	"electronic mail"[Mesh]
	14	"e-mail"[Text Word]
	15	"SMS"[Text Word]
	16	"Text messaging"[Mesh]
	17	"Short message service"[Text Word]
	18	"text messag*"[Text Word]
	19	"txt"[Text Word]
	20	"MMS"[Text Word]
	21	"Multimedia message service"[Text Word]
	22	"Handheld device*"[Text Word]
	23	"Cell phone*"[Text Word]
	24	"Mobile phone"[Text Word]
	25	"Mobile app"[Text Word]
	26	"Smartphone*"[Text Word]
	27	"Smartphone app*"[Text Word]
	28	"tablet computer*"[Text Word]
	29	"iPad"[Text Word]
	30	"iPod touch"[Text Word]
	31	"Wireless Technology"[Mesh]
	32	"Wearable activity tracker"[Text Word]
	33	"BodyMedia"[Text Word]
	34	"Fitbit"[Text Word]
	35	"LarkLife"[Text Word]
	36	"Misfit Shine"[Text Word]
	37	"Nike+ FuelBand"[Text Word]
	38	"SYNC Burn"[Text Word]
	39	"Up by Jawbone"[Text Word]
	40	"Withings Pulse"[Text Word]
	41	"Zamzee"[Text Word]
	42	"AIRO band"[Text Word]
	43	"Health Education"[Mesh]
	44	"Patient education as Topic"[Mesh]
	45	"Primary prevention"[Mesh]
	46	"Health Promotion"[Mesh]
	47	"Behavior Therapy"[Mesh]
	48	"Cognitive Therapy"[Mesh]
	49	"Primary Health Care"[Mesh]
	50	"Workplace"[Mesh]
	51	"Schools"[Mesh]
	52	"Home"[Text Word]
	53	"Program$"[Text Word]
	54	"Promot$"[Text Word]
	55	"Educat$"[Text Word]
	56	"Behaviour change"[Text Word]
	57	"Behavior change"[Text Word]
	58	"Exercise"[Mesh]
	59	"Physical Exertion"[Mesh]
	60	"aerobic$"[Text Word]
	61	"Physical Education and Training"[Mesh]
	62	"Motor activity"[Mesh]
	63	"physical activity"[Text Word]
	64	"physically active"[Text Word]
	65	"Physical endurance"[Text Word]
	66	"Physical exertion"[Text Word]
	67	"Physical Exercise"[Text Word]
	68	"Exercise Therapy"[Mesh]
	69	"Physical fitness"[Mesh]
	70	"Sports"[Mesh]

/ = Subject heading;

.mp. = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier;

.tw. = Text Word includes Title (TI) and Abstract (AB);

.sh. = MeSH Subject Heading - Medical Subject Headings used by indexers at the National Library of Medicine (NLM) to describe the content of an article. NLM's MeSH terms are organized in a hierarchy, or "tree" structure;

.pt. – Publication Type classifications as reviews, clinical trials, directories and letters;

ADJn operator = records that contain your terms (in any order) within a specified number (n) of words of each other;

* = unlimited right-hand truncation;

? = optional wild card stands for zero or one characters within a word or at the end of a word;

71	"sport$"[Text Word]
72	"Walk$"[Text Word]
73	"Bicycl$"[Text Word]
74	"Dancing"[Text Word]
75	"Sedentary Lifestyle"[Mesh]
76	"active lifestyle"[Text Word]
77	"active life style"[Text Word]
78	Randomized Controlled Trial[Publication Type]
79	Controlled clinical trial[Publication Type]
80	"randomized"[Abstract]
81	"randomised"[Abstract]
82	"randomly"[Abstract]
83	"Quasi-Experimental Study"[Text Word]
84	"Placebo"[Abstract]
85	"Trial"[Abstract]
86	"Cross-Over Studies"[Mesh]
87	"Groups"[Abstract]
88	((((((((((((((((((((((((("Mobile devices"[Text Word]) OR "computers, handheld"[Mesh]) OR "Cellular Phone"[Mesh]) OR "mhealth"[Text Word]) OR "m-Health"[Text Word]) OR "mobile health"[Text Word]) OR "Telemedicine"[Mesh]) OR "Telehealth"[Text Word]) OR "SMS"[Text Word]) OR "Text messaging"[Mesh]) OR "Short message service"[Text Word]) OR "text messag*"[Text Word]) OR "txt"[Text Word]) OR "MMS"[Text Word]) OR "Multimedia message service"[Text Word]) OR "Handheld device*"[Text Word]) OR "Cell phone*"[Text Word]) OR "Mobile phone"[Text Word]) OR "Mobile app"[Text Word]) OR "Smartphone*"[Text Word]) OR "Smartphone app*"[Text Word]) OR "tablet computer*"[Text Word]) OR "iPad"[Text Word]) OR "iPod touch"[Text Word]) OR "Wireless Technology"[Mesh]) OR "Wearable activity tracker"[Text Word]
89	(((((((("BodyMedia"[Text Word]) OR "Fitbit"[Text Word]) OR "LarkLife"[Text Word]) OR "Misfit Shine"[Text Word]) OR "Nike+ FuelBand"[Text Word]) OR "SYNC Burn"[Text Word]) OR "Up by Jawbone"[Text Word]) OR "Withings Pulse"[Text Word]) OR "Zamzee"[Text Word]) OR "AIRO band"[Text Word]
90	(((((("Multimedia"[Mesh]) OR "Interactive media"[Text Word]) OR "Internet"[Mesh]) OR "Web"[Text Word]) OR "electronic mail"[Mesh]) OR "e-mail"[Text Word]
91	((((((((((("Health Education"[Mesh]) OR "Patient education as Topic"[Mesh]) OR "Primary prevention"[Mesh]) OR "Health Promotion"[Mesh]) OR "Cognitive Therapy"[Mesh]) OR "Primary Health Care"[Mesh]) OR "Workplace"[Mesh]) OR "Schools"[Mesh]) OR "Home"[Text Word]) OR "Program$"[Text Word]) OR "Promot$"[Text Word]) OR "Educat$"[Text Word]) OR "Behaviour change"[Text Word]) OR "Behavior change"[Text Word]
92	((((((((((((((((((("Exercise"[Mesh]) OR "Physical Exertion"[Mesh]) OR "aerobic$"[Text Word]) OR ("Physical Education and Training"[Mesh])) OR "Motor activity"[Mesh]) OR "physical activity"[Text Word]) OR "physically active"[Text Word]) OR "Physical endurance"[Text Word]) OR "Physical exertion"[Text Word]) OR "Physical Exercise"[Text Word]) OR "Exercise Therapy"[Mesh]) OR "Physical fitness"[Mesh]) OR "Sports"[Mesh]) OR "sport$"[Text Word]) OR "Walk$"[Text Word]) OR "Bicycl$"[Text Word]) OR "Dancing"[Text Word]) OR "Sedentary Lifestyle"[Mesh])) OR "active lifestyle"[Text Word]) OR "active life style"[Text Word]
93	(((((((((Randomized Controlled Trial[Publication Type]) OR Controlled clinical trial[Publication Type]) OR "randomized"[Abstract]) OR "randomised"[Abstract]) OR "randomly"[Abstract]) OR "Quasi-Experimental Study"[Text Word]) OR "Placebo"[Abstract]) OR "Trial"[Abstract]) OR "Cross-Over Studies"[Mesh]) OR "Groups"[Abstract]

94	((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word]))
95	((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word]))) AND ((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word])

	96	((((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word]))) AND ((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word]) OR ((((((((((“BodyMedia”[Text Word]) OR “Fitbit”[Text Word]) OR “LarkLife”[Text Word]) OR “Misfit Shine”[Text Word]) OR “Nike+ FuelBand”[Text Word]) OR “SYNC Burn”[Text Word]) OR “Up by Jawbone”[Text Word]) OR “Withings Pulse”[Text Word]) OR “Zamzee”[Text Word]) OR “AIRO band”[Text Word])
	97	((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word])) AND ((((((“Multimedia"[Mesh]) OR “Interactive media”[Text Word]) OR “Internet”[Mesh]) OR “Web”[Text Word]) OR “electronic mail”[Mesh]) OR “e-mail”[Text Word])

	98	((((((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word])) AND ((((((“Multimedia"[Mesh]) OR “Interactive media”[Text Word]) OR “Internet”[Mesh]) OR “Web”[Text Word]) OR “electronic mail”[Mesh]) OR “e-mail”[Text Word]))) AND ((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word]))

	99	((((((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word])) AND ((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word]))) OR ((((((((((“BodyMedia”[Text Word]) OR “Fitbit”[Text Word]) OR “LarkLife”[Text Word]) OR “Misfit Shine”[Text Word]) OR “Nike+ FuelBand”[Text Word]) OR “SYNC Burn”[Text Word]) OR “Up by Jawbone”[Text Word]) OR “Withings Pulse”[Text Word]) OR “Zamzee”[Text Word]) OR “AIRO band”[Text Word]))) OR ((((((((((((((((((((((((((“Mobile devices”[Text Word]) OR “computers, handheld”[Mesh]) OR “Cellular Phone”[Mesh]) OR “mhealth"[Text Word]) OR “m-Health”[Text Word]) OR “mobile health”[Text Word]) OR “Telemedicine”[Mesh]) OR “Telehealth”[Text Word]) OR “SMS”[Text Word]) OR “Text messaging”[Mesh]) OR “Short message service”[Text Word]) OR “text messag*”[Text Word]) OR “txt”[Text Word]) OR “MMS”[Text Word]) OR “Multimedia message service”[Text Word]) OR “Handheld device*”[Text Word]) OR “Cell phone*”[Text Word]) OR “Mobile phone”[Text Word]) OR “Mobile app”[Text Word]) OR “Smartphone*”[Text Word]) OR “Smartphone app*”[Text Word]) OR “tablet computer*”[Text Word]) OR “iPad”[Text Word]) OR “iPod touch”[Text Word]) OR “Wireless Technology”[Mesh]) OR “Wearable activity tracker”[Text Word])) AND ((((((“Multimedia"[Mesh]) OR “Interactive media”[Text Word]) OR “Internet”[Mesh]) OR “Web”[Text Word]) OR “electronic mail”[Mesh]) OR “e-mail”[Text Word]))) AND ((((((((((((((((((((((((((“Exercise”[Mesh]) OR “Physical Exertion”[Mesh]) OR “aerobic$”[Text Word]) OR (“Physical Education and Training”[Mesh])) OR “Motor activity”[Mesh]) OR “physical activity”[Text Word]) OR “physically active”[Text Word]) OR “Physical endurance”[Text Word]) OR “Physical exertion”[Text Word]) OR “Physical Exercise”[Text Word]) OR “Exercise Therapy”[Mesh]) OR “Physical fitness”[Mesh]) OR “Sports”[Mesh]) OR “sport$”[Text Word]) OR “Walk$”[Text Word]) OR “Bicycl$”[Text Word]) OR “Dancing”[Text Word]) OR “Sedentary Lifestyle”[Mesh])) OR “active lifestyle”[Text Word]) OR “active life style”[Text Word])) AND ((((((((((((“Health Education”[Mesh]) OR “Patient education as Topic”[Mesh]) OR “Primary prevention”[Mesh]) OR “Health Promotion”[Mesh]) OR “Cognitive Therapy”[Mesh]) OR “Primary Health Care”[Mesh]) OR “Workplace”[Mesh]) OR “Schools”[Mesh]) OR “Home”[Text Word]) OR “Program$”[Text Word]) OR “Promot$”[Text Word]) OR “Educat$”[Text Word]) OR “Behaviour change”[Text Word]) OR “Behavior change”[Text Word]))

	Search Term	MeSH Term	Database thesaurus info DECISION
PubMed	Multimedia	Multimedia	"Multimedia"[Mesh]
	Interactive media		“Interactive media”[Text Word]
	Mobile devices		“Mobile devices”[Text Word]
	PDA	computers, handheld	“computers, handheld”[Mesh]
	Cellular Phone	Cellular phone	“Cellular Phone”[Mesh]
	m-Health		“m-Health”[Text Word]
	mhealth		“mhealth"[Text Word]
	Mobile health	Telemedicine	“mobile health”[Text Word] + “Telemedicine”[Mesh]
	telemedicine	Telemedicine	
	telehealth		“Telehealth”[Text Word]
	internet	Internet	“Internet”[Mesh]
	web		“Web”[Text Word]
	e-mail	Electronic mail	“electronic mail”[Mesh] + “e-mail”[Text Word]
	electronic mail		(subject heading already included)
	SMS		“SMS”[Text Word]
	Short message service	Text Messaging	“Text messaging”[Mesh] + “Short message service”[Text Word]
	Text messag*		“text messag*”[Text Word]
	txt		“txt”[Text Word]
	MMS		“MMS”[Text Word]
	Multimedia message service		“Multimedia message service”[Text Word]
	Handheld device*		“Handheld device*”[Text Word]
	Cell phone*	Cellular phone	“Cell phone*”[Text Word]
	Mobile phone*	Cellular phone	“Mobile phone”[Text Word]
	Mobile app*		“Mobile app”[Text Word]
	Smartphone*		“Smartphone*”[Text Word]
	Smartphone app*		“Smartphone app*”[Text Word]
	tablet computer*		“tablet computer*”[Text Word]
	iPad		“iPad”[Text Word]
	iPod touch		“iPod touch”[Text Word]
	Wireless Technology	Wireless Technology	“Wireless Technology”[Mesh]
	Wearable activity tracker		“Wearable activity tracker”[Text Word]
	sensing		
	Pedometer*		
	Accelerometer*		
	gyroscope*		
	inclinometer*		
	BodyMedia		“BodyMedia”[Text Word]
	Fitbit		“Fitbit”[Text Word]
	LarkLife		“LarkLife”[Text Word]
	Misfit Shine		“Misfit Shine”[Text Word]
	Nike+ FuelBand		“Nike+ FuelBand”[Text Word]
	SYNC Burn		“SYNC Burn”[Text Word]
	Up by Jawbone		“Up by Jawbone”[Text Word]
	Withings Pulse		“Withings Pulse”[Text Word]
	Zamzee		“Zamzee”[Text Word]
	AIRO		“AIRO band”[Text Word]
	Health Education	Health Education	“Health Education”[Mesh]
	Patient education	Patient education as Topic	“Patient education as Topic”[Mesh]
	Primary prevention	Primary prevention	“Primary prevention”[Mesh]
	Health promotion	Health Promotion	“Health Promotion”[Mesh]
	Behaviour Therapy	Behavior Therapy	“Behavior Therapy”[Mesh]
	Cognitive Therapy	Cognitive Therapy	“Cognitive Therapy”[Mesh]
	Primary Health Care	Primary Health Care	“Primary Health Care”[Mesh]
	Workplace	Workplace	“Workplace”[Mesh]
	Schools	Schools	“Schools”[Mesh]
	Home		“Home”[Text Word]
	Program		“Program$”[Text Word]
	Promotion	Health Promotion	“Promot$”[Text Word]
	Education	Education	“Educat$”[Text Word]
	Behaviour change		“Behaviour change”[Text Word] + “Behavior change”[Text Word]
	Aerobic exercise	Exercise	“Exercise”[Mesh] + “aerobic$”[Text Word]
	Physical Exertion	Physical Exertion	“Physical Exertion”[Mesh]
	Physical Education and Training;	Physical Education and Training	“Physical Education and Training”[Mesh]

	Physical activity	Motor Activity	"Motor activity"[Mesh] + "physical activity"[Text Word] + "physically active"[Text Word] + "Physical endurance"[Text Word] + "Physical exertion"[Text Word]
	Exercise	Exercise	"Physical Exercise"[Text Word]
	Exercise Therapy	Exercise Therapy	"Exercise Therapy"[Mesh]
	Physical fitness	Physical fitness	"Physical fitness"[Mesh]
	Sport	Sports	"Sports"[Mesh] + "sport$"[Text Word]
	Walk	Walking	"Walk$"[Text Word]
	Bicycle	Bicycling	"Bicycl$"[Text Word]
	Dancing	Dancing	"Dancing"[Text Word]
	Sedentar*	Sedentary Lifestyle	"Sedentary Lifestyle"[Mesh]
	Inactivity		
	Life style	Life style	"active lifestyle"[Text Word] + "active life style"[Text Word]
	Proof of concept		
	Pilot		
	Usability		
	acceptability		
	feasibility		
	evaluation		
	Intervention	Intervention Studies	
	Randomized controlled trial		Randomized Controlled Trial[Publication Type]
	Controlled clinical trial		Controlled clinical trial[Publication Type]
	Random sample	Random allocation	"randomized"[Abstract] + "randomised"[Abstract] + "randomly"[Abstract]
	Quasi-Experimental Stud*		"Quasi-Experimental Stud*"[Text Word]
	Placebo	Placebos	"Placebo"[Abstract]
	Trial	Clinical Trial/; Controlled Clinical Trial/	"Trial"[Abstract] + "Cross-Over Studies"[Mesh] + "Groups"[Abstract]

Electronic Supplementary Material 2 – Characteristics of Included Studies

Adams 2013

Methods	Two arms randomised controlled trial, 36 weeks intervention period. Trial registration: NCT01793064
Participants	N = 20, n = 10 intervention, n = 10 comparator; inactive overweight adults, 85% women, M = 36.9 ± 9.2 years, 35% non-white
Interventions	Intervention: Pedometer + Adaptive Intervention + email with health info brochures + SMS/email with message prompt encouraging PA every 9 days + differential daily feedback messages + feedback points & financial incentives for step goal accomplishments Comparator: Pedometer + Static Intervention + email with health info brochures + SMS/email with message prompt encouraging PA every 9 days + encouraging upload messages + escalating financial incentives for upload
Outcomes	Steps/day, objectively measured via pedometer
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.5. Review behavior goal(s), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1 Social support (unspecified), 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 7.1. Prompts/cues, 8.7. Graded tasks, 9.1. Credible source, 10.2. Material reward (behavior), 12.5. Adding objects to the environment Comparator: 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1 Social support (unspecified), 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 7.1. Prompts/cues, 9.1. Credible source, 10.2. Material reward (behavior), 12.5. Adding objects to the environment
Inclusion criteria	Between 18 and 65 years old, inactive (less than 1000 metabolic equivalent of task (MET)-minutes/week reported on International Physical Activity Questionnaire (IPAQ) and overweight (body mass index ≥25)
Exclusion criteria	BMI >45, unable to walk unassisted, had a medical condition (assessed by Physical Activity Readiness Questionnaire (PAR-Q)), pregnant, using pharmaceuticals (except birth control), currently participating in a commercial/research-related diet/exercise program, could not speak and read English, did not have computer and internet access daily

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Participants were randomly assigned in sequential order….A 1:1 random allocation was determined by the first author using a computer generated random number sequence*."
Allocation concealment	Unclear risk	"*Participants and investigators were not blinded to intervention assignment*." No information given about whether investigators were blinded pre-assignment.
Blinding of participants and personnel	High risk	Results paper: "*Participants and investigators were not blinded to intervention assignment and no adverse events were reported during the trial*." Trial registry: "Masking: Single Blind (Subject)"

Blinding of outcome assessment	Unclear risk	Step counts were uploaded by the participants. The primary outcome was measured objectively, unclear impact on participants' response to social desirability; other outcomes were self-reported.
Incomplete outcome data	Low risk	"*Intent-to-treat procedures without imputation were used to preserve random assignment*." Study participants: n=20, analysis included n=20
Selective reporting	High risk	Trial registry: "*Primary outcome measures: physical activity measured daily over 6 months by Omron pedometers*. *Secondary outcome measures: Satisfaction survey*." Results paper: "*During the blinded baseline phase, the Static Intervention group averaged 5,364 (SD = 1,145) steps/day and the Adaptive Intervention group averaged 4,555 (SD = 843) steps/day*. *During the intervention phase, the SI group averaged 6,348 (SD=671) steps/day and the AI group averaged 6,760 (SD=1,078) steps/ day*. *This outcome represents a 984 steps/day (18%) improvement for the SI group and a 2,205 step/day (48%) improvement for the AI group;*". Secondary outcomes were not presented in the results paper.
Other bias	Low risk	Analyses adjusted for baseline values and outcome assessed using a validated measure

Allen 2013

Methods	Four arms randomised controlled trial, 36 weeks intervention period
Participants	68 obese adults (SP+IC n = 16, SP+LIC n = 17, SP n = 17, IC n = 18; 78% female, 49% African American, M = 45 ± 11 years, BMI = 34.3 ± 3.9 Kg/m^2)
Interventions	Intervention Smartphone + Intensive Counseling (SP + IC): Lose It! App + intensive counseling Intervention Smartphone + Less Intensive Counseling (SP + LIC): Lose It! App + less intensive counseling twice 1st month and monthly 2nd-6th month Intervention Smartphone alone (SP): smartphone only (Lose It! App) + one session of basic nutrition counseling Comparator: Intensive Counseling (IC): 1h in-person contact with nutritionist weekly 1st month and biweekly 2nd-6th month (SCT, behavioral self-management, motivational interviewing)
Outcomes	MVPA (hours/week), Stanford 7-Day PA Recall, Self-reported PA
Behaviour Change Techniques	Intervention (SP + IC): 1.1. Goal setting (behavior), 2.2 Feedback on behaviour, 2.3. Self-monitoring of behavior, 2.4. Self-monitoring of outcome(s) of behaviour, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 9.1. nutritional counseling Intervention (SP + LIC): 1.1. Goal setting (behavior), 2.2 Feedback on behaviour, 2.3. Self-monitoring of behavior, 2.4. Self-monitoring of outcome(s) of behaviour, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 9.1. nutritional counseling Intervention (SP): 1.1. Goal setting (behavior), 2.2 Feedback on behaviour, 2.3. Self-monitoring of behavior, 2.4. Self-monitoring of outcome(s) of behaviour, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 9.1. nutritional counseling

	Comparator (IC): 1.1. Goal setting (behavior), 4.1. Instruction on how to perform the behavior, 9.1. nutritional counseling	
Inclusion criteria	Individuals between 21 and 65 years with BMI of 28-42 Kg/m^2 who had an iPhone or Android, willing to download the application to be used on their devices	
Exclusion criteria	Conditions that significantly limit exercise, such as actice cancer treatment, severe orthopedic problems; History of myocardial infarction, angina, coronary artery bypass graft surgery, percutaneous transluminal coronary angioplasty, congestive heart failure, diabetes; Currently participating in another structured weight loss program, pregnancy, taking weight loss medication, history of psychiatric illness, alcohol or substance abuse within the past 12 months	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Unclear risk	"*The SLIM (Smart coach for LIfestyle Management) study randomized 68 eligible participants to receive one of four interventions for six months:*"
Allocation concealment	Unclear risk	No information
Blinding of participants and personnel	High risk	"*Participants in the more intensive intervention groups received healthy eating and exercise counseling from a nutritionist coach weekly for the first month and biweekly for the second through sixth month. Participants in the less intensive counseling plus smartphone intervention received healthy eating and exercise counseling from the nutritionist twice during the first month and then monthly from two to six months. Inperson nutritional counseling focused on...*"
Blinding of outcome assessment	Unclear risk	No information
Incomplete outcome data	Low risk	"*Due to the uneven and relatively high attrition rates (31%–41%) among the four groups, we chose not to impute data or carry forward the baseline value for missing data for an intention-to-treat analysis. However, a sensitivity analysis imputing data, carrying the last observation forward and analysis only on those who completed the six-month followup, did not produce different results*." Participant losses to follow-up were balanced across the four groups (despite small numbers) and reasons for missings appear similar and well reported. In addition, the authors used several methods to deal with the losses and no differences in results were detected : "*...a sensitivity analysis imputing data, carrying the last observation forward and analysis only on those who completed the six-month follow up, did not produce diferent results*".
Selective reporting	Low risk	Methods: "*The outcome measures of weight, BMI, waist circumference, and self-reported dietary intake and physical activity were assessed at baseline and six months*." Results: "*Baseline characteristics of participants by group are shown in Table 1 (include weight, BMI, WC)*." Change values were calculated for all of the outcomes listed in the methods.
Other bias	Unclear risk	Contamination between groups: "*Twenty-eight percent of those who completed the trial also reported that at some time during the trial*

	they had used another weight loss intervention (e.g., computer programs or smartphone applications) in addition to their originally allocated intervention."

Bickmore 2013

Methods	Two arms randomised controlled trial, 8 weeks "active" intervention period (52 weeks follow up)	
Participants	Older inactive adults aged 65 and older, N = 263, n = 132 intervention, n = 131 comparator; M = 71.3 ± 5.4 years, 61% female; 63% African American; BMI = 29.5 kg/m^2, 51% with high school diploma or less	
Interventions	Intervention: tablet computer with daily embodied conversational agent coach to discuss walking (2 months) + pedometer (+ 10 months kiosk on clinic waiting room) Comparator: pedometer + monthly logs to track step counts	
Outcomes	Steps/day, objectively measured via pedometer	
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 1.7. Review outcome goals, 2.4. Self-monitoring of outcomes of behaviour, 2.7. Feedback on outcome of behaviour, 3.1. Social support (unspecified), 6.1. Demonstration of the behavior, 7.1. Prompts/cues, 10.4. Social reward, 12.5. Adding objects to the environment Comparator: 2.4. Self-monitoring of outcomes of behaviour, 12.5. Adding objects to the environment	
Inclusion criteria	Community-dwelling adults who attended the geriatrics or internal medicine ambulatory care clinics, aged 65 and older, English speaking, inactive (not engaged in regular moderate intensity or greater PA ≥ 3 days/week for at least 20 min/day over the previous 6 months, free of any medical condition that would limit participation in a walking program, and stable on medications for at least 3 months.	
Exclusion criteria	Cognitive impairment (Mini-Cog score <2), significant depressive symptoms (Patient Health Questionnaire ≥16), at high risk of falls, or a timed maximal walking velocity < 0.5 m/s	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*At study entry and at the end of baseline data collection, participants were randomized in blocks of six or eight, selected randomly, and stratified according to clinic site and health literacy status (inadequate vs adequate)*." The block size appears to be varied to decrease chances of foreknowledge of assignment, but there is no mention to the method used for sequence generation (random number table, computer generated,...).
Allocation concealment	Unclear risk	A two-arm, single-blind, randomized controlled trial. No other information.
Blinding of participants and personnel	High risk	A two-arm, single-blind, randomized controlled trial. No other information.

Blinding of outcome assessment	Low risk	"*All participants returned for assessments at 2 and 12 months, at which a different research assistant blinded to group assignment and findings from earlier data collection points collected data*";
Incomplete outcome data	High risk	"*Statistical analysis was performed on an intention-to- treat basis, in accordance with CONSORT guidelines*."; "*A sensitivity analysis was conducted replacing missing or invalid electronic values with paper log values when available and then replacing excluded values as described above to test the effect of missing data on results*."; "*The sensitivity analysis to test the effect of missing data on results confirmed the general trends above but did not yield significant differences between groups at either time point*." Figure 2 (participant flow) shows drop outs and reasons are clearly described and balanced across groups, however, the lack of pedometer data was larger in the intervention group over time (n = 77 had insufficient step, only n = 55 analysed at 12 months VS n = 58 with insufficient step data and n = 73 analysed for the control). Data reported on Table 2/Outcomes is based on n = 200 with adequate pedometer data (2 months) and n = 128 (12 months), analysis reported appear restricted to pedometer use "compliers"; and conclusion in the abstract is not based on the primary outcome (step count at 12 months).
Selective reporting	Low risk	"*The primary outcome was average daily step count for the 30 days before the 12-month interview*. *Secondary outcomes were average daily step count for the 30 days before the 2-month interview*. *Outcomes were also stratified according to health literacy level*."
Other bias	Low risk	Analyses adjusted for baseline values and outcome assessed using a validated measure

Duncan 2014

Methods	Two arms randomised controlled trial, 36 weeks intervention. Trial registration: ACTRN12611000081910
Participants	Adult overweight and obese males aged 35-54 years (N = 301, n = 205 intervention arm, M = 44.2 ± 5.9 years, n = 96 comparator, M = 43.8 ± 5.8 years)
Interventions	Intervention: automated website and mobile phone-delivered materials (education) and capacity to self-monitor + feedback on individual progress + interact with other participants on the ManUp challenges Comparator: print-based hard-copy booklet with same educational materials, log sheets (no feedback nor interaction)
Outcomes	Total PA - duration and sessions/week (Active Australia Survey), Self-reported PA
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.4. Action planning, 1.5. Review behavior goals, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 6.3. Social comparison, 8.7. Graded tasks Comparator: 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 8.7. Graded tasks

Inclusion criteria	Males aged 35-54 years who owned a mobile telephone, had access to the internet, did not have a mobility impairment, resided in the cities of Gladstone or Rockhampton (Queensland, Australia), and were classified as low risk to increase PA according to the Australian Government Department of Health and Ageing pre-exercise screening system.	
Exclusion criteria	-	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*... participants were randomly allocated to 1 of the 2 intervention arms*". *Group assignment was conducted on a two-to-one ratio in favour of the IT-based intervention arm. Unequal group allocation was conducted to maximize the number of participants allocated to the intervention arm.* "*Randomization lists were generated by one of the authors (MJD) using freely available software (www.randomization.com).*"
Allocation concealment	High risk	"*Participants were advised of their group allocation via phone*." Unclear whether those involved in allocation could see the randomisation lists prior to allocating participants but trial registration reports "Allocation is not concealed."
Blinding of participants and personnel	High risk	"*Participants were blinded to group allocation until baseline assessments were completed*."
Blinding of outcome assessment	Unclear risk	"*Given that participants completed the assessment of outcome measures via online survey, nonblinding of researchers to participant group allocation was unlikely to bias outcomes*".
Incomplete outcome data	Low risk	"*Generalized linear mixed models use all available data at each time point allowing participants with missing data at follow-up time points to be retained in the analysis. Therefore, generalized linear mixed models with an unstructured covariance matrix were used to examine change over time and differences between intervention arms in physical activity...*"; "*To explore the impact of missing data, a sensitivity analysis using baseline observation carried forward (BOCF) for participants with missing data at follow-up time points was performed for physical activity,...*" ; " *Comparison of change in physical activity, dietary behaviors, and health literacy with and without BOCF revealed only small differences in the magnitude of these outcomes..*" ; "*Given these minor differences, only the results from the analyses without BOCF are reported*." ; "*All analyses ... followed intention-to-treat principles*."
Selective reporting	Unclear risk	Information from protocol paper and trial registration: Primary outcomes: Participants wll be asked to complete the following survey instruments and have the following measurements taken at each data collection time point: Physical Activity Questionnaire, Nutrition/Food Questionnaire, Physical Activity Literacy Questionnaire, Nutrition Literacy Questionnaire. Secondary outcomes: Phase 1 - Control Group and IT Group. All individuals will be provided with a detailed information sheet

		and an informed consent form. They will have their data recorded at a time convenient for them. Participants will complete the survey instruments (Surveys mentioned in Primary Outcome 1) and will have their height and weight measured at each time point. Phase 2 - Sub-sample group. All individuals will be fitted with an accelerometer and will have objective measures taken of their height and weight whilst completing the same intervention as Phase 1 participants. Timepoint [1]0, 3 and 12 months. From protocol paper: "*Self-reported duration of sitting in occupational settings over the previous seven days was assessed using two items*. *Adapted from an*...". Two outcomes (daily minutes of sitting outside of work + sitting at work) are reported on the protocol paper table 4 but such outcomes are not reported on the results paper. Accelerometer data is also not reported on the results paper but the authors present a valid justification. From results paper: Table 3 and 4 seem to report on all measures; "*Although a subsample of participants (n=91) were provided with accelerometers to objectively measure physical activity*, *poor participant compliance with measurement protocols resulted in too few participants providing valid data for meaningful analysis and these data are not reported in this paper*."
Other bias	Low risk	Analyses adjusted for baseline values and outcome assessed using a validated measure

Fassnacht 2015

Methods	Two arms randomised controlled trial, 8 weeks intervention
Participants	N = 49 children from an elementary school aged 8-10 years (M = 9.6 ± 0.4 years, 53% female, BMI z-scores 0.8 ± 1.1; 18% overweight and 10% obese; n = 22 intervention, n = 27 comparator)
Interventions	Intervention: 1 parent educational session + 2 child educational group sessions + pedometer + daily behaviour report SMS + supportive feedback SMS Comparator: 1 parent educational session + 2 child educational group sessions
Outcomes	MVPA (hours/day?) + Screen time (hours/day?) (Family Eating and Activity Habits Questionnaire), Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 9.1. Credible source, 12.5 Adding objects to the environment Comparator: 1.1. Goal setting (behavior), 9.1. Credible source
Inclusion criteria	4th grade children from an elementary school, aged 8-10 years, regardless of weight or ethnicity
Exclusion criteria	
Risk of Bias	Judgement Support for judgement

Random sequence generation	Low risk	"*A total of 49 children (aged 8–10years) were randomized by school classes into a monitoring vs no-monitoring group*." ; "*By tossing a coin, the children of 2 school classes were assigned to either a monitoring (intervention: n = 22) or control (n = 27) condition*."
Allocation concealment	Low risk	Coin tossing should prevent deciphering of allocation schedulle
Blinding of participants and personnel	High risk	"*All children participated in 2x 60-minute educational sessions presented in a group format and facilitated by 2 trained psychologists*." "*Children from the intervention group were asked to monitor their fruit and vegetable consumption, physical activity, and screen time daily*"; "*Children were instructed to report data in a standard format via SMS*."
Blinding of outcome assessment	Unclear risk	No information
Incomplete outcome data	High risk	For physical activity measurement only 21/22 (intervention) and 23/27 (control) are presented with no reasons reported; same for screen time.
Selective reporting	High risk	Outcomes derived from the self-report health behaviour questionnaire are not reported.
Other bias	High risk	Analyses were adjusted for baseline values but "*children were randomized class-wise rather than individually*" and this cluster-design was not taken into account. The instrument to assess physical activity and sedentary behaviour were translated/modified and used only some items from originally validated measures

Fjeldsoe 2010

Methods	Two arms randomised controlled trial, 12 weeks intervention
Participants	N= 88 women, n = 45 intervention, n = 43 comparator, M = 30 ± 6 years, BMI = 27 ± 6 Kg/m^2, 17% with lower than year 10 education
Interventions	Intervention: 1 face-to-face goal setting consutation + PA print-based info pack + goal magnet + goal review consultation at 6 weeks + 3-5 tailored SMS/week + 2 SMS/week to nominated support person + "goal-check" SMS requiring reply Comparator: 1 face-to-face consutation + PA print-based info pack (minimal contact control)
Outcomes	MVPA (mins/week and days/week) and walking (mins/week and days/week), (Australian Women's Activity Survey), Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 1.4. Action planning, 1.5. Review behavior goal, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support, 5.1. Information about health consequences, 7.1. Prompts/cues, 8.1. Behavioral practice/rehearsal, 12.5. Adding objects to the environment Comparator: 5.1. Information about health consequences
Inclusion criteria	English skills to enable informed consent, less than12-months postpartum, not currently in the second or third trimesters of pregnancy, possession of a mobile

	telephone, engaged in less than 5 days/week of 30 min of MVPA, intended to increase PA in the next 3 months, able to nominate a social support person with possession of a mobile telephone	
Exclusion criteria	-	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Participants were randomized according to the prefix of the unique identifier label (1 or 2) attached to their baseline survey. At each baseline assessment the research assistant shuffled the labeled surveys and randomly selected one from the pile. After all baseline data were collected, a coin was tossed to determine group allocation based on the prefix of the unique identifier label*."
Allocation concealment	Low risk	"*After all baseline data were collected, a coin was tossed to determine group allocation based on the prefix of the unique identifier label*."
Blinding of participants and personnel	High risk	"*Participants and the research assistant were blinded to group allocation at baseline; however, this could not be maintained at 6 and 13 weeks. Assessor bias was minimized by training the research assistant not to deviate from the interview script*."
Blinding of outcome assessment	High risk	"*Participants and the research assistant were blinded to group allocation at baseline; however, this could not be maintained at 6 and 13 weeks. Assessor bias was minimized by training the research assistant not to deviate from the interview script*."
Incomplete outcome data	Low risk	"*Data analysis was conducted in 2008 and used intention-to- treat principles. The distributions of all physical activity outcomes were not normal (according to Kolmogorov– Smirnov tests), and remained skewed following transformation due to the zero-inflated distribution of the data. Since the data were not normally distributed, missing data were imputed using a regression tree model. This method was used because unlike other modeling-based imputation methods (i.e., expectation maximization algo- rithms) this method does not assume that the complete dataset, from which missing values are predicted, has a normal distribution*" In Figure 1, 'n' is the same for allocation and analysis.
Selective reporting	Low risk	"*The primary outcome for this study was the number of days per week that participants reported at least 30 min of MVPA or walking for exercise (referred to as frequency). We also examined total duration (min/week) of MVPA and walking for exercise. These outcomes were assessed using the Australian Women's Activity Survey (AWAS) and a study-specific single-item measure*." All outcomes are reported in Table 3.
Other bias	Unclear risk	Analyses adjusted for baseline values and outcome assessed using a validated measure. However, "*there were meaningful (but not statistically significant) differences between study groups in baseline physical activity levels (Table 2). The median for MVPA and walking for exercise frequency was 1 day per week higher in the intervention group than the control group at baseline (Table 2). The median MVPA duration was 60 min per week higher in the*

		intervention group than the control group and median walking for exercise duration was 40 min per week higher at baseline."

Glynn 2014

Methods	Two arms randomised controlled trial, 8 weeks intervention. Trial registration: ISRCTN99944116	
Participants	N = 90 adults, n = 45 intervention, n = 45 comparator, M = 44 ± 11 years, 64% female, BMI = 28.2 ± 5.5 Kg/m^2	
Interventions	Intervention: "Accupedo Pedometer" app + Physical activity goals and info + Benefits of exercise Comparator: Physical activity goals and info + Benefits of exercise	
Outcomes	Steps/day, objectively measured via smartphone pedometer	
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 5.1. Information about health consequences, 9.1. Credible source, 12.5. Adding objects to the environment Comparator: 1.1. Goal setting (behavior), 5.1. Information about health consequences, 9.1. Credible source	
Inclusion criteria	≥ 16 years, active Android smartphone user	
Exclusion criteria	Do not have an Android smartphone, have an acute psychiatric illness, pregnancy, could not participate in moderate exercise	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Randomisation occurred using random permuted blocks to ensure there were similar numbers of participants in the intervention and control groups. An independent investigator was responsible for generating the allocation sequence using the Research Randomizer computer software program (available at www. randomizer.org/form.htm).*" This matches the protocol paper.
Allocation concealment	Low risk	Protocol paper: "*The same independent researcher is responsible for assigning participants to the intervention and control groups. Thus, the allocation sequence is concealed from all study researchers until the interventions are assigned.*"
Blinding of participants and personnel	High risk	"*For the week following the screening visit (week 1), all participants were asked to carry their smartphone during waking hours and to continue operating at their normal physical activity levels. During week 1, the smartphone app display was not visible for either group and the investigators remained blinded.* *At the end of week 1, the randomisation code was broken by the investigators. In this way, the allocation sequence was concealed from all study investigators and participants until all codes were assigned and week 1 was completed*". While baseline assessments were blinded, this was not possible after week 1. "*At the end of weeks 1, 2, and 8, all participants were contacted via SMS and asked to email their step-count data to the research team using a 'share data' function of the app. All participants were invited back for follow-up testing within 1 week of finishing the trial.*"

Blinding of outcome assessment	Low risk	"*Step-count data were recorded automatically, beyond the control of investigators and participants, and stored by the app on the telephones of all trial participants*." For secondary outcomes (e.g. blood pressure) the risk would be unclear.
Incomplete outcome data	Unclear risk	No intention to treat analyses, numbers analysed do not match the numbers randomised (Table 2 and Figure 1). "*Finally, due to the 'sleep' function on certain smartphone models, which forced the app to pause, some step-count data were not recorded' this is why such data were not available for all participants at follow-up. However, this was similar for both groups over the course of the trial and was accounted for in the statistical modelling*."
Selective reporting	Low risk	Protocol paper and trial registration: "*The primary outcome variable is step count, measured daily for a week prior to treatment assignment (that is, baseline) and subsequently for a seven week follow-up period. Seven secondary outcomes will be measured at baseline and at the end of the follow-up period, namely: systolic blood pressure; diastolic blood pressure; resting heart rate; BMI; mental health as measured by HADS score; quality of life as measured by ED-5D and EQ-VAS*." These match the outcomes presented in the results paper, Table 2.
Other bias	Unclear risk	Analyses adjusted for baseline values and outcome assessed using a valid measure. However, "*There was a difference in baseline step count between control and intervention groups. This was not statistically significant but, nonetheless, this potential difference was recognised a priori and adjusted for...*"

Hebden 2014

Methods	Two arms randomised controlled trial, 12 weeks intervention.
Participants	University students and staff aged 18-35 years (N = 51; n = 26 intervention, M = 22.6 ± 5.4 years, 85% female, BMI = 27.3 ± 2.1 Kg/m^2; n = 25 comparator, M = 23.1 ± 3.7 years, 76% female, BMI = 27.2 ± 2.5 Kg/m^2
Interventions	Intervention: session with dietitian + printed booklet with PA guidelines + 2 SMS and 2 e-mails/week + app + internet forum Comparator: session with dietitian + printed booklet with PA guidelines
Outcomes	MVPA + LPA + Sedentary (min/day) objectively measured via GT1M accelerometer + Total PA (min/week and MET-min/week) + Sitting (min/day) self-reported (International Physical Activity Questionnaire - IPAQ)
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 1.4. Action planning, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 5.1. Information about health consequences, 7.1. Prompts/cues, 9.1. Credible source Comparator: 1.1. Goal setting (behavior), 5.1. Information about health consequences, 9.1. Credible source
Inclusion criteria	BMI 24.00–31.99 or 23.00–23.99 kg/m^2 with weight gain >2 kg in past 12 months, Aged 18–35 years, Moderate intensity PA <60 min/day, Consumes ≥1 L of SSB/week or <2 serves fruit/day or <5 serves vegetables/day or ≥2 energy-dense takeaway meals/week, Stage of change is Contemplation or Preparation for ≥2 of the physical activity or dietary behaviours

Exclusion criteria	Cannot receive SMS or does not have regular Internet access, On a diet required for medical reasons, medical condition that influences body weight or ability to comply with intervention, Takes medications or herbal preparations that may influence body weight, Enrolled in a weight loss programme or taking supplements for weight loss, currently pregnant or planning pregnancy in the next 3 months

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Participants were randomly allocated to intervention and control arms in a 1 : 1 ratio. A list of random numbers was generated using computer software by investigator LH to randomise participants' unique identification numbers into the two study arms*."
Allocation concealment	High risk	"*Participants were enrolled in the study, randomised to their study arm and provided the study materials by investigator (LH)*". It appears that LH was responsible to allocate participants to their respective group.
Blinding of participants and personnel	High risk	"*Participants were aware that two treatment arms existed; however, they were blinded to the nature of each.*"; "*At their baseline appointment, participants selected two of these behaviours to work on during the programme, under the guidance of investigator LH.*"; "*Within forums, both participants and investigator LH were able to contribute comments, questions and information.*"; "*New information was posted by the investigator LH biweekly...*"
Blinding of outcome assessment	Unclear risk	"*Online surveys administered at baseline and week 13 follow-up included questions about sitting time and physical activity in the previous week,...*"
Incomplete outcome data	Low risk	"*Data were analysed according to the intention-to-treat principle with baseline values imputed for missing follow-up data*." Numbers of 'analysed' and 'allocated' match in the flow diagram (figure 1). "*Because of the small number of participants with valid accelerometery data for baseline and follow-up (n = 15 control; n = 12 intervention), analyses were limited to these subjects*."
Selective reporting	Low risk	All primary and secondary outcomes listed are reported.
Other bias	Low risk	Analyses adjusted for baseline values; outcome assessed using a valid measure; accelerometry data further adjusted for average wear time.

Hurling 2007

Methods	Two arms randomised controlled trial, 9 weeks intervention
Participants	N = 77 healthy adults, M = 40.4 ± 7.6 years, BMI = 26.3 ± 3.4 Kg/m^2, 66% female, n = 47 intervention, n = 30 comparator
Interventions	Intervention: internet + mobile phone program with solutions for barriers, schedule, reminders, message board to share experiences and feedback + wrist worn accelerometer with real-time feedback via internet Comparator: wrist worn accelerometer with no support

Outcomes	Overall PA and leisure time PA + Sitting (MET mins/week, International Physical Activity Questionnaire - Long Form - IPAQ-LF) + Moderate PA Uniaxial wrist accelerometer (2min epochs/day)
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 1.4. Action planning, 1.9. Commitment, 2.2. Feedback on behavior, 2.3. Self-mointoring of behavior, 3.1. Social support (unspecified), 6.2. Social comparison, 7.1. Prompts/cues, 8.7. Graded tasks, 12.5. Adding objects to the environment Comparator: 2.3. Self-monitoring of behavior, 12.5. Adding objects to the environment
Inclusion criteria	Age 30-55 years, BMI 19-30 Kg/m^2, not vigorously active, not taking regular prescription medication, Internet and email access, mobile phone user, not employed by Unilever
Exclusion criteria	-

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*After 3 weeks of monitoring baseline physical activity, participants returned and were stratified by age, gender, and BMI and were randomly allocated to either the control (n = 30) or test group (n = 47).*"
Allocation concealment	Unclear risk	No information
Blinding of participants and personnel	High risk	"*Following collection of 3 weeks of baseline data, the test group participants received a short demonstration of the Internet-based behavior change system; the control group also came to the center but only received verbal advice on recommended physical activity levels. The test group then had access to the Internet-based behavior change system for 9 weeks, whereas the control group had no access and received no feedback*".
Blinding of outcome assessment	Unclear risk	"T*he primary dependent measure was change in moderate physical activity recorded by the longer version of the International Physical Activity Questionnaire (IPAQ) and the wrist-worn accelerometer*".
Incomplete outcome data	Low risk	"*Three participants were found to have faulty Actiwatches and so were removed from all statistical analyses.*"; "*As shown in Table 2, an intent-to-treat analysis of (the square-root transformed) MET minutes per week found no significant difference, after adjusting for the baseline covariate, between the test group (mean = 12.0, SE = 3.1) and the control (mean = 4.0, SE = 4.1), with P = .12 (95% CI for the difference = −2.3-18.3).*"
Selective reporting	High risk	"*The primary dependent measure was change in moderate physical activity recorded by the longer version of the International Physical Activity Questionnaire (IPAQ) and the wrist-worn accelerometer. Changes in weight, percent body fat (as measured by bioelectrical impedance scales), height, and resting blood pressure were secondary measures. All measures were taken before and after the 9-week intervention period...*"; "*A set of cognitive items was developed specifically for the study...*"; "*Participants also completed an exercise Skills and Knowledge Questionnaire that asked about skills used to increase physical activity*."

		These outcomes were reported for baseline and after 9 weeks. The authors report using the long version of IPAQ (which allows differentiation of activity in the leisure, work, household and transport domains) and computation of time spent in other intensities of physical activity (light, vigorous) and time spent sitting. However, only time spent sitting and moderate PA are reported (only overall and for the leisure domain, not for the work, transport, and household domains). Further, for sitting, the data is further differentiated between weekdays and weekend days, which are inconsistencies compared to what was announced in the methods section. "*A Generalized Estimating Equation Model with log link and Poisson distribution was used to calculate the number of 2-min epochs spent within three metabolic equivalent (MET) ranges, corresponding to moderate intensity (MET level over 3 and up to 6), high intensity (MET level over 6 and up to 9), and very high intensity (MET level over 9)...*" For accelerometer data only moderate and vigorous intensity physical activity is reported, which is also inconsistent with the methods section.
Other bias	Low risk	Analyses adjusted for baseline values; outcome assessed using a valid measure.

Kim 2013

Methods	Two arms randomised controlled trial, 6 weeks intervention. Trial registration: NCT01697475
Participants	N = 36 African Americans aged 60-85 years, n = 26 intervention, M = 69.3 ± 7.3 years, 81% female, BMI = 31.4 ± 7.4 Kg/m^2; n = 10 comparator, M = 70.6 ± 7.5 years, 80% female, BMI = 30.2 ± 7.0 Kg/m^2
Interventions	Intervention: 3x motivational SMS/day, 3days/week + pedometer + walking manual/log Comparator: pedometer + walking manual/log
Outcomes	Steps/day objectively measured via pedometer (but data analysed was from participants' logs?) + total PA MET (Godin Leisure Time Exercise Questionnaire - LTEQ, self-reported)
Behaviour Change Techniques	Intervention: 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 7.1. Prompts/cues, 12.5. Adding objects to the environment Comparator: 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 12.5. Adding objects to the environment
Inclusion criteria	African American community-dwelling adults aged 60 to 85 who were recruited from senior centers; had to be healthy (no restrictions and medical clearance to walk); had to have a mobile phone with text messaging capability
Exclusion criteria	Any physical or psychological illness or medical problem that restricted walking, did not own a mobile phone with text messaging capability, not willing/able to follow study procedures
Risk of Bias	Judgement Support for judgement

Random sequence generation	High risk	"*Recruitment was staggered over time, and participants were assigned randomly into a control or intervention group by a flip of the coin. An unbalanced randomization was used so that once the control group reached a maximum number of 15 participants, the rest were placed in the intervention group*."
Allocation concealment	High risk	See above.
Blinding of participants and personnel	High risk	Even thoug the trial registration reports "Masking: Double Blind (Subject, Investigator)", the results paper reports "*In addition, participants were not blinded to allocation of the intervention, and ability to monitor the pedometer throughout the day may have inflated step-count levels in both groups*."
Blinding of outcome assessment	Unclear risk	No information
Incomplete outcome data	Unclear risk	"*Intention-to-treat (ITT) analyses also were conducted using a last-observation-carried-forward approach on all randomized participants (control group n = 15; intervention group n = 30). ITT analysis revealed similar intervention effects compared to participants who completed the study and therefore was not included in the main analysis*." However, n analysed reported on Figure 1, Table 1, and table 2 are inconsistent.
Selective reporting	Low risk	Outcomes reported match those listed in the trial registration. "*Step-count and walking log. The Omron (Model #HJ-113) pedometer, when worn at hip level, measures the number of steps taken. The walking manual consisted of an introduction to the study, general walking tips, pedometer usage instructions, and blank tables where participants could record the number of steps they took that day for up to 6 weeks.*"; "*Leisure Time Exercise Questionnaire. Pre–post perceived activity levels were assessed using the Leisure Time Exercise Questionnaire (LTEQ). A total MET is scored by weighing intensity levels, using 3 for mild, 5 for moderate, and 9 for strenuous activity. The LTEQ has good test–retest reliability and has shown convergent validity with both objective and self-reported measures of physical activity*".
Other bias	Unclear risk	Unclear if analyses were adjusted for baseline values. Outcome assessed using a valid measure.

King 2008

Methods	Two arms randomised controlled trial, 8 weeks intervention.
Participants	N = 37 healthy underactive adults aged ≥ 50 years; n = 19 intervention, M = 60.7 ± 6.8 years, 42% women, 74% white; n = 18 comparator, M = 59.6 ± 7.6 years, 44% women, 83% white
Interventions	Intervention: instructional session + PDA to monitor and receive feedback and support + pedometer + written physical activity educational materials Comparator: written physical activity educational materials

Outcomes	MVPA (min/week) using the Community Healthy Activities Model Program for Seniors questionnaire - CHAMPS, Self-reported	
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 12.5. Adding objects to the environment Comparator: 4.1. Instruction on how to perform the behavior	
Inclusion criteria	≥ 50 years old, ≤ 60 min/week of MVPA over the previous 6 months, interested in learning ways to increase physical activity, free of medical conditions limiting participation in MVPA, English language skills to enable informed consent and participate in study procedures, willing to use a PDA as directed, willing to be randomised	
Exclusion criteria	-	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Subjects were randomly assigned to either an 8-week hand-held computer-based intervention arm or a standard information control*"; Citation to the Efron procedure.
Allocation concealment	Unclear risk	No information.
Blinding of participants and personnel	High risk	"*Intervention participants were provided with a PDA and instructed in its use as a means of monitoring and increasing their physical activity levels*".
Blinding of outcome assessment	Unclear risk	No information.
Incomplete outcome data	Low risk	"*All 37 participants completed the primary measure of interest (CHAMPS) at 8 weeks*."; "*Data were successfully retrieved from the PDAs of 14 of the 19 intervention participants*. *Nonretrieval was due to individuals not returning the PDA (n 2) or corruption of data files during the data retrieval/transfer process (n 3*)."
Selective reporting	Low risk	"*Regular physical activity was measured using the Community Healthy Activities Model Program (CHAMPS) questionnaire for older adults*."; "*At the 8-week post-test, intervention participants completed a 20-item questionnaire evaluating the acceptability and utility of the PDA*."
Other bias	Low risk	Analyses adjusted for baseline values; outcome assessed using a valid measure.

King 2013

Methods	Three arms randomised controlled trial, 8 weeks intervention.
Participants	N = 68 community-dwelling adults, M = 59.1 ± 9.2 years (range = 45-81), 73.5% women, 69% white, BMI = 29.6 ± 6.2 Kg/m^2, n = 22 analytic, n = 23 social, n = 23 affect
Interventions	Intervention: analytic app focused on goal setting, self-monitoring and problem solving Intervention: social app focused on social comparisons, norms, and support

	Intervention: affective app focused on reinforcement and emotional transference to an avatar
Outcomes	Walking (min/week) + MVPA (min/week) using the Community Healthy Activities Model Program for Seniors questionnaire - CHAMPS -, TV viewing (hours/day) using the Measure of Older Adults' Sedentary Time questionnaire - MOST - , Self-reported
Behaviour Change Techniques	Intervention (analytic app): 1.1. Goal setting (behavior), 1.2. Problem solving, 1.5. Review behavior goal(s), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 10.2. Material reward (behavior) Intervention (social app): 1.2. Problem solving, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 6.1. Demonstration of the behavior, 6.2. Social comparison, 6.3. Information about others' approval Intervention (affective app): 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 10.2. Material reward (behavior), 14.4. Reward approximation
Inclusion criteria	Community-dwelling adults aged ≥ 45 years, insufficiently active (i.e., engaged in < 60 minutes of MVPA/week), sitting for ≥10 hours/day, able to participate safely in a PA program (Physical Activity Readiness Questionnaire), currently using a mobile phone but not using a smartphone
Exclusion criteria	

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*...individuals meeting the eligibility criteria were randomly assigned, using a computerized version of the Efron procedure, to use one of the three custom apps for an 8- week period*".
Allocation concealment	Unclear risk	No information
Blinding of participants and personnel	High risk	"*At the end of this initial week, participants returned to the research facility to receive their randomly assigned behavior change app and basic instruction on its use*"
Blinding of outcome assessment	Unclear risk	"*...participants completed standard self-administered questionnaires at baseline and at the end of the 8-week intervention period*."
Incomplete outcome data	Low risk	"*While all but one participant was successful in using their assigned smartphone app through at least 5 weeks of the 8-week protocol, 7 participants were missing post-test physical activity or sedentary behavior questionnaire data (i.e., 10.3%). Missing questionnaire data were due to participant time constraints or not properly filling out the questionnaires.*"; "*Within the constraints imposed by analysis of subgroups with small n's, independent t- tests or Chi-Square analyses comparing the 7 participants with missing post-test questionnaires with the rest of the sample indicated that the 7 participants were significantly different than the full sample with regard to age ... but not significantly different from the rest of the sample in other demographic variables (i.e., gender, race,*

		education, income), BMI, group assignment, or baseline physical activity or sedentary behavior variables."
Selective reporting	Unclear risk	"*To assess physical activity levels, the CHAMPS Physical Activity Questionnaire was used.*"; "*To assess sedentary behavior levels, the Australian sedentary behavior questionnaire (referred to as the Measure of Older Adults' Sedentary Time [MOST]) was used. The measure includes metrics for a variety of sedentary behaviors such as television viewing, reading, or office work and metrics for each individual behavior along with total sedentary time have been developed. Given that television viewing is the most prevalent discretionary sedentary activity undertaken by people in this age group, television-viewing time was considered to be the primary sedentary variable of interest*"; "*To evaluate user acceptability of the apps, participants completed a user satisfaction survey at the end of the 8-week intervention period. The survey, adapted from similar user satisfaction surveys in this age group, consisted of 22 items asking users to rate, on a 6-point Likert-type scale, level of disagreement to agreement with each item concerning the usability of the apps. An additional 20 items captured participants' general attitudes towards smartphones following the intervention period on a 5-point Likert-type scale*." Even though the authors present a valid justification to only present tv viewing time from the outcomes possible to compute from the MOST instrument, it appears that participants answered all the items. The authors could maybe also have reported physical activity and sedentary time as obtained from the phone's built-in accelerometers.
Other bias	Unclear risk	Unclear whether analyses were adjusted for baseline values "*Analysis of covariance was used to explore between-group differences in the variables of interest across apps, with all major outcome variables log-transformed in response to non-normality*."; outcome assessed using a valid measure.

Knight 2014

Methods	Three arms randomised controlled trial, 12 weeks intervention
Participants	N = 45 older adults, M = 63 ± 5 years; n = 14 SB, 64% female, BMI = 33.8 ± 4 Kg/m^2; n = 15 EX, 46% female, BMI = 30.4 ± 5 Kg/m^2; n = 16 combined, 56% female, BMI = 29.6 ± 6 Kg/m^2
Interventions	Intervention (SB): prescription targeting reductions and interruptions in sedentary behaviour + smartphone and app + blood pressure monitor + glucometer + pedometer Intervention (EX): prescription targeting high-intensity activity + app and smartphone + blood pressure monitor + glucometer + pedometer Intervention (combined): prescription targeting both reductions and interruptions in sedentary behaviour and high-intensity activity + smartphone and app + blood pressure monitor + glucometer + pedometer
Outcomes	Steps/day objectively measured via pedometer

Behaviour Change Techniques	Intervention (SB): 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 2.6. Biofeedback, 3.1. Social support (unspecified), 5.1. Information about health consequences, 12.5. Adding objects to the environment Intervention (EX): 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 2.6. Biofeedback, 3.1. Social support (unspecified), 8.7. Graded tasks, 12.5. Adding objects to the environment Intervention (combined): 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 2.6. Biofeedback, 3.1. Social support (unspecified), 5.1. Information about health consequences, 8.7. Graded tasks, 12.5. Adding objects to the environment	
Inclusion criteria	Mean and women aged 55-75 years, healthy, with no diagnisis (e.g. hypertension, diabetes, obesity)	
Exclusion criteria	Resting blood pressure ≥ 180/110 mm Hg, type 1 diabetes, history of myocardial infarction, angioplasty, coronary artery bypass, cerebrovascular ischemia, symptomatic congestive heart failure, atrial flutter, unstable angina, implanted pacemaker, second- or third-degree heart block, unstable pulmonary disease, unstable metabolic diasease, use of medications known to affect heart rate (eg, ß-blockers), started or changed dose of lipid lowering agent(s) within the previous 3 months, any orthopedic condition restricting PA	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*After screening for eligibility, participants were allocated to 4 groups based on a randomization schedule created using an online randomization tool (www.random.org/lists/).*"
Allocation concealment	Unclear risk	No information.
Blinding of participants and personnel	High risk	"*Participants were not blinded to group allocation*."
Blinding of outcome assessment	Unclear risk	No information. The pilot study paper notes limited access to data, but does not mention if assessors had knowledge of the intervention group. "*When participants measured blood pressure and glucose, the reading was automatically sent to their smartphone via the Bluetooth connection. Measures for body weight and physical activity were manually entered by participants into their smartphone. The smartphone transmitted measures through a wireless network to the study database.*"; "*The mean change in remotely submitted home-monitored variables is presented in Table 2*".
Incomplete outcome data	Low risk	"*All participants who enrolled in the study completed the 12-week intervention*."
Selective reporting	Low risk	All listed outcomes are reported.
Other bias	Unclear risk	"*Repeated measures of multivariate analysis of variance (MANOVA) were conducted to test the effect of the intervention on changes in remotely submitted measures over time. Univariate analyses were examined to test for effects of group assignment over time.*"; Unclear

	whether analyses were adjusted for baseline values, outcome assessed using a valid outcome.

Patrick 2013

Methods	Four arms randomised controlled trial (two arms of interest), 52 weeks intervention. Trial registration: NCT00412165
Participants	N = 101 overweight or obese adolescents at risk for T2DM, M = 14.3 ± 1.5 years, 63.4% female, BMI percentile = 97.6, 74.3% Hispanic; n = 26 website only; n = 26 website + monthly group sessions + follow-up calls; n = 24 website + SMS; n = 25 usual care (Two arms of interest: web + SMS; usual care)
Interventions	Intervention (web + SMS): website with tutorials + ≥ 3 SMS/week with challenges, goals, strategies, and communicate with health counselor + pedometer + weekly email reminder + monthly mailed tips Comparator (usual care): printed materials from the American Diabetes Association and the American Heart Association + 3x 1h group nutrition sessions + monthly mailed tips
Outcomes	MVPA (min/week) via the 7-day PA recall interview + SB (hours/day) via Robinson survey, Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 7.1. Prompts/cues, 8.7. Graded tasks, 10.3. Non-specific reward, 12.5. Adding objects to the environment, 15.4. Self-talk Comparator: 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 7.1. Prompts/cues
Inclusion criteria	Adolescents aged 12-16 years at "high risk" for diabetes (as defined by the American Diabetes Association: BMI > 85th percentile for age and sex, weight and height > 85th percentile, or weight >120% of ideal for height plus any two of the following risk factors: family history of T2DM in a 1st- or 2nddegree relative, race/ethnicity American Indian, African-American, Hispanic, Asian/Pacific Islander, or signs of insulin resistance e.g. acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome); both teens and parents could access the Internet, having a telephone, ability to sepak and read English, willingness to participate in online activities and attend monthly group sessions
Exclusion criteria	Diagnosis of diabetes, pregnancy, any medical condition that would prevent participation in the intervention, not planning to be in the area over the study period

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Unclear risk	"*Participants were randomized to four study arms*..." Not enough information.
Allocation concealment	Unclear risk	"*Participants were randomized to four study arms*..." Not enough information.
Blinding of participants and personnel	High risk	Trial registration: "Masking: Open Label"; Results paper: "*The program website and its tutorials were designed to promote weight loss and healthy behaviors related to obesity*."

Blinding of outcome assessment	Unclear risk	"*Prior to randomization and initial counseling and encouragement from the primary care physician, baseline anthropometric, psychosocial, and behavioral measures were collected*."
Incomplete outcome data	Low risk	"*Group effects on each of the outcome measures at 12 months were tested with mixed model analyses using maximum likelihood repeated measures. Intent-to-treat analyses were conducted using all available data from participants who enrolled, were randomized, and started the interventions (n = 101) assuming data were missing at random*." Flow diagram does not show n analysed.
Selective reporting	Low risk	"*All measures were collected at baseline, 6 months, and 12 months*." All measures described in the trial registration and methods appear to be reported.
Other bias	Unclear risk	Unclear whether analyses were adjusted for baseline values, outcome assessed using a valid measure.

Prestwich 2010

Methods	Three arm randomised controlled trial, 4 weeks intervention	
Participants	N = 149 mostly university students, M = 23.44 ± 5.63 years, 64% female, BMI = 22.9 ± 3.9 Kg/m^2	
Interventions	Intervention: asked participants to meet PA guidelines + implementation intention + SMS with plan reminder Intervention: asked participants to meet PA guidelines + implementation intention + SMS with goal reminder Comparator: asked in writing to be active as defined by governmental guidelines (no SMS nor implementation intentions)	
Outcomes	Number of days/week walked or exercised for ≥ 30 min using the Self-Report Walking and Exercise Tables - SWET measure, Self-reported	
Behaviour Change Techniques	Intervention (plan): 1.1. Goal setting (behavior), 1.4. Action planning, 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 7.1. Prompts/cues Intervention (goal): 1.1. Goal setting (behavior), 1.4. Action planning, 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 7.1. Prompts/cues Comparator: 1.1. Goal setting (behavior), 5.1. Information about health consequences	
Inclusion criteria	Exercise < 3x/week (including brisk walking), not have a medical condition that prevented brisk walking, own a cell phone, be able to attend a follow-up session exactly 4 weeks after the first session	
Exclusion criteria	-	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Participants were randomized to one of three groups (implementation intention SMS plan, implementation intention SMS goal, control) and completed measures of walking at baseline and 4 weeks follow-up. An allocation sequence, based on complete randomization (nonblocked, nonstratified) with no restrictions, was prepared by Research Staff Member 1 using a computer- generated*

		randomization program. On the basis of this allocation sequence, Research Staff Member 2 placed the relevant study materials in a series of numbered and sealed envelopes. These envelopes were passed to Research Staff Member 3, who met with the participants. Participants opened the envelopes in individual cubicles away from research staff."
Allocation concealment	Unclear risk	See above. It is not specified whether numbered and sealed envelopes were opaque.
Blinding of participants and personnel	High risk	"*These envelopes were passed to Research Staff Member 3, who met with the participants. Participants opened the envelopes in individual cubicles away from research staff. On completion of the study materials, participants sealed their completed measures in other envelopes. Consequently, Research Staff Member 3 was unaware of condition during the testing phase.*" ; "*All participants were asked, in writing, to try to be active (as defined by governmental guidelines). Furthermore, to minimize the risk of contaminating the experimental manipulations, the need to refrain from communicating with other people about the study was stressed to all participants. Participants (by not discussing the trial with others), those entering the data (Research Staff Members 5 and 6, by receiving only the dependent measures), and the data analyst (Research Staff Member 7, by receiving information regarding the study groups coded by number rather than name) were unaware of condition*." Personnel appears to be blinded but it is unclear whether participants were blinded to the intervention despite the author's efforts. "*All participants were recruited using an e-mail distributed to a participant database that outlined the eligibility criteria and described the study as concerning attitudes and behavior relating to walking*."
Blinding of outcome assessment	Low risk	"*These envelopes were passed to Research Staff Member 3, who met with the participants. Participants opened the envelopes in individual cubicles away from research staff. On completion of the study materials, participants sealed their completed measures in other envelopes. Consequently, Research Staff Member 3 was unaware of condition during the testing phase.*"; "*Participants (by not discussing the trial with others), those entering the data (Research Staff Members 5 and 6, by receiving only the dependent measures), and the data analyst (Research Staff Member 7, by receiving information regarding the study groups coded by number rather than name) were unaware of condition*."; "*Participants' height, weight, waist size, and hip size were measured by Research Staff Member 3, who was unaware of condition*".
Incomplete outcome data	Low risk	Flow diagram shows that not all who were randomised were analysed (less 15) but reasons presented appear valid. "*On each dependent variable, six participants' responses could not be coded into the number of days on which they walked or exercised for at least 30 min because of incomplete data. Nine participants were lost to follow-up, reflecting a dropout rate of 6%*." The authors do not seem to have tried approaches to deal with missing data, likely

		because plausible effect size among the missing dependent variable data were insufficient to impact the effect size.
Selective reporting	High risk	"*The walking subscale of the SWET requires participants to note in a table their walks during the past week; the days on which they took these walks, the duration of each walk, and the speed of each walk...*".; "*In this table, participants were required to note nonwalking physical exercise, the days on which they did this exercise, and the duration of each exercise session (in minutes) during the past week*." Duration of walking (and duration of exercise) were not reported. This data was available after contacting the authors.
Other bias	Low risk	Analyses adjusted for baseline values; outcome assessed using a valid measure. "*We used analysis of covariance to test the effects of the interventions on increasing brisk or fast walking during the intervention period, using condition (implementation intention plan reminder, implementation intention goal reminder, control) as the between-subjects independent variable and brisk or fast walking at baseline as the covariate. This analysis was repeated with the secondary outcomes...*" ; "*A self-report index of walking was taken from ... validated Self-Report Walking and Exercise Tables (SWET) measure*."

Schwerdtfeger 2012

Methods	Three arms randomised controlled trial (two of interest), 1 week intervention	
Participants	N = 63; n = 22 augmented intervention, M = 23.9 ± 4.1 years, 67% female, BMI = 23.1 ± 4.8 Kg/m^2; n = 21 comparator, M = 23.6 ± 3.6 Kg/m^2, 81% female, BMI = 24.1 ± 4.2 Kg/m^2; n = 20 standard psychoeducational intervention (Two arms of interest: augmented intervention; comparator/no intervention).	
Interventions	Intervention: 1x psychoeducational standard intervention + 7x SMS/week with reminders of intentions Comparator: no intervention but PA assessment	
Outcomes	Mean counts/min, Objectively measured via uniaxial accelerometer (ankle)	
Behaviour Change Techniques	Intervention: 1.4. Action planning, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 7.1. Prompts/cues Comparator:	
Inclusion criteria	Adult 18-34 years old, own a mobile phone, self-reported exercise frequency of maximum 1 day/week for < 1h	
Exclusion criteria	-	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	*Unclear risk*	"*Participants were randomly assigned to one of three intervention arms: no intervention (n = 21, 17 women), standard psy-choeducational intervention (n = 20, 12 women), and augmented intervention (n = 22, 14 women)*".
Allocation concealment	Unclear risk	No information.

Blinding of participants and personnel	High risk	"*The study was advertised as a study on objectively assessed physical activity as performed in everyday-life*."; "*Participants of both intervention arms attended the psychoeducational session in mixed groups and were not informed beforehand about their membership in one of the two intervention groups. However, they were told that some of them would receive short text messages during the next week.*"; "*Then their height and weight were assessed by the experimenter*."
Blinding of outcome assessment	Low risk	"*Physical activity was recorded by means of uniaxial accelerometers (Actigraph GT1M) attached to the ankle of the non-dominant foot 1 week prior to the intervention session (week 1) and 1 week following the session (week 2).*" The primary outcome was measured objectively, unclear impact on participants'/reactivity; other outcomes were self-reported.
Incomplete outcome data	Low risk	"*One individual in the augmented intervention group did not wear the device at all at post-assessment, thus leaving a total sample size of 21 individuals in this group*."
Selective reporting	Low risk	"*Physical activity was recorded by means of uniaxial accelerometers (Actigraph GT1M) attached to the ankle of the non-dominant foot 1 week prior to the intervention session (week 1) and 1 week following the session (week 2).*"; "*At the end of the intervention, participants were instructed to rate on a 3-point scale to what extent they believed their physical activity had changed from pre-assessment to post-assessment (physical activity increased, stayed about the same, decreased).*"; Use of mobile phone, familiarity with SMS; Self-efficacy with modified version of the self-efficacy scale for physical exercise; Satisfaction with intervention by short questionnaire; BMI. All outcomes listed in the methods section appear reported.
Other bias	Unclear risk	It appears that analyses were not adjusted for baseline values, outcomes were assessed using a valid instrument. "*... we calculated a repeated measures- ANOVA with group as between-subject factor (control, inter- vention, intervention plus SMS) and time as within-subject factor (pre- vs. post-assessment).*"

Shapiro 2008

Methods	Three arms randomised controlled trial (two of interest), 8 weeks intervention
Participants	N = 58 children; n = 18 SMS intervention, M = 8.4 ± 2.3 years, 72% female, BMI = 28.6 ± 6.2 Kg/m^2; n = 22 comparator, M = 8.5 ± 2.3 years, 59% female, BMI = 26.2 ± 6.7 Kg/m^2; n = 18 paper diaries (Two arms of interest: SMS intervention; comparator/no-monitoring control).
Interventions	Intervention: 1x psychoeducational session/week (total = 3) + self-monitoring SMS with feddback + pedometer Comparator: 1x psychoeducational session/week (total = 3) + no monitoring + pedometer
Outcomes	Exercise time (min/day) + Screen time (min/day), Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 2.4. Self-monitoring of outcomes of behavior, 2.7. Feedback on outcome of behavior, 3.1. Social support

	(unspecified), 4.1. Instruction on how to perform the behavior, 8.2. Behavior substitution, 12.5. Adding objects to the environment Comparator: 1.1. Goal setting (behavior), 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 8.2. Behavior substitution, 12.5. Adding objects to the environment
Inclusion criteria	Children of any weight, with no major metabolic problems associated with obesity, aged 5-13 years, with anticipated parent participation (same parent must attend each session as parents were both a means to help children and to acquire accurate data), fluency in English
Exclusion criteria	

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Fifty-eight eligible families were randomized on a 1:1:1 basis (SMS: 18, PD: 18, C: 22) using the uniform random number generator in SAS*..."
Allocation concealment	Unclear risk	No information.
Blinding of participants and personnel	High risk	"*All families participated in a total of 3 educational group sessions (90 minutes each) weekly, for 3 weeks. All groups were facilitated by the same psychologist. Members of each group met only with others in the same condition.*"; "*They were instructed to send 2 SMS per day (one for parent and one for child), daily for the full 8 weeks of the study, and for each SMS sent, they would each receive an immediate, automated SMS feedback message from the program hosted on a secure server*."
Blinding of outcome assessment	Unclear risk	"*Parents answered the questions for themselves, and parent and child together answered for the child*."
Incomplete outcome data	High risk	"*A total of 31 completed the study (SMS: 13/18, PD: 7/18, C: 11/22). Differences in attrition were analyzed using the Fisher exact P value. Although not statistically significant (P .15) owing to the small sample size, the number of dropouts was substantially lower in SMS (n=5, 27.8%) than in PD (n=11, 61.1%) or C (n=11, 50.0%)*".
Selective reporting	Low risk	"*Families in SMS and PD completed daily responses to 3 questions: (1) what was the number on your pedometer today? (2) how many SSB did you drink today? and (3) how many minutes of screen time did you have today? Means from weeks 1 and 8 constituted baseline and post-treatment. All families also responded to the following questions at both baseline and post-treatment: "On average over the past week, for each day: (1) how many minutes did you spend exercising? (2) how many SSB did you consume? and (3) how many minutes of TV did you watch?*" Parents and children completed treatment acceptability questions at post-treatment (Table 2). Height, weight. All outcomes appear reported, pilot study.
Other bias	Unclear risk	Unclear whether analyses were adjusted for baseline values; some outcomes assessed using non validated measures. "*All families also responded to the following questions at both baseline and post-*

	treatment: (...) Although not validated, these questions were used to explore the preliminary efficacy of SMS in promoting behavior change."

Shuger 2011

Methods	Four arms randomised controlled trial (three of interest), 36 weeks intervention. Trial registration: NCT00957008	
Participants	N = 197 sedentary overweight/obese adults; n = 49 (SWA alone) SenseWear Armband alone, M = 47.7 ± 11.6 years, 82% female, BMI = 33.2 ±5.4 kg/m^2; n = 48 (SWA + GWL) SenseWear Armband + Group Weight Loss, M = 45.7 ± 10.4 years, 82% female, BMI = 33.0 ± 5.0 Kg/m^2; n = 50 Standard Care, M = 47.2 ± 8.9 years, 84% female, BMI = 33.7 ± 5.5 Kg/m^2; n = 49 Group Weight Loss (Three arms of interest: SWA alone; SWA + GWL; Standard Care)	
Interventions	Intervention (SWA alone): SenseWear Armband + wrist watch + weight loss manual Intervention (SWA + GWL): SenseWear Armband + wrist watch + group sessions + weight loss manual Comparator: standard care self-directed weight loss program manual	
Outcomes	Steps/day, MVPA (mins/day), Total and MVPA EE (Kcal/day)(SenseWear Armband, tri-axial accelerometer); Objectively measured	
Behaviour Change Techniques	Intervention (SWA alone): 1.1. Goal setting (behavior), 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 8.3. Habit formation, 12.5. Adding objects to the environment Intervention (SWA + GWL): 1.1. Goal setting (behavior), 1.2. Problem solving, 1.5. Review behavior goals, 2.2. Feedback on behavior, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 8.1. Behavioral practice/rehearsal, 8.3. Habit formation, 11.2. Reduce negative emotions, 12.5. Adding objects to the environment Comparator: 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 8.3. Habit formation	
Inclusion criteria	Men or women aged 18-65 years; underactive (<150 minutes of MVPA/week in bouts ≥ 10 minutes); overweight or obese (BMI) = 25-45 kg/m^2); access to the internet	
Exclusion criteria	Significant weight loss (> 9Kg) in the last 6 months; elevated blood pressure (160/ 95 mm Hg); ailments that limited PA; serious medical conditions or other issues (eg. pregnancy or depression) that contraindicated or confounded the weight loss intervention	
Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	Protocol paper: "*The randomization process was performed by the study statistician based on a computer-automated randomization sequence. The sequence was determined from randomly permuted blocks of equal length with each having a fixed number of treatment allotments to balance the treatment enrollments over time. Although randomization theoretically leads to an equality of all factors in both intervention and standard care groups, we employed a stratification procedure to ensure equal numbers of participants with specific and potentially confounding characteristics in all four groups.*

		Randomization was stratified based on age, sex, baseline BMI, and availability to attend the GWL sessions." Results paper: "*Eligible participants were randomly assigned after completing run-in and baseline assessments. The randomization sequence was computer generated. The sequence was determined from randomly permuted blocks of equal length with fixed numbers of treatment allotments each, to balance treatment enrollments over time*."
Allocation concealment	Unclear risk	Protocol paper: "*During the randomization visit, all participants received the evidence-based weight loss manual, an envelope containing their randomization assignment, and a brief health education session with handouts that covered physical activity, healthy eating, and weight loss*." Unclear whether the envelope was numbered, opaque.
Blinding of participants and personnel	High risk	Protocol paper: "*The physical activity education provided an overview of what constitutes physical activity, physical activity benefits, different types of physical activity, current physical activity recommendations, tips for starting physical activity, and warning signs and symptoms for heart attack and stroke. (...) All participants were also reminded of study expectations for the group to which they were assigned. Participants randomized to SWA alone received a 90-min training session on how to use the armband and corresponding website.*"; "*Throughout the study, the GWL + SWA and SWA-alone group participants used the self-monitoring device to aid behavior change via real-time lifestyle feedback targeting physical activity and dietary tracking*". Trial registration: "Masking: Open Label".
Blinding of outcome assessment	Low risk	Protocol paper: "*At the conclusion of this session, participants were asked to wear the armband for 7 days to assess baseline physical activity levels and (...) Participants received no feedback from the armband during this period.*"; "*During the baseline and month 9 assessments, no participants received physical activity and energy balance feedback from the SenseWear platform.*" ; "*Physical activity levels were assessed using the armband. The armband is a commercially available (www.bodymedia.com) lightweight physical activity monitor that is worn on the upper left arm halfway between the acromion and olecranon processes*." Results paper: "*Our study had several strengths: a randomized design, primary and secondary outcomes assessed, including objective measures of adiposity, outcomes assessed by researchers blinded to group assignment,...*".
Incomplete outcome data	Low risk	Protocol paper: "*Differences between the four study arms in the two primary endpoints will be tested according to the intention-to-treat philosophy. All randomized participants will be analyzed according to their group assignment at randomization, regardless of adherence to the intervention.*" Results paper: Figure 1 shows all who were randomised were included in the primary analysis. "*... there was a large attrition rate, particularly from the Standard Care group, where only 52% of the*

		initial sample had complete data at month 9. Although the attrition rate is disappointing, it does not diminish our findings. Those lost to follow-up were similar to those who completed the study with the exception of a difference in education levels. Moreover, since we assumed no weight loss occurred in individuals lost to follow-up (initial weights carried forward), attrition biases our results toward finding no effect rather than overstating the effects of our interventions "*Moreover, since we assumed no weight loss occurred in individuals lost to follow-up (initial weights carried forward), attrition biases our results toward finding no effect rather than overstating the effects of our interventions*."
Selective reporting	High risk	"*The primary outcomes were body weight (kg) and waist circumference (cm). Secondary outcomes were BMI (kg/ m2) and percent body fat.*"; "*This device uses four sensors to assess energy expenditure, sleep duration and efficiency, physical activity levels (sedentary, moderate, vigorous) and duration, steps, and on/off body wear time*." Outcomes listed on the trial registration and on the protocol paper are the same. However, for some of the outcomes reported on the results paper there are inconsistencies (e.g. no tertiary outcomes - blood pressure, blood markers, quality of life). Weekly energy expenditure in physical activity is listed as a secondary outcome but only baseline data is presented (no 4 or 9 month); BMI is presented as a secondary outcome but this was not defined on the trial protocol/registration. The authors kindly shared physical activity related outcomes when contacted.
Other bias	Low risk	Protocol paper: "*All analyses will take into account prespecified covariates, including (...) baseline values of outcome measures*." Analyses adjusted for baseline values; outcome assessed using a valid measure. Results paper, Competing interests disclosure: "*This study was funded by an unrestricted research grant from BodyMedia, Inc to Steven N. Blair, Principal Investigator. Dr. Blair and the research team at the University of South Carolina planned and executed the study, analyzed the data, and wrote the manuscript. None of the members of the research team own any shares in BodyMedia, Inc; and none of them hold patents, nor are they applying for any patents related to this research.*"

Sirriyeh 2010

Methods	Four arms randomised controlled trial, 2 weeks intervention
Participants	N = 120 adolescents enrolled in state schools, M = 17.3 ± 0.68, 70% female; n = 32 affective; n = 31 instrumental; n = 33 combined; n = 32 comparator
Interventions	Intervention (affective): 1x SMS/day to manipulate affective beliefs Intervention (instrumental): 1x SMS/day to manipulate instrumental beliefs Intervention (combined): 1x SMS/day to manipulate affective and instrumental beliefs Comparator: 1x SMS/week neutral

Outcomes	MVPA MET minutes/week computed from the International Physical Activity Questionnaire - IPAQ short form (modified: questions relating to walking and sitting were removed)
Behaviour Change Techniques	Intervention affective: 5.6. Information about emotional consequences, 7.1. Prompts/cues Intervention instrumental: 5.1. Information about health consequences, 7.1. Prompts/cues Intervention combined: 5.1. Information about health consequences, 5.6. Information about emotional consequences, 7.1. Prompts/cues Comparator: 7.1. Prompts/cues
Inclusion criteria	Aged 16-19 years; full time students; possession of a mobile phone
Exclusion criteria	-

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*After each school recruitment session, participants from that school were randomly allocated to one of four groups by the first author using a random number generator (Haahr, 2004) prior to the next school recruitment. This stratification ensured that there was an equal distribution of participants from each school in each of the experimental groups and the control group*."
Allocation concealment	Low risk	"*Neither the researcher nor participant had any knowledge of who was allocated to which group as the questionnaires were coded by group by an independent researcher*."
Blinding of participants and personnel	High risk	"*A control message was used in an attempt to blind participants to condition, but the number of messages was kept to a minimum to reduce the impact of simply receiving a text, which may have acted as a cue to activity*." ; "*Each SMS text message was delivered at 4 p.m. at the end of the school day to minimize the likelihood of cross-contamination.*"; "*Participants were required to read each message privately to reduce cross-contamination between participants in each of the groups*." ; "*The delivery of messages after class, and inclusion of individuals from a range of sixth forms may have minimized the likelihood of crosscontamination, but there remains the possibility of shared messages within friendship groups*."
Blinding of outcome assessment	Low risk	"*Participants were issued with the initial questionnaire by teachers during morning registration*"; "*Neither the researcher nor participant had any knowledge of who was allocated to which group as the questionnaires were coded by group by an independent researcher.*"; "*Following the intervention period, the second questionnaire was completed using the same protocol*".; "*...problems of assessing PA through self-report such as lack of precision (...). The self-report IPAQ, although argued to be a reliable and valid measure, possesses a number of sources of bias, such as retrospective recall, over-reporting, and social desirability bias,...*". (we considered this to be a characteristic of all PA self-report instruments but such opportunities for bias are likely equivalent across groups).

Incomplete outcome data	Unclear risk	"*A total of 120 participants completed T2 measures of PA (128 were randomised) representing 94% retention.*"; "*After checking for outliers, two cases were removed from further analysis*". No information on attempts to deal with the missing data or its possible impacts.
Selective reporting	Unclear risk	"*PA behaviour was measured using the validated and widely used, self-report International Physical Activity Questionnaire (IPAQ).*" ; "*Evidence to suggest that the only forms of PA to be recorded accurately by older children and adolescents through self-report have been formal or discrete units of activity such as sport or structured exercise, resulted in the decision to focus only on moderate or vigorous activities.Thus, questions relating to walking and sitting were removed from the IPAQ in an attempt to reduce inaccurate reporting*".
Other bias	Unclear risk	Analyses adjusted for baseline values; outcome assessed using a valid measure but "*Modifications were made to the original form of the IPAQ due to the target population. Evidence to suggest that the only forms of PA to be recorded accurately by older children and adolescents through self-report have been formal or discrete units of activity such as sport or structured exercise, resulted in the decision to focus only on moderate or vigorous activities (Fox & Riddoch, 2000). Thus, questions relating to walking and sitting were removed from the IPAQ in an attempt to reduce inaccurate reporting*.".

Turner-McGrievy 2009

Methods	Two arms randomised controlled trial, 12 weeks intervention. Trial registration: NCT00771095
Participants	N = 78 overweight men and women ; n = 41 intervention, M = 37.7 ± 11.8 years, 68% female, BMI = 31.8 ± 3.2 kg/m^2; n = 36 comparator, M = 39.6 ± 12.2 years, 81% female, BMI = 31.4 ± 4.1 kg/m^2
Interventions	Intervention: 2x enhanced podcast/week + book with calorie and fat gram amounts of food Comparator: 2x weight-loss podcast/week + book with calorie and fat gram amounts of food
Outcomes	MVPA and Walking (mins/week and days/week) + Sitting (hours/day) computed from the International Physical Activity Questionnaire - IPAQ short form; Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 2.3. Self-monitoring of behavior, 5.1. Information about health consequences Comparator: 11.2. Reduce negative emotions, 12.3. Avoidance/reducing exposure to cues of the behavior, 13.2. Framing/reframing
Inclusion criteria	Overweight and obese men and women (BMI 25–40 kg/m^2); own a digital music player (MP3 player); access to a body-weight scale
Exclusion criteria	Unstable medical status (conditions that could preclude study participation, such as cardiovascular disease); history of an eating disorder; pregnancy; alcohol or drug abuse; tobacco use; mental illness; diabetes mellitus; an uncontrolled thyroid condition

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Unclear risk	"*After a participant was accepted into the pilot study, he or she was randomly assigned to receive a currently available weight-loss podcast (control podcast) considered to be accurate and popular based on a content analysis (unpublished observations, 2008) or a theory-based weight-loss podcast designed by the researchers (enhanced podcast) in 2008*."
Allocation concealment	Unclear risk	See above.
Blinding of participants and personnel	High risk	Trial registration: "Masking: Open Label"; Results paper: "*Participants were not told the condition to which they were assigned until they arrived at the meeting. They were told that two different podcasts were being tested but were not told about the differences between the podcasts*."
Blinding of outcome assessment	High risk	"*Participants attended an introductory meeting where they were weighed in light clothing with a digital scale accurate to 0.1 kg, measured for height with shoes off, completed information on baseline demographics, and learned how to download podcasts. Participants also completed questionnaires...*"
Incomplete outcome data	Low risk	"*All data collection and analyses were conducted in 2008 using intention-to-treat by bringing baseline values forward for participants who attended the introductory meeting but did not complete the study.*"; "*Of the 94 who were accepted into the study, 16 (17%) did not attend the introductory meeting (nine in the control group and seven in the enhanced group), and therefore randomization was not revealed and no data were collected on these participants; thus, they are not included in the intention-to-treat analysis*."
Selective reporting	Low risk	Results paper: "*Weight was measured on a digital scale at baseline and follow-up. Both groups also completed questionnaires assessing demographic information, food intake, physical activity, and SCT constructs at the introductory and 12-week meetings. Additional questionnaires at the 12-week meeting assessed perceptions of the intervention*." Trial registration: Weight is listed as the primary outcome and only elaboration as the secondary outcome (ELM). More outcomes were reported than the ones listed on the trial registration. The authors kindly shared additional data from the IPAQ following our request.
Other bias	Unclear risk	Results paper: "*Between-subjects t tests were calculated for all measures*". Inconsistency in the inclusion criteria between the results paper (BMI = 25-40 kg/m^2) and the trial registration (BMI = 25-35). Outcomes assessed using valid measures.

Turner-McGrievy 2011

Methods	Two arms randomised controlled trial, 24 weeks intervention. Trial registration: NCT01139255

Participants	N = 83; n = 47 intervention, M = 42.6 ± 10.7 years, 77% female, BMI = 32.9 ± 4.8 Kg/m^2; n = 49 comparator, M = 43.2 ± 11.7 years, 73% female, BMI = 32.2 ± 4.5 Kg/m^2
Interventions	Intervention: 2x 15 min podcast/week (1-3 month) and 2x 5 min minipodcasts/week (3-6 month) + physical activity and diet monitoring app (FatSecret's Calorie Counter) + Twitter (counselors 2x post/day and participants encouraged 1x/day) Comparator: 2x 15 min podcast/week (1-3 month) and 2x 5 min minipodcasts/week (3-6 month) + book with calorie and fat gram amounts of food
Outcomes	Total PA EE (Kcals/day) computed from the Paffenbarger Physical Activity Questionnaire - PPAQ; Self-reported
Behaviour Change Techniques	Intervention: 1.1. Goal setting (behavior), 1.2. Problem solving, 2.3. Self-monitoring of behavior, 3.1. Social support (unspecified), 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 6.3. Information about others' approval, 7.1. Prompts/cues Comparator: 1.1. Goal setting (behavior), 1.2. Problem solving, 2.3. Self-monitoring of behavior, 4.1. Instruction on how to perform the behavior, 5.1. Information about health consequences, 6.3. Information about others' approval
Inclusion criteria	Overweight and obese men and women (BMI 25–45 kg/m^2;18–60 years; access to a body weight scale; own an Internet-capable mobile devices (iPhone, iPod Touch, BlackBerry, or Android); access to the internet
Exclusion criteria	Smoker; unstable medical status or uncontrolled thyroid condition; unable to attend visits or increase walking as a form of exercise; psychiatric illness; in treatment for alcohol/drug dependency; eating disorder; currently participating in a weight-loss program; were pregnant, breastfeeding, or planning on becoming pregnant within the next 6 months; history of myocardial infarction or stroke (had to obtain physician consent for participation if endorsing yes on other items of the Physical Activity Readiness Questionnaire

Risk of Bias	Judgement	Support for judgement
Random sequence generation	Low risk	"*Participants were randomly assigned using a computerized random numbers generator (as conducted by study investigators) once they completed of all their baseline questionnaires*."
Allocation concealment	Unclear risk	"*Once all baseline measures were collected, participants were given an overview of which group they were randomly assigned to and were provided with more details about grou*p assignment."
Blinding of participants and personnel	High risk	Trial registration: "Masking: Open Label". Results paper: "*... participants were given an overview of which group they were randomly assigned to and were provided with more details about group assignment. Both conditions were active treatments and participants were not told which group was the intervention of interest or enhanced group. Neither study participants nor investigators were blind to treatment assignment*."
Blinding of outcome assessment	High risk	"*Neither study participants nor investigators were blind to treatment assignment*."

Incomplete outcome data	Unclear risk	Methods for handling missing data vary across outcomes. "*We conducted all data collection and analyses using intention-to-treat by using imputation (baseline observation carried forward), with the exception of some variables that we collected only at 6 months (such as information processing variables), which we assessed using completers only*."
Selective reporting	Low risk	Outcomes listed in the methods are reported in the results. "*Change in body weight was the main outcome of the study, and body weight was collected at baseline, 3 months, and 6 months at the study site. In addition to the diet, physical activity, and psychosocial measures discussed above, other measures were collected at both 3 and 6 months including novelty, cognitive load, user control, elaboration (Elaboration Likelihood Model Questionnaire), and process evaluation questions, all via online questionnaire. Participants were also sent a weekly online questionnaire link so they could report the number of podcasts they had listened to that week, their weight, number of days they monitored their diet and physical activity, and, for the Podcast+Mobile group, questionnaire items assessing use of Twitter... The number of Twitter messages per participant was also recorded over the course of the study, and an objective measure of number of downloads per podcast by treatment group was obtained from the podcast hosting site*.".
Other bias	Unclear risk	Trial registry only specifies the primary outcome (i.e. weight) and no intermediary measurement timepoint (i.e. 3 months). No secondary outcome measures are listed on the trial registry; possible reporting bias.Outcomes assessed using valid measures. Results paper: "*Between-subjects t tests were calculated for differences between continuous variables, and paired-samples t tests were used to examine differences within groups*."

Electronic Supplementary Material 3 – Baseline and post-intervention outcome data of included studies.

Table 2. Baseline characteristics of participants in intervention studies examining mHealth technologies to promote PA and reduce SB among free-living individuals, 2007-2015

First Author, Year	Intervention							Comparison						
	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)
Hurling, 2007	47	40.5 (7.1)	30	64	26.2 (2.8)	MPA acc. (min/day)[1]	21.7 (5.0)	30	40.1 (7.7)	21	70	26.5 (4.1)	MPA acc. (min/day)	20.4 (5.1)
						MPA MET mins (/day)	621.4 (457.1)						MPA MET mins (/day)	552.6 (322.4)
King, AC, 2008	19	60.7 (6.8)	8	42.1		MVPA (min/day)	17.7 (16.4)	18	59.6 (7.6)	8	44.4		MVPA (min/day)	30.7 (23.7)
						MVPA caloric expenditure (kg/day)	1.1 (1.1)						MVPA caloric expenditure (kg/day)	1.9 (1.6)
Shapiro, JR, 2008	18	8.4 (2.3)	13	72.2	28.6 (6.2)	Exercise (min/day)	102.9 (48.5)	22	8.5 (2.3)	13	59.1	26.2 (6.7)	Exercise (min/day)	129.2 (126.3)
						Screen time (min/day)	149.3 (90.0)						Screen time (min/day)	188.6 (197.1)
Turner-McGrievy, 2009	41	37.7 (11.8)	28	68	31.8 (3.2)	Vigorous PA (min/day)	4.3 (5.0)	36	39.6 (12.2)	29	81	31.4 (4.1)	Vigorous PA (min/day)	4.5 (5.2)
						Moderate PA (min/day)	5.3 (8.7)						Moderate PA (min/day)	3.9 (6.3)
						MVPA (min/day)	9.6 (7.1)						MVPA (min/day)	8.4 (5.7)
						Walking (min/day)	6.2 (7.4)						Walking (min/day)	5.1 (4.7)
						Sitting (min/day)	540 (192)						Sitting (min/day)	570 (366)
						Vigorous PA (days/week)	1.2 (1.4)						Vigorous PA (days/week)	1.8 (1.8)
						Moderate PA (days/week)	1.3 (1.6)						Moderate PA (days/week)	1.6 (1.9)
						Walking (days/week)	3.8 (2.5)						Walking (days/week)	4.3 (2.2)
Fjeldsoe, 2010,	45	28 (6)	45	100	27 (5)	MVPA (min/day)	23.5 (24.4)	43	31 (6)	43	100	27 (6)	MVPA (min/day)	12.0 (24.4)
						Walking (min/day)	11.9 (14.8)						Walking (min/day)	6.9 (14.8)
						MVPA (days/week)	1.8 (1.5)						MVPA (days/week)	1.7 (1.4)
						Walking (days/week)	1.6 (1.9)						Walking (days/week)	1.1 (1.8)
Prestwich, 2010, (II + plan)	47	22.2 (5.0)	28	60	22.4 (3.6)	Walking (min/day)	7.2 (8.5)	50	23.6 (4.5)	34	68	23.1 (4.3)	Walking (min/day)	6.0 (9.9)
	46					Total PA (min/day)	15.7 (17.8)	50					Total PA (min/day)	13.3 (18.1)
	47					Walking ≥ 30 min (days/week)	0.68 (0.96)	50					Walking ≥ 30 min (days/week)	0.71 (1.17)
	47					Total PA ≥ 30 min (days/week)	1.40 (1.51)	50					Total PA ≥ 30 min (days/week)	1.35 (1.51)

First Author, Year	Intervention							Comparison						
	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)
Prestwich, 2010, (II + goal)	52	24.4 (6.9)	33	64	23.2 (3.7)	Walking (min/day)	7.1 (15.1)	50	23.6 (4.5)	34	68	23.1 (4.3)	Walking (min/day)	6.0 (9.9)
	52					Total PA (min/day)	12.4 (18.1)	50					Total PA (min/day)	13.3 (18.1)
	52					Walking ≥ 30 min (days/week)	0.63 (1.52)	50					Walking ≥ 30 min (days/week)	0.71 (1.17)
	52					Total PA ≥ 30 min (days/week)	1.10 (1.69)	50					Total PA ≥ 30 min (days/week)	1.35 (1.51)
Sirriyeh, 2010, (affective)	32	17.3 (0.7)	23	70		MVPA MET minutes/day		32	17.3 (0.7)	22	70		MVPA MET minutes/day	
Sirriyeh, 2010, (instrumental)	31	17.3 (0.7)	22	70		MVPA MET minutes/day		32	17.3 (0.7)	22	70		MVPA MET minutes/day	
Sirriyeh, 2010, (combined)	33	17.3 (0.7)	23	70		MVPA MET minutes/day		32	17.3 (0.7)	22	70		MVPA MET minutes/day	
Shuger, SL, 2011 (SWA alone)	49	47.7 (11.6)	40	82	33.2 (5.4)	Steps/day	7155.9 (2866.9)	47	47.2 (8.9)	42	84	33.7 (5.5)	Steps/day	7367.7 (2321.8)
						MVPA (mins/day)	53.3 (29.7)						MVPA (mins/day)	55.0 (29.0)
						MVPA EE ≥3 MET (Kcals/day)	327.4 (200.2)						MVPA EE ≥3 MET (Kcals/day)	349.8 (238.4)
						Total EE (Kcals/day)	1902.5 (490.3)						Total EE (Kcals/day)	1945.9 (494.4)
Shuger, SL, 2011 (SWA+GWL)	48	45.7 (10.4)	40	82	33.0 (5.0)	Steps/day	6922.9 (2326.2)	47	47.2 (8.9)	42	84	33.7 (5.5)	Steps/day	7367.7 (2321.8)
						MVPA (mins/day)	54.1 (28.1)						MVPA (mins/day)	55.0 (29.0)
						MVPA EE ≥3 MET (Kcals/day)	337.9 (223.5)						MVPA EE ≥3 MET (Kcals/day)	349.8 (238.4)
						Total EE (Kcals/day)	1938.8 (485.3)						Total EE (Kcals/day)	1945.9 (494.4)
Turner-McGrievy, 2011	47	42.6 (10.7)	36	77	32.9 (4.8)	Total PA EE (kcals/day)	112.1 (101.3)	49	43.2 (11.7)	36	73	32.2 (4.5)	Total PA EE (kcals/day)	116.0 (115.7)
Schwerdtfeger AR, 2012	22	23.9 (4.1)	14	67	23.1 (4.8)	Mean counts/min	696.5 (242.4)	21	23.6 (3.6)	17	81	24.1 (4.2)	Mean counts/min	707.2 (273.0)
Adams, MA, 2013	10	34.5 (8.1)	9	90	29.8 (2.9)	Steps/day	4.555 (843)	10	39.3 (10.0)	8	80	30.1 (2.2)	Steps/day	5364 (1145)
Allen, JK, 2013 (SP+IC)	16	45.6 (9.3)	11	69	34.3 (3.9)	MVPA (mins/day)	42 (48.9)	18	42.5 (12.1)	14	78	34.1 (4.1)	MVPA (mins/day)	42.9 (44.6)
Allen, JK, 2013 (SP + LIC)	17	46.4 (9.6)	13	77	33.5 (3.5)	MVPA (mins/day)	45.4 (46.3)	18	42.5 (12.1)	14	78	34.1 (4.1)	MVPA (mins/day)	42.9 (44.6)
Allen, JK, 2013 (SP alone)	17	45.3 (13.2)	15	88	35.3 (4.1)	MVPA (mins/day)	30 (31.7)	18	42.5 (12.1)	14	78	34.1 (4.1)	MVPA (mins/day)	42.9 (44.6)
Bickmore, TW, 2013	132	71.7 (5.6)	89	67	29.6	Steps/day	4335 (2498)	131	71.3 (5.4)	72	55	29.4	Steps/day	4303 (2747)

First Author, Year	Intervention							Comparison						
	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)
Kim, BH, 2013	26	69.3 (7.3)	21	81	31.4 (7.4)	Steps/day	5852 (1961.4)	10	70.6 (7.5)	8	80	30.2 (7.0)	Steps/day	4382.4 (2085)
						Total PA MET/day?	11.8 (6.4)						Total PA MET/day?	10.4 (3.7)
King, AC, 2013 (analytic)	22	59.1 (9.2)	16	74	29.6 (6.2)	Walking (min/day)	12.7 (14.3)							
						MVPA (min/day)	15.4 (19.5)							
						TV viewing (min/day)	175.5 (84.3)							
King, AC, 2013 (social)	23	59.1 (9.2)	17	74	29.6 (6.2)	Walking (min/day)	10.8 (10.0)							
						MVPA (min/day)	8.8 (9.0)							
						TV viewing (min/day)	210.0 (137.3)							
King, AC, 2013 (affect)	23	59.1 (9.2)	17	74	29.6 (6.2)	Walking (min/day)	10.5 (15.4)							
						MVPA (min/day)	19.0 (25.1)							
						TV viewing (min/day)	157.1 (78.1)							
Patrick, K, 2013	24	14.3 (1.8)	12	50		MVPA (min/day)	44.6 (1.8)	25	14.5 (1.5)	18	72		MVPA (min/day)	54.1 (1.6)
						SB (mins/day)	234 (332.2)						SB (mins/day)	324 (336)
Duncan, MJ, 2014	205	44.2 (5.9)	0	0		Total PA (min/day)	40.9 (50.6)	96	43.8 (5.8)	0	0		Total PA (min/day)	39.7 (40.8)
						Total PA (sessions/week)	5.1 (5.1)						Total PA (sessions/week)	5.1 (5)
Fassnacht, D, 2015	20	9.5 (0.3)	8	36	1.0 (1.3) z-score	MVPA (mins/day)	102 (66)	25	9.6 (0.4)	18	67	0.6 (0.9) z-score	MVPA (mins/day)	126 (84)
	22					Screen time (mins/day)	72 (60)	27					Screen time (mins/day)	90 (72)
Glynn, LG, 2014	37	42 (11)	35	78	27.4 (6.0)	Steps/day	4365 (2732)	41	46 (11)	23	51	28.9 (4.9)	Steps/day	5138 (3873)
Hebden, L, 2014	12	22.6 (5.4)	22	85	27.3 (2.1)	MVPA (min/day)	50.4 (26.5)	15	23.1 (3.7)	19	76	27.2 (2.5)	MVPA (min/day)	44.0 (25.6)
	12					LPA (min/day)	205.9 (44.2)	15					LPA (min/day)	216.2 (41.0)
	12					Sedentary (min/day)	584.6 (69.4)	15					Sedentary (min/day)	563.1 (94.3)
	26					Total PA (min/day)	37.0 (35.3)	25					Total PA (min/day)	32.9 (23.6)
	26					Total PA (MET-min/day)	166.4 (196.3)	25					Total PA (MET-min/day)	150.7 (127.9)
	25					Sitting (min/day)	752.8 (188.0)	24					Sitting (min/day)	663.6 (177.1)
Knight, E, 2014 (SB)	14	63 (4)	9	64	33.8 (4)	Steps/day	6343 (3325)							
Knight, E, 2014 (EX)	15	63 (5)	7	46	30.4 (5)	Steps/day	9258 (5412)							
Knight, E, 2014 (combined)	16	62 (4)	9	56	29.6 (6)	Steps/day	9194 (3306)							

[1] = (number of accelerometer epochs during 3-week initiation period*2-min epochs) / 21 days; PA: Physical Activity; BMI: Body mass index; MVPA: Moderate-to-vigorous-intensity physical activity; MPA: Moderate Physical Activity; MV: Moderate-to-vigorous; MET: Metabolic Equivalent of Task; SB: Sedentary Behaviour; II: Implementation intentions; SWA: Sensewear armband; GWL: Group sessions; SP: Smartphone; IC: Intensive counseling; LIC: Less intensive counseling; EX: exercise;

Table 3. Post-intervention characteristics of participants in intervention studies examining mHealth technologies to promote PA and reduce SB among free-living individuals, 2007-2015

First Author, Year	Intervention						Comparison					
	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)
Hurling, 2007	47	40.5 (7.1)	30	64	26.2 (2.8)	MPA acc. (min/day)[1] MPA MET mins (/day) Sitting (min/day) MVPA (min/day)	Change? Change? Change? 43.1 (42.6); 44.4 (38.2)	30	40.1 (7.7)	21	70	26.5 (4.1)	MPA acc. (min/day)[1] MPA MET mins (/day) Sitting (min/day) MVPA (min/day)	Change? Change? Change? 19.3 (29.7); 17.9 (38.3)
King, AC, 2008	19	60.7 (6.8)	8	42.1		MVPA caloric expenditure (kg/day)	2.6 (2.7); 2.7 (2.4)	18	59.6 (7.6)	8	44.4		MVPA caloric expenditure (kg/day)	1.3 (1.9); 1.1 (2.4)
Shapiro, JR, 2008	13	8.4 (2.3)	13	72.2		Exercise (min/day) Screen time (min/day)	137.3 (187.7) 80.6 (47.1)	11	8.5 (2.3)	13	59.1		Exercise (min/day) Screen time (min/day)	114.1 (105.4) 111.8 (87.7)
Turner-McGrievy, 2009	38 36 36 40 41	37.7 (11.8)	28	68		Vigorous PA (min/day) Moderate PA (min/day) MVPA (min/day) Walking (min/day) Sitting (min/day) Vigorous PA (days/week) Walking (days/week) MVPA (min/day)	8.1 (9.7) 7.9 (9.2) 16.0 (9.4) 7.8 (6.8) 492 (228) 2.1 (1.9) 4.6 (2.2) 21.4 (23.9)	29 28 28 34 36	39.6 (12.2)	29	81		Vigorous PA (min/day) Moderate PA (min/day) MVPA (min/day) Walking (min/day) Sitting (min/day) Vigorous PA (days/week) Walking (days/week) MVPA (min/day)	5.3 (5.7) 8.1 (10.6) 13.4 (8.5) 7.5 (6.1) 552 (372) 1.4 (1.6) 4.5 (2.3) 22.8 (27.4)
Fjeldsoe, 2010,	45	28 (6)	45	100		Walking (min/day) MVPA (days/week) Walking (days/week)	14.1 (15.6) 3.6 (1.0) 2.4 (1.4)	43	31 (6)	43	100		Walking (min/day) MVPA (days/week) Walking (days/week)	7.3 (17.4) 2.0 (1.3) 2.1 (1.9)
Prestwich, 2010, (II + plan)	42 42 40	22.2 (5.0)	28	60	22.4 (3.6)	Walking (min/day) Total PA (min/day) Walking ≥ 30 min (days/week) Total PA ≥ 30 min (days/week)	14.2 (10.1) 30.3 (16.3) 1.98 (1.75) 3.13 (1.57)	49 49 46	23.6 (4.5)	34	68	23.1 (4.3)	Walking (min/day) Total PA (min/day) Walking ≥ 30 min (days/week) Total PA ≥ 30 min (days/week)	13.5 (20.9) 26.6 (30.3) 1.17 (1.58) 2.28 (1.99)
Prestwich, 2010, (II + goal)	49 49 48	24.4 (6.9)	33	64	23.2 (3.7)	Walking (min/day) Total PA (min/day) Walking ≥ 30 min (days/week) Total PA ≥ 30 min (days/week)	13.7 (13.4) 24.5 (18.8) 1.98 (2.04) 2.81 (1.96)	49 49 46	23.6 (4.5)	34	68	23.1 (4.3)	Walking (min/day) Total PA (min/day) Walking ≥ 30 min (days/week) Total PA ≥ 30 min (days/week)	13.5 (20.9) 26.6 (30.3) 1.17 (1.58) 2.28 (1.99)
Sirriyeh, 2010, (affective)	30	17.3 (0.7)	23	70		MVPA MET minutes/day	3193.14 (2381.86)	30	17.3 (0.7)	23	70		MVPA MET minutes/day	2233.47 (1758.35)

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	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)	n	Mean Age years (SD)	Female Sex n	Female Sex %	BMI	PA/SB Outcome	PA/SB Outcome Mean (SD)
Sirriyeh, 2010, (instrumental)	30	17.3 (0.7)	22	70		MVPA MET minutes/day	2350.38 (2029.09)	30	17.3 (0.7)	22	70		MVPA MET minutes/day	2233.47 (1758.35)
Sirriyeh, 2010, (combined)	30	17.3 (0.7)	23	70		MVPA MET minutes/day Steps/day	2345.96 (2201.65) 6881.2 (2717.2)	30	17.3 (0.7)	23	70		MVPA MET minutes/day Steps/day	2233.47 (1758.35) 6649.1 (2277.1)
Shuger, SL, 2011 (SWA alone)	24	47.7 (11.6)	40	81.6		MVPA (mins/day) MVPA EE ≥3 MET (Kcals/day) Total EE (Kcals/day)	52.9 (30.4) 289.1 (165.5) 1743.6 (440.8)	23	47.2 (8.9)	42	84.0		MVPA (mins/day) MVPA EE ≥3 MET (Kcals/day) Total EE (Kcals/day)	54.2 (31.2) 332.9 (222.7) 1805.3 (474.3)
Shuger, SL, 2011 (SWA+GWL)	32	45.7 (10.4)	40	81.6		Steps/day MVPA (mins/day) MVPA EE ≥3 MET (Kcals/day) Total EE (Kcals/day)	6755.6 (3016.0) 53.3 (30.7) 312.8 (233.7) 1843.4 (499.9)	23	47.2 (8.9)	42	84.0		Steps/day MVPA (mins/day) MVPA EE ≥3 MET (Kcals/day) Total EE (Kcals/day)	6649.1 (2277.1) 54.2 (31.2) 332.9 (222.7) 1805.3 (474.3)
Turner-McGrievy, 2011	47	42.6 (10.7)	36	77		Total PA EE (kcals/day)	198.9 (177.2)	49	43.2 (11.7)	36	73		Total PA EE (kcals/day)	212.6 (179.2)
Schwerdtfeger AR, 2012	21	23.9 (4.1)	14	67		Mean counts/min	738.6 (245.7)	21	23.6 (3.6)	17	81		Mean counts/min	610.6 (203.6)
Adams, MA, 2013	10	34.5 (8.1)	9	90		Steps/day	6760 (1078)	10	39.3 (10.0)	8	80		Steps/day	6348 (671)
Allen, JK, 2013 (SP+IC)	11	45.6 (9.3)	11	68.8		MVPA (mins/day)	Change -2.0 (5.4)	12	42.5 (12.1)	14	77.8		MVPA (mins/day)	Change -1.4 (7.1)
Allen, JK, 2013 (SP + LIC)	10	46.4 (9.6)	13	76.5		MVPA (mins/day)	Change -3.6 (5.5)	12	42.5 (12.1)	14	77.8		MVPA (mins/day)	Change -1.4 (7.1)
Allen, JK, 2013 (SP alone)	10	45.3 (13.2)	15	88.2		MVPA (mins/day)	Change 0.19 (5.1)	12	42.5 (12.1)	14	77.8		MVPA (mins/day)	Change -1.4 (7.1)
Bickmore, TW, 2013	10	071.7 (5.6)	89	67.4		Steps/day	4335 (2498)	10	071.3 (5.4)	72	55.0		Steps/day	4303 (2747)
Kim, BH, 2013	26	69.3 (7.3)	21	80.8		Steps/day Total PA MET/day?	6531 (2648) 23.8 (6.3)	10	70.6 (7.5)	8	80.0		Steps/day Total PA MET/day?	4780.2 (1978.1) 14.9 (3.9)
King, AC, 2013 (analytic)	19	59.1 (9.2)		74		Walking (min/day) MVPA (min/day) TV viewing (mins/day)	22.8 (20.5) 40.1 (39.0) 126.6 (73.6)							
King, AC, 2013 (social)	21	59.1 (9.2)		74		Walking (min/day) MVPA (min/day) TV viewing (mins/day)	28.5 (22.3) 45.5 (60.6) 175.1 (93.5)							
King, AC, 2013 (affect)	21	59.1 (9.2)		74		Walking (min/day) MVPA (min/day) TV viewing (mins/day)	25.6 (28.9) 38.2 (45.9) 150.6 (71.4)							
Patrick, K, 2013	24	14.3 (1.8)	12	50		MVPA (min/day) SB (mins/day)	43.1 (1.5) 216 (335.1)	25	14.5 (1.5)	18	72		MVPA (min/day) SB (mins/day)	37.7 (1.8) 318 (345)
Duncan, MJ, 2014	205	44.17 (0.41)	0	0		Total PA (min/day) Total PA (sessions/week)	50.9 (50.5) 7.5 (7.3)	96	43.8 (5.8)	0	0		Total PA (min/day) Total PA (sessions/week)	61.0 (54.8) 8.1 (7)
Fassnacht, D, 2015	20 22	9.5 (0.3)	8	36.4		MVPA (mins/day) Screen time (mins/day)	96 (54) 54 (36)	25 27	9.6 (0.4)	18	66.7		MVPA (mins/day) Screen time (mins/day)	96 (60) 66 (48)
Glynn, LG, 2014	31	42 (11)	35	78		Steps/day	5855 (4264)	35	46 (11)	23	51		Steps/day	4859 (3474)
Hebden, L, 2014	12	22.6 (5.4)	22	85		MVPA (min/day)	42.6 (25.8)	15	23.1 (3.7)	19	76		MVPA (min/day)	38.6 (16.1)

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	12					LPA (min/day)	238.8 (50.6)	15					LPA (min/day)	225.7 (42.5)
	12					Sedentary (min/day)	530.0 (98.0)	15					Sedentary (min/day)	549.8 (63.8)
	26					Total PA (min/day)	42.9 (37)	25					Total PA (min/day)	36.4 (16.8)
	26					Total PA (MET-min/day)	184 (182.5)	25					Total PA (MET-min/day)	177 (103.1)
	25					Sitting (min/day)	685.7 (218.8)	24					Sitting (min/day)	667.1 (171.1)
Knight, E, 2014 (SB)	14	63 (4)	9	64		Steps/day	6809 (3624)							
Knight, E, 2014 (EX)	15	63 (5)	7	46		Steps/day	9195 (6094)							
Knight, E, 2014 (combined)	16	62 (4)	9	56		Steps/day	8762 (3578)							

PA: Physical Activity; MVPA: Moderate-to-vigorous-intensity physical activity; MPA: Moderate Physical Activity; MV: Moderate-to-vigorous; MET: Metabolic Equivalent of Task; SB: Sedentary Behaviour; II: Implementation intentions; SWA: Sensewear armband; GWL: Group sessions; SP: Smartphone; IC: Intensive counseling; LIC: Less intensive counseling; EX: exercise;

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Author(s) Statement of Conflict of Interest and Adherence to Ethical Standards:

The study was conducted in accordance to ethical standards. Author Direito, Author Carraça, Author Rawstorn, Author Whittaker and Author Maddison declare that they have no conflict of interest. All authors have no financial disclosures.