Evidence Portfolio – Physical Activity Promotion Subcommittee, Question 1: Communication Environment

What interventions are effective for increasing physical activity?

a. Does the effectiveness vary by age, sex, race/ethnicity, or socio-economic status?

Sources of Evidence: Existing Systematic Reviews, Meta-Analyses, and a High-Quality Report

Conclusion Statements and Grades

COMPUTER-TAILORED PRINT

Moderate evidence indicates that computer-tailored print interventions, which collect user information through mailed surveys that is then used to generate computer-tailored mailings containing personalized physical activity advice and support, have a small but positive effect in increasing physical activity in general populations of adults when compared with minimal or no-treatment controls, particularly over short time periods (e.g., less than 6 months). **PAGAC Grade: Moderate.**

INTERACTIVE VIDEO GAMES PROMOTING ACTIVE PLAY OR EXERCISE

Limited evidence suggests that active video game interventions used in structured community-based programs are effective for increasing physical activity in healthy children. **PAGAC Grade: Limited.**

Limited evidence suggests that technology-based exercise programs (i.e., "exergames") are a potentially acceptable and safe approach for use in programs aimed at increasing physical activity levels in adults ages 60 years and older. **PAGAC Grade: Limited.**

MOBILE PHONE PROGRAMS

Moderate evidence indicates that mobile phone programs consisting of or including text-messaging have a small to moderate positive effect on physical activity levels in general adult populations. **PAGAC Grade: Moderate.**

Strong evidence demonstrates that the use of smartphone applications increases regular physical activity in children and adolescents. **PAGAC Grade: Strong.**

Limited evidence suggests that smartphone applications increase regular physical activity in the general populations of adults. **PAGAC Grade: Limited.**

SOCIAL MEDIA

Limited evidence suggests that physical activity interventions based on or including social media are effective for increasing physical activity in adults or youth. **PAGAC Grade: Limited.**

TELEPHONE-ASSISTED

Strong evidence demonstrates that telephone-assisted interventions, including those lasting 1 year or longer, are a safe and effective means for increasing physical activity in general adult populations, including older adults. **PAGAC Grade: Strong.**

WEARABLE ACTIVITY MONITORS

Strong evidence demonstrates that wearable activity monitors, including step counters (pedometers) and accelerometers, when used in conjunction with goal-setting and other behavioral strategies, can help increase physical activity in the general population of adults as well as in those who have type 2 diabetes. **PAGAC Grade: Strong.**

Moderate evidence indicates that these monitors can help increase physical activity in adults with overweight or obesity. **PAGAC Grade: Moderate.**

Limited evidence suggests that wearable activity monitors may help increase physical activity in adults with musculoskeletal disorders. **PAGAC Grade: Limited.**

WEB-BASED OR INTERNET-DELIVERED

Strong evidence demonstrates that Internet-delivered interventions that include educational components have a small but consistently positive effect in increasing physical activity levels in the general adult population, particularly in the shorter-term (i.e., less than 6 months), when compared with interventions that do not include Internet-delivered materials. **PAGAC Grade: Strong.**

Limited, early evidence suggests that web-based or Internet-delivered interventions may have some efficacy in increasing short-term physical activity levels in individuals with type 2 diabetes. **PAGAC Grade: Limited.**

Description of the Evidence

An initial search for systematic reviews, meta-analyses, pooled analyses, and reports identified sufficient literature to answer the evaluation question as determined by the Physical Activity Promotion Subcommittee. Additional searches were not needed.

Existing Systematic Reviews and Meta-Analyses

COMPUTER-TAILORED PRINT

Overview

Two existing systematic reviews were included.[1, 2] The reviews were published in 2011 and 2013.

The systematic reviews included a range of 11 to 26 studies and covered an extensive timeframe: from inception to October 2012,[1] and inception to May 2010.[2]

Interventions

The included reviews examined interventions using computer-tailored printed materials. Short et al[2] also assessed the effectiveness of materials constructed using different health behavior theories.

Outcomes

Both reviews addressed changes in physical activity measured by self-report or by a device (accelerometers or pedometers).

INTERACTIVE VIDEO GAMES PROMOTING ACTIVE PLAY OR EXERCISE

Overview

A total of three systematic reviews were included.[3-5] The reviews were published in 2014 and 2016.

The systematic reviews included a range of 22 to 54 studies. Two systematic reviews covered an extensive timeframe: from inception to May 2015,[4, 5] while the timeframe of the other review was 2000 to August 2013.[3]

Interventions

Two of the included reviews examined the effects of active video game interventions among children.[3, 4] Valenzuela et al[5] examined technology-based interventions, with the majority of studies utilizing a gaming console, among older adults.

Outcomes

Included reviews addressed changes in physical activity levels. Liang and Lau[3] assessed the immediate physical activity effects (energy expenditure or physical activity levels during active video game play) as well as habitual physical activity or changes in physical activity levels.

MOBILE PHONE PROGRAMS

Overview

A total of eight existing reviews were included: 5 systematic reviews[6-10] and 3 meta-analyses.[11-13] The reviews were published from 2013 to 2016.

The systematic reviews included a range of 9 to 30 studies. Reviews covered the following timeframes: inception to October 2011,[8] inception to September 2013,[7] inception to March 2015,[9] 2000 to 2012,[6] and 2006 to October 2016.[10]

The meta-analyses included a range of 11 to 74 studies. One analysis[13] covered inception to October 2011; and Fanning et al[12] covered 2000 to July 2012. Brannon and Cushing[11] did not report the timeframe searched.

Interventions

The included reviews examined the effects of mobile phone interventions. The interventions utilized smartphones, mobile wireless devices, or personal digital assistants in a variety of ways to promote health behavior change. Two reviews[10, 11] specifically examined the use of smartphone apps, while Buchholz et al[8] and Head et al[13] assessed text messaging interventions.

Outcomes

Included reviews addressed changes in physical activity. In all of the reviews, physical activity was measured by self-report, device (accelerometers or pedometers), or a combination. In addition to physical activity as an outcome, two reviews[10, 13] also assessed sedentary behaviors.

SOCIAL MEDIA

Overview

A total of four existing reviews were included: 1 systematic review,[14] 2 meta-analyses,[15, 16] and 1 report.[17] The reviews were published in 2012 and 2014.

The systematic review[14] included 10 studies published between 2000 and December 2012. The meta-analyses included a range of 16 to 22 studies. Mita et al[15] covered 2000 to June 2014, and Williams et al[16] covered 2000 to May 2013. The report covered 2001 to July 2012.

Interventions

All of the included reviews examined health behavior interventions utilizing web-based social media or social networking platforms.

Outcomes

Included reviews addressed changes in physical activity levels, including exercise behaviors. One review[14] also addressed physical inactivity and mediators of behavior changes, such as physical activity self-efficacy.

TELEPHONE-ASSISTED

Overview

Two existing systematic reviews were included.[1, 18] The reviews were published in 2013 and 2016.

The systematic reviews included a range of 11 to 27 studies. Foster et al[1] covered an extensive timeframe: from inception to October 2012, while Goode et al[18] covered 2006 to April 2010.

Interventions

The included reviews examined the effects of telephone-based interventions.

Outcomes

Both reviews addressed changes in physical activity.

WEARABLE ACTIVITY MONITORS

Overview

A total of seven existing reviews were included: 4 systematic reviews[19-22] and 3 meta-analyses.[23-25] The reviews were published from 2013 to 2016.

The systematic reviews included a range of 5 to 14 studies. Reviews covered the following timeframes: from inception to February 2014,[21] inception to August 2016,[22] and 2000 to January 2015.[20] Funk and Taylor[19] did not report the timeframe searched; however, the included studies were published between 2004 and 2011.

Each of the included meta-analyses examined 11 studies. All meta-analyses covered an extensive timeframe: from inception to July 2015,[23] inception to December 2014,[25] and 1994 to June 2013.[24]

Interventions

All of the included reviews examined interventions utilizing activity monitors. Three reviews[19, 21, 24] specifically examined pedometer-based interventions, while Goode et al[20] examined the use of accelerometers. One review[25] examined pedometers and accelerometers

Outcomes

All included reviews addressed changes in physical activity. Four reviews[19, 21, 22, 24] specifically examined changes in the number of steps per day. de Vries et al[23] examined steps per day, total moderate-to-

vigorous physical activity minutes per time unit, walking metabolic equivalent (or MET) minutes per week, and physical activity kilocalories per week. Qiu et al[25] examined change in sedentary time.

WEB-BASED OR INTERNET-DELIVERED

Overview

Four existing reviews were included: 3 systematic reviews[1, 26, 27] and 1 meta-analysis.[28] The reviews were published from 2012 to 2014.

The systematic reviews included a range of 7 to 15 studies and covered an extensive timeframe: from inception to October 2012,[1] 1966 to April 2011[26] and 1991 to March 2013.[27] The meta-analysis[28] included 34 studies published between 1990 and June 2011.

Interventions

The included reviews examined interventions delivered remotely via the Internet or a web page. One review[28] assessed studies that used the Internet, email communication, or a combination. Foster et al[1] also assessed the effectiveness of different types of professionals delivering the interventions.

Outcomes

Both reviews addressed changes in physical activity. Changes in physical activity were often measured by self-report or by using a device (accelerometers or pedometers).

Populations Analyzed

The table below lists the populations analyzed in each article.

Table 1. Populations Analyzed by All Sources of Evidence

	Age	Weight Status	Disability Status	Chronic Conditions
Blackman, 2013	All ages			
Bort-Roig, 2014	Adults and adolescents			
Bossen, 2014	Adults			
Brannon, 2014	Children and adolescents			
Buchholz, 2013	Adults			
Connelly, 2013	Adults			Type 2 diabetes
Davies, 2012	Adults; >44 <45; mean age 43.06			
de Vries, 2016	Adults	Overweight and obese		
DHHS, 2012	Children 3–17			
Fanning, 2012	8–68			
Foster, 2013	Adults, ≥16			
Funk, 2013	Adults			Type 2 diabetes
Goode, 2012	Adults			
Goode, 2016	Adults			
Head, 2013	All ages			
Liang, 2014	Children ≤18			
Maher, 2014	All ages			
Mansi, 2014	Adults 40–82		Musculoskeletal disorders	
Mita, 2016	All ages			
Norris, 2016	Children 5–17			
Pfaeffli, 2016	Adults			
Qiu, 2014	Adults			Type 2 diabetes

	Age	Weight Status	Disability Status	Chronic Conditions
Qiu, 2015	Adults; mean age 52.5–68.3			Type 2 diabetes
Ridgers, 2016	Children 5–19			
Schoeppe, 2016	Adults 18–71, children 8–17			
Short, 2011	Adults			
Valenzuela, 2016	Adults ≥60			
Williams, 2014	All ages			

Supporting Evidence

Existing Systematic Reviews and Meta-Analyses

Table 2. Existing Systematic Reviews and Meta-Analyses Individual Evidence Summary Tables

Computer-tailored Print	Telephone	Web-based or Internet-delivered
Systematic Review **Citation:** Foster C, Richards J, Thorogood M, Hillsdon M. Remote and web 2.0 interventions for promoting physical activity. *Cochrane Database Syst Rev*. 2013;(9). doi:10.1002/14651858.CD010395.pub2.		
Level(s) of Impact: Technology	**Abstract:** Background: Remote and web 2.0 interventions for promoting physical activity (PA) are becoming increasingly popular but their ability to achieve long term changes are unknown.Objectives: To compare the effectiveness of remote and web 2.0 interventions for PA promotion in community dwelling adults (aged 16 years and above) with a control group exposed to placebo or no or minimal intervention.Search methods: We searched CENTRAL, MEDLINE, EMBASE, CINAHL, and some other databases (from earliest dates available to October 2012). Reference lists of relevant articles were checked. No language restrictions were applied.Selection criteria: Randomised controlled trials (RCTs) that compared remote and web 2.0 PA interventions for community dwelling adults with a placebo or no or minimal intervention control group. We included studies if the principal component of the intervention was delivered using remote or web 2.0 technologies (for example the internet, smart phones) or more traditional methods (for example telephone, mail-outs), or both. To assess behavioural change over time, the included studies had a minimum of 12 months follow-up from the start of the intervention to the final results. We excluded studies that had more than a 20% loss to follow-up if they did not apply an intention-to-treat analysis.Data collection and analysis: At least two authors independently assessed the quality of each study and extracted the data. Non-English language papers were reviewed with the assistance of an interpreter who was an epidemiologist. Study authors were contacted for additional information where necessary. Standardised mean differences (SMDs) and 95% confidence intervals (CIs) were calculated for the continuous measures of self-reported PA and cardio-respiratory fitness. For studies with dichotomous outcomes, odds ratios and 95% CIs were calculated.Main results: A total of 11 studies recruiting 5862 apparently healthy adults met the inclusion criteria. All of the studies took place in high-income countries. The effect of the interventions on cardiovascular fitness at one year (two studies; 444 participants) was positive and moderate with significant heterogeneity of the observed effects (SMD 0.40; 95% CI 0.04 to 0.76; high quality evidence). The effect of the interventions on
Purpose: To compare the effectiveness of remote and web 2.0 interventions for physical activity (PA) promotion in community-dwelling adults (aged 16 years and above) with a control group exposed to a placebo, or receiving no intervention or a minimal intervention.		
Timeframe: Inception–2012		
Total # of Studies: 11		
Description of Intervention(s): An intervention is any deliberate attempt to increase the PA levels of the participants. It may be delivered using various methods and implemented through a broad range of professions (for example, health professional, exercise specialist, PA researchers).		
Outcomes Addressed: Changes in PA assessed using objective methods (for example, accelerometers, pedometers) or subjective tools (for example, PA diary, survey). Cardio-respiratory fitness (CF), estimated from a submaximal fitness test or recorded directly from a maximal fitness test. CF was typically expressed as a peak oxygen uptake (VO2 max) score. **Sedentary Behavior an Outcome:**		

No	self-reported PA at one year (nine studies; 4547 participants) was positive and moderate (SMD 0.20; 95% CI 0.11 to 0.28; moderate quality evidence) with heterogeneity (I2 = 37%) in the observed effects. One study reported positive results at two years (SMD 0.20; 95% CI 0.08 to 0.32; moderate quality evidence). When studies were stratified by risk of bias, the studies at low risk of bias (eight studies; 3403 participants) had an increased effect (SMD 0.28; 95% CI 0.16 to 0.40; moderate quality evidence). The most effective interventions applied a tailored approach to the type of PA and used telephone contact to provide feedback and to support changes in PA levels. There was no evidence of an increased risk of adverse events (seven studies; 2892 participants). Risk of bias was assessed as low (eight studies; 3060 participants) or moderate (three studies; 2677 participants). There were no differences in effectiveness between studies using different types of professionals delivering the intervention (for example health professional, exercise specialist). There was no difference in pooled estimates between studies that generated the prescribed PA using an automated computer programme versus a human, nor between studies that used pedometers as part of their intervention compared to studies that did not.Authors' conclusions: We found consistent evidence to support the effectiveness of remote and web 2.0 interventions for promoting PA. These interventions have positive, moderate sized effects on increasing self-reported PA and measured cardio-respiratory fitness, at least at 12 months. The effectiveness of these interventions was supported by moderate and high quality studies. However, there continues to be a paucity of cost effectiveness data and studies that incl de participants from varying socioeconomic or ethnic groups. To better understand the independent effect of individual programme components, longer term studies, with at least one year follow-up, are required.
Examine cost, cost-effectivenesss or ROI: Three studies reported data for cost effectiveness. All three studies reported positive findings for both PA and quality of life measures, which appeared to be linked to the calculations of cost effectiveness. **Examine Cardiorespiratory Fitness as Outcome:** Yes	
Populations Analyzed: Adults ≥16	**Author-Stated Funding Source:** British Heart Foundation Core Grant and National Institute for Health Research Cochrane Incentive Scheme 2012

<table>
<tr><th colspan="2">Computer-tailored Print</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Short CE, James EL, Plotnikoff RC, Girgis A. Efficacy of tailored-print interventions to promote physical activity: a systematic review of randomised trials. Int J Behav Nutr Phys Act. 2011. 8:113. doi:10.1186/1479-5868-8-113.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: OBJECTIVE: Computer-tailored physical activity interventions are becoming increasingly popular. Recent reviews have comprehensively synthesised published research on computer-tailored interventions delivered via interactive technology (e.g. web-based programs) but there is a paucity of synthesis for interventions delivered via traditional print-based media in the physical activity domain (i.e. tailored-print interventions). The current study provides a systematic review of the tailored-print literature, to identify key factors relating to efficacy in tailored-print physical activity interventions. METHOD: Computer-tailored print intervention studies published up until May 2010 were identified through a search of three databases: Medline, CINAHL, and Psycinfo; and by searching reference lists of relevant publications, hand searching journals and by reviewing publications lists of 11 key authors who have published in this field. RESULTS: The search identified 12 interventions with evaluations reported in 26 publications. Seven out of the 12 identified studies reported positive intervention effects on physical activity behaviour, ranging from one month to 24 months post-baseline and 3 months to 18 months post-intervention. The majority of studies reporting positive intervention effects were theory-based interventions with multiple intervention contacts. CONCLUSION: There is preliminary evidence that tailored-print interventions are a promising approach to promoting physical activity in adult populations. Future research is needed to further identify key factors relating to efficacy and to determine if this approach is cost-effective and sustainable in the long-term.</td></tr>
<tr><td>Purpose: To evaluate the evidence for tailored print interventions in changing physical activity (PA) behavior, inclusive of aerobic, strength, and prolonged sedentary behavior.</td></tr>
<tr><td>Timeframe: Inception–2010</td></tr>
<tr><td>Total # of Studies: 26</td></tr>
<tr><td>Description of Intervention(s): Tailored printed/non-printed or non-tailored printed materials constructed using the Transtheoretical Model, Integrated Model, or a combination of other theories.</td></tr>
<tr><td>Outcomes Addressed: Changes in PA: self-report. One study used an objective measure to confirm validity of self report (weak correlation).
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Reported in two studies: The cost of delivering the tailored-print intervention ($35.81 per month per participant) was consistent between studies. Of note for intervention developers, the tailored print and tailored-Internet interventions cost $10,742 and $109,564 (USD), respectively, to develop.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Cancer Council New South Wales and the Cancer Institute New South Wales Research Scholar Award</td></tr>
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Interactive Video Games Promoting Active Play or Exercise	
Systematic Review **Citation:** Norris E, Hamer M, Stamatakis E. Active video games in schools and effects on physical activity and health: a systematic review. *J Pediatr*. 2016;172:40-46.e5. doi:10.1016/j.jpeds.2016.02.001.	
Level of Impact(s): Technology	**Abstract:** OBJECTIVE: To assess the quality of evidence for the effects of school active video game (AVG) use on physical activity and health outcomes. STUDY DESIGN: Online databases (ERIC, PsycINFO, PubMed, SPORTDiscus, and Web of Science) and gray literature were searched. Inclusion criteria were the use of AVGs in school settings as an intervention; assessment of at least 1 health or physical activity outcome; and comparison of outcomes with either a control group or comparison phase. Studies featuring AVGs within complex interventions were excluded. Study quality was assessed using the Effective Public Health Practice Project tool. RESULTS: Twenty-two reports were identified: 11 assessed physical activity outcomes only, 5 assessed motor skill outcomes only, and 6 assessed both physical activity and health outcomes. Nine out of 14 studies found greater physical activity in AVG sessions compared with controls; mostly assessed by objective measures in school time only. Motor skills were found to improve with AVGs vs controls in all studies but not compared with other motor skill interventions. Effects of AVGs on body composition were mixed. Study quality was low in 16 studies and moderate in the remaining 6, with insufficient detail given on blinding, participation rates, and confounding variables. CONCLUSIONS: There is currently insufficient evidence to recommend AVGs as efficacious health interventions within schools. Higher quality AVG research utilizing randomized controlled trial designs, larger sample sizes, and validated activity measurements beyond the school day is needed.
Purpose: To present current evidence on school-based active video games and their relationship with health and physical activity (PA) outcomes, including motor skills in children and youth aged 5 years and older.	
Timeframe: Inception–2015	
Total # of Studies: 22	
Description of Intervention(s): Interventions featured active video game exposure in school: within a lesson, during break time, or before or after the school day.	
Outcomes Addressed: Changes in PA: self-report or accelerometer. BMI and body composition. **Sedentary Behavior an Outcome:** No	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Children 5–17 years old	**Author-Stated Funding Source:** University College London Crucible doctoral studentship; National Health and Medical Research Council Senior Research Fellowship

<table>
<tr><th colspan="2">Interactive Video Games Promoting Active Play or Exercise</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Liang Y, Lau PW. Effects of active videogames on physical activity and related outcomes among healthy children: a systematic review. Games Health J. 2014;3(3):122-144. doi:10.1089/g4h.2013.0070.</td></tr>
<tr><td>Level of Impact(s): Technology</td><td rowspan="6">Abstract: OBJECTIVE: This review systematically evaluated the effects of active videogames (AVGs) on physical activity (PA) and related outcomes in healthy children. MATERIALS AND METHODS: Electronic databases were searched to retrieve articles published from January 2000 through August 2013. Included were original studies published in English, in peer-reviewed journals, that included at least one subgroup of healthy participants not older than 18 years, and that measured at least one PA-related cognitive, psychosocial, or behavioral outcome. All study designs were included, but only intervention studies with PA comparison between groups or across time were assessed for methodological quality. Evidence strength for intervention studies was stratified by settings (including the free-living home setting, the school, community, or primary care setting with structured AVG sessions [i.e., AVG play of participants was organized by teachers or researchers], and multiple settings). RESULTS: Fifty-four articles were identified, including 32 studies that examined the immediate PA effects (i.e., energy expenditure and PA levels during AVG play), one survey study, and 21 intervention studies aimed to promote PA. AVGs led to light- to moderate-intensity PA among studies of immediate PA outcomes. No effect was identified of AVGs on PA in the home setting. Moderate evidence was found that structured AVG play could improve PA. Inconclusive evidence was found for the effect of AVGs on PA in multiple settings. CONCLUSIONS: The present review does not support using AVGs alone in the home setting to promote PA. Structured AVG play has the potential to promote PA in children.</td></tr>
<tr><td>Purpose: To evaluate the effects of active video games on physical activity (PA)-related cognitive, psychosocial, and behavioral outcomes among children.</td></tr>
<tr><td>Timeframe: January 2000–August 2013</td></tr>
<tr><td>Total # of Studies: 54</td></tr>
<tr><td>Description of Intervention(s): Active video games intervention studies.</td></tr>
<tr><td>Outcomes Addressed: PA-related outcomes: separated into two groups, (1) the immediate PA effects (energy expenditure or PA levels) and (2) habitual PA or change of PA (PA levels).
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: Yes</td></tr>
<tr><td>Populations Analyzed: Children ≤18 years old</td><td>Author-Stated Funding Source: Research Grants Council of Hong Kong, the General Research Fund from Research Grants Council of Hong Kong</td></tr>
</table>

Interactive Video Games Promoting Active Play or Exercise	
Systematic Review **Citation:** Valenzuela T, Okubo Y, Woodbury A, Lord SR, Delbaere K. Adherence to technology-based exercise programs in older adults: a systematic review. *J Geriatr Phys Ther*. 2016.	
Level of Impact: Technology	**Abstract:** BACKGROUND AND PURPOSE: Exercise participation and adherence in older people is often low. The integration of technology-based exercise programs may have a positive effect on adherence as they can overcome perceived barriers to exercise. Previous systematic reviews have shown preliminary evidence that technology-based exercise programs can improve physical functioning. However, there is currently no in-depth description and discussion of the potential this technology offers to improve exercise adherence in older people. This review examines the literature regarding older adults' acceptability and adherence to technology-based exercise interventions. METHODS: A comprehensive systematic database search for randomized controlled trials, clinical controlled trials, and parallel group trials was performed, including MEDLINE, PsycINFO, EMBASE, CINAHL, EMB Reviews, and Cochrane Library, completed in May 2015. Trials reporting adherence to technology-based exercise programs aimed at improving physical function were included. Adherence was defined as the percentage of exercise sessions attended out of the total number of sessions prescribed. RESULTS: Twenty-two studies were included. The mean cohort age range was 67 to 86 years. Studies were conducted in research facilities, aged care facilities, and people's homes. Ten studies compared outcomes between technology-based and traditional exercise programs. Adherence to both types of interventions was high (median 91.25% and 83.58%, respectively). Adherence was higher for technology-based interventions than traditional interventions independent of study site, level of supervision, and delivery mode. The majority of the studies used commercially available gaming technologies, and both types of exercise interventions were mostly supervised. A lack of detailed reporting of adherence and the pilot nature of most studies did not allow computation of a comprehensive adherence rate. DISCUSSION: This systematic review provides evidence that technology offers a well-accepted method to provide older adults with engaging exercise opportunities, and adherence rates remain high in both supervised and unsupervised settings at least throughout the first 12 weeks of intervention. The higher adherence rates to technology-based interventions can be largely explained by the high reported levels of enjoyment when using these programs. However, the small sample sizes, short follow-up periods, inclusion of mostly healthy older people, and problems related to the methods used to report exercise adherence limit the generalizability of our findings. CONCLUSION: This systematic review indicates that technology-based exercise interventions
Purpose: To examine the literature regarding the use of technology-based exercise interventions to improve physical functioning in older adults, and explore older adults' acceptability and adherence to such programs.	
Timeframe: Inception–2015	
Total # of Studies: 22	
Description of Intervention(s): Technology-based intervention compared against a control group that was either a non-exercise group or a traditional exercise group. The majority of studies utilized a gaming console as an intervention. Balance training was also a key component of 77% of studies.	
Outcomes Addressed: Changes in balance, functional performance, muscle strength, endurance, and stepping ability. Measures of cognitive function were also conducted, looking at executive function, processing speed, and dual-task costs. Overall levels of physical activity were also assessed. **Sedentary Behavior an Outcome:** No	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	

	have good adherence and may provide a sustainable means of promoting physical activity and preventing falls in older people. More research is required to investigate the feasibility, acceptability, and effectiveness of technology-based exercise programs undertaken by older people at home over extended trial periods.
Populations Analyzed: Adults ≥60 years old	**Author-Stated Funding Source:** Univesrity of New South Wales doctorate scholarship; National Health and Medical Research Council; Japan Society for the Promotion of Science

Mobile Phone Programs	
Systematic Review **Citation:** Blackman KC, Zoellner J, Berrey LM, et al. Assessing the internal and external validity of mobile health physical activity promotion interventions: a systematic literature review using the RE-AIM framework. *J Med Internet Res*. 2013;15(10):e224. doi:10.2196/jmir.2745.	
Level of Impact: Technology **Purpose:** To determine the degree to which studies testing mHealth interventions to promote physical activity (PA) report on factors that inform generalizability across settings and populations. **Timeframe:** 2000–2012 **Total # of Studies:** 20 **Description of Intervention(s):** Studies used mobile phones or personal digital assistants to monitor outcomes via self-report or data from an external pedometer/accelerometer. Most studies intervened at the individual level, two intervened at the group level, and one targeted both levels. Additionally, mobile technology was used to provide prompts to encourage behavior change and provide health promotion information sent through SMS (texting). Furthermore, in two studies, mobile technology was used as an interactive mobile application (one study delivered an exercise program and another study used a mobile PA diary). **Outcomes Addressed:** PA was measured through self-report and objective measures. **Sedentary Behavior an Outcome:** Yes **Examine cost, cost-effectivenesss or ROI:** Four studies reported on measures of cost of implementation. Only one study assessed cost effectiveness, which indicated that the cost per participant associated with a mobile phone-based exercise program was $580, and coaching was added at a low incremental cost of $80 (USD). **Examine Cardiorespiratory Fitness as Outcome:** No	**Abstract:** BACKGROUND: Mobile health (mHealth) interventions are effective in promoting physical activity (PA); however, the degree to which external validity indicators are reported is unclear. OBJECTIVE: The purpose of this systematic review was to use the RE-AIM (reach, effectiveness, adoption, implementation, and maintenance) framework to determine the extent to which mHealth intervention research for promoting PA reports on factors that inform generalizability across settings and populations and to provide recommendations for investigators planning to conduct this type of research. METHODS: Twenty articles reflecting 15 trials published between 2000 and 2012 were identified through a systematic review process (ie, queries of three online databases and reference lists of eligible articles) and met inclusion criteria (ie, implementation of mobile technologies, target physical activity, and provide original data). Two researchers coded each article using a validated RE-AIM data extraction tool (reach, efficacy/effectiveness, adoption, implementation, maintenance). Two members of the study team independently abstracted information from each article (inter-rater reliability >90%) and group meetings were used to gain consensus on discrepancies. RESULTS: The majority of studies were randomized controlled trials (n=14). The average reporting across RE-AIM indicators varied by dimension (reach=53.3%, 2.67/5; effectiveness/efficacy=60.0%, 2.4/4; adoption=11.1%, 0.7/6; implementation=24.4%, 0.7/3; maintenance=0%, 0/3). While most studies described changes in the primary outcome (effectiveness), few addressed the representativeness of participants (reach) or settings (adoption) and few reported on issues related to maintenance and degree of implementation fidelity. CONCLUSIONS: This review suggests that more focus is needed on research designs that highlight and report on both internal and external validity indicators. Specific recommendations are provided to encourage future mHealth interventionists and investigators to report on representativeness, settings, delivery agents for planned interventions, the extent to which protocol is delivered as intended, and maintenance of effects at the individual or organizational level.

Populations Analyzed: All ages	**Author-Stated Funding Source:** Not Reported

Mobile Phone Programs	
Systematic Review **Citation:** Bort-Roig J, Gilson ND, Puig-Ribera A, Contreras RS, Trost SG. Measuring and influencing physical activity with smartphone technology: a systematic review. *Sports Med*. 2014;44(5):671-686. doi:10.1007/s40279-014-0142-5.	
Level of Impact: Technology	**Abstract:** BACKGROUND: Rapid developments in technology have encouraged the use of smartphones in physical activity research, although little is known regarding their effectiveness as measurement and intervention tools. OBJECTIVE: This study systematically reviewed evidence on smartphones and their viability for measuring and influencing physical activity. DATA SOURCES: Research articles were identified in September 2013 by literature searches in Web of Knowledge, PubMed, PsycINFO, EBSCO, and ScienceDirect. STUDY SELECTION: The search was restricted using the terms (physical activity OR exercise OR fitness) AND (smartphone* OR mobile phone* OR cell phone*) AND (measurement OR intervention). Reviewed articles were required to be published in international academic peer-reviewed journals, or in full text from international scientific conferences, and focused on measuring physical activity through smartphone processing data and influencing people to be more active through smartphone applications. STUDY APPRAISAL AND SYNTHESIS METHODS: Two reviewers independently performed the selection of articles and examined titles and abstracts to exclude those out of scope. Data on study characteristics, technologies used to objectively measure physical activity, strategies applied to influence activity; and the main study findings were extracted and reported. RESULTS: A total of 26 articles (with the first published in 2007) met inclusion criteria. All studies were conducted in highly economically advantaged countries; 12 articles focused on special populations (e.g. obese patients). Studies measured physical activity using native mobile features, and/or an external device linked to an application. Measurement accuracy ranged from 52 to 100% (n = 10 studies). A total of 17 articles implemented and evaluated an intervention. Smartphone strategies to influence physical activity tended to be ad hoc, rather than theory-based approaches; physical activity profiles, goal setting, real-time feedback, social support networking, and online expert consultation were identified as the most useful strategies to encourage physical activity change. Only five studies assessed physical activity intervention effects; all used step counts as the outcome measure. Four studies (three pre-post and one comparative) reported physical activity increases (12-42 participants, 800-1,104 steps/day, 2 weeks-6 months), and one case-control study reported physical activity maintenance (n = 200 participants; >10,000 steps/day) over 3 months. LIMITATIONS: Smartphone use is a relatively new field of study in physical activity research, and consequently the evidence base is emerging. CONCLUSIONS: Few studies identified in this review considered the validity of phone-based assessment of physical activity. Those that did report on measurement properties found average-to-excellent levels of accuracy for different behaviors. The
Purpose: To examine the extent to which smartphones can effectively be used to measure and influence physical activity (PA).	
Timeframe: Inception–2013	
Total # of Studies: 26	
Description of Intervention(s): Promoted PA through smartphone apps: provided user profiles and real-time feedback; provided summary of activities at end of day; displayed graphical feedback and a historical view of progress; delivered motivational text messages, games as a tool to learn about balance, and tips and suggestions to become physically active.	
Outcomes Addressed: PA effects: step counts, PA levels. **Sedentary Behavior an Outcome:** Yes	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	

	range of novel and engaging intervention strategies used by smartphones, and user perceptions on their usefulness and viability, highlights the potential such technology has for physical activity promotion. However, intervention effects reported in the extant literature are modest at best, and future studies need to utilize randomized controlled trial research designs, larger sample sizes, and longer study periods to better explore the physical activity measurement and intervention capabilities of smartphones.
Populations Analyzed: Adults and adolescents	**Author-Stated Funding Source:** Ministerio de Ciencia e Innovacion--Gavierno de Espana

<table>
<tr><th colspan="2">Mobile Phone Programs</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Brannon EE, Cushing CC. Is there an app for that? translational science of pediatric behavior change for physical activity and dietary interventions: a systematic review. J Pediatr Psychol. 2015;40(4):373-384. doi:10.1093/jpepsy/jsu108.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="5">Abstract: OBJECTIVE:
Systematically review and meta-analyze the pediatric literature on behavior-change techniques (BCT) as defined by Abraham & Michie (Health Psychology, 27, 379-387, 2008), and describe whether the most effective BCTs are incorporated in physical activity (PA) and dietary mobile apps.
METHODS:
Randomized controlled trials (n = 74) targeting diet or PA were meta-analyzed. Metaregressions were used to determine which BCTs predict aggregate effect size (ES). iTunes™ apps were coded for presence/absence of BCTs that produce larger ES.
RESULTS:
Modeling was the only predictor of PA ES in children (aged 6-13 years). Consequences for behavior, other's approval, self-monitoring, intention formation, and behavioral contracting significantly predicted PA for adolescents. Modeling and social support predicted dietary ES in adolescents and children, respectively. Practice was also a significant predictor for children. A majority of effective strategies for children were not widely incorporated in apps; however, the picture is more optimistic for adolescents.
CONCLUSIONS:
More collaboration is needed between pediatric psychologists and technologists to incorporate evidence-based BCTs into developmentally appropriate mobile apps.</td></tr>
<tr><td>Purpose: To identify the behavioral components that lead to intervention effectiveness among children and adolescents and assess whether effective behavioral components are, or can be, incorporated into the mHealth sphere.</td></tr>
<tr><td>Timeframe: Not Reported</td></tr>
<tr><td>Total # of Studies: 74</td></tr>
<tr><td>Description of Intervention(s): Interventions that promoted physical activity (PA) in healthy children and adolescents using apps available to the general public.</td></tr>
<tr><td>Outcomes Addressed: PA: self-report, objectively assessed moderate-to-vigorous PA and fitness.
Sedentary Behavior an Outcome: Yes</td><td></td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td><td></td></tr>
<tr><td>Populations Analyzed: Children and adolescents</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

Mobile Phone Programs	
Systematic Review **Citation:** Buchholz SW, Wilbur J, Ingram D, Fogg L. Physical activity text messaging interventions in adults: a systematic review. *Worldviews Evid Based Nurs*. 2013;10(3):163-173. doi:10.1111/wvn.12002.	
Level of Impact: Technology	**Abstract:** BACKGROUND: Physical inactivity is a leading health risk factor for mortality worldwide. Researchers are examining innovative techniques including the use of mobile technology to promote physical activity. One such technology, text messaging, is emerging internationally as a method to communicate with and motivate individuals to engage in healthy behaviors, including physical activity. AIM: Review the existing scientific literature on adult physical activity text messaging interventions. METHODS: This systematic review examined research papers that addressed physical activity text messaging intervention studies in adults. Using multiple databases, the search strategy included published English language studies through October 1, 2011. An author-developed data collection tool was used independently by two reviewers to extract and examine the selected study variables. RESULTS: The initial search resulted in the identification of 200 publications. Eleven publications representing 10 studies were included in the final review. Studies were conducted in seven countries with over half the studies being randomized controlled trials. Participants of the studies were predominantly young to middle aged women. Physical activity data were mainly obtained by self-report although three studies used pedometers or accelerometers. Interventions ranged from only sending out text messages to combining text messages with educational materials, staff support, and/or Internet technology. Minimal information was given regarding development or number of text messages used. The median effect size for the studies was 0.50. CONCLUSIONS: To date, using text messaging as a method to promote physical activity has only been studied by a small group of researchers. Current physical activity text messaging literature is characterized by small sample sizes, heterogeneous but positive effect sizes, and a lack of specificity as to the development of the text messages used in these studies. Further research in this area is imperative to facilitate the expansion of mobile technology to promote physical activity.
Purpose: To identify, retrieve, critically appraise, and synthesize the existing scientific literature on physical activity (PA) text messaging interventions for adults.	
Timeframe: Inception–2011	
Total # of Studies: 11	
Description of Intervention(s): Interventions ranged from only sending out PA text messages, to combining text messages with educational materials, as well as providing counseling sessions delivered by healthcare providers and staff. Two studies combined a text messaging intervention with Internet technology. Content varied significantly, with the majority of content focusing on the benefits of PA, how to overcome barriers, and other advice regarding PA. Generally, text messages were sent to participants one to four times a week.	
Outcomes Addressed: Change in PA levels. PA was measured by self-reported minutes of PA, self-reported frequency of PA, or recorded steps using either a pedometer or an accelerometer. **Sedentary Behavior an Outcome:** No	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults	**Author-Stated Funding Source:** Not Reported

Mobile Phone Programs	
Meta-Analysis **Citation:** Fanning J, Mullen SP, McAuley E. Increasing physical activity with mobile devices: a meta-analysis. *J Med Internet Res.* 2012;14(6):e161. doi:10.2196/jmir.2171.	
Level of Impact: Technology **Purpose:** To conduct a meta-analysis of research utilizing mobile devices to influence physical activity (PA) behavior. **Timeframe:** 2000–July 2012 **Total # of Studies:** 11 **Description of Intervention(s):** Interventions incorporated mobile technologies in the collection or dissemination of intervention materials meant to positively influence PA behavior. Eight studies reported use of SMS (texting), four reported use of native mobile software, and two reported use of a personal digital assistant (PDA) rather than a mobile phone to implement their intervention. **Outcomes Addressed:** Five studies reported duration of moderate-to-vigorous physical activity (MVPA duration), three reported pedometer step counts, one reported frequency of MVPA (MVPA frequency), another reported the percentage of active time spent in MVPA (% MVPA), one study reported accelerometer counts per minute, two reported metabolic equivalents, and one reported the number of days per week of walking for exercise as well as the number of days of exercise per week. **Sedentary Behavior an Outcome:** No	**Abstract:** BACKGROUND: Regular physical activity has established physical and mental health benefits; however, merely one quarter of the U.S. adult population meets national physical activity recommendations. In an effort to engage individuals who do not meet these guidelines, researchers have utilized popular emerging technologies, including mobile devices (ie, personal digital assistants [PDAs], mobile phones). This study is the first to synthesize current research focused on the use of mobile devices for increasing physical activity. OBJECTIVE: To conduct a meta-analysis of research utilizing mobile devices to influence physical activity behavior. The aims of this review were to: (1) examine the efficacy of mobile devices in the physical activity setting, (2) explore and discuss implementation of device features across studies, and (3) make recommendations for future intervention development. METHODS: We searched electronic databases (PubMed, PsychINFO, SCOPUS) and identified publications through reference lists and requests to experts in the field of mobile health. Studies were included that provided original data and aimed to influence physical activity through dissemination or collection of intervention materials with a mobile device. Data were extracted to calculate effect sizes for individual studies, as were study descriptives. A random effects meta-analysis was conducted using the Comprehensive Meta-Analysis software suite. Study quality was assessed using the quality of execution portion of the Guide to Community Preventative Services data extraction form. RESULTS: Four studies were of "good" quality and seven of "fair" quality. In total, 1351 individuals participated in 11 unique studies from which 18 effects were extracted and synthesized, yielding an overall weight mean effect size of g = 0.54 (95% CI = 0.17 to 0.91, P = .01). CONCLUSIONS: Research utilizing mobile devices is gaining in popularity, and this study suggests that this platform is an effective means for influencing physical activity behavior. Our focus must be on the best possible use of these tools to measure and understand behavior. Therefore, theoretically grounded behavior change interventions that recognize and act on the potential of smartphone technology could provide investigators with an effective tool for increasing physical activity.

Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Children and adults ages 8 to 68	**Author-Stated Funding Source:** National Institute on Aging

<table>
<tr><th colspan="2">Mobile Phone Programs</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Head KJ, Noar SM, Iannarino NT, Grant Harrington N. Efficacy of text messaging-based interventions for health promotion: a meta-analysis. Soc Sci Med. 2013;97:41-48. doi:10.1016/j.socscimed.2013.08.003.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="7">Abstract: This meta-analysis investigated the efficacy of text messaging-based health promotion interventions. Nineteen randomized controlled trials conducted in 13 countries met inclusion criteria and were coded on a variety of participant, intervention, and methodological moderators. Meta-analytic procedures were used to compute and aggregate effect sizes. The overall weighted mean effect size representing the impact of these interventions on health outcomes was d = .329 (95% CI = .274, .385; p < .001). This effect size was statistically heterogeneous (Q18 = 55.60, p < .001, I(2) = 67.62), and several variables significantly moderated the effects of interventions. Smoking cessation and physical activity interventions were more successful than interventions targeting other health outcomes. Message tailoring and personalization were significantly associated with greater intervention efficacy. No significant differences were found between text-only interventions and interventions that included texting plus other components. Interventions that used an individualized or decreasing frequency of messages over the course of the intervention were more successful than interventions that used a fixed message frequency. We discuss implications of these results for health promotion interventions that use text messaging.</td></tr>
<tr><td>Purpose: To investigate the effectiveness of health promotion interventions that incorporate text messaging.</td></tr>
<tr><td>Timeframe: Inception–2011</td></tr>
<tr><td>Total # of Studies: 19</td></tr>
<tr><td>Description of Intervention(s):
Interventions that used mobile phone text messaging to change health behaviors. Forty-seven percent of the interventions were text only, while the remainder combined text messaging with other modalities such as websites, print materials, and human counselors. Programs ranged from sending one or two text messages to sending texts once a day or more. Forty-seven percent of programs used tailored messages only, while 37% used both tailored and targeted messages, and 16% used targeted messages only.</td></tr>
<tr><td>Outcomes Addressed: Three studies had physical activity as an outcome and one study focused on increasing physical activity and reducing childhood television screen time.
Sedentary Behavior an Outcome: Yes</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: All ages</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

Mobile Phone Programs	
Systematic Review **Citation:** Pfaeffli Dale L, Dobson R, Whittaker R, Maddison R. The effectiveness of mobile-health behaviour change interventions for cardiovascular disease self-management: A systematic review. *Eur J Prev Cardiol.* 2016. 23(8):801-817. doi:10.1177/2047487315613462.	
Level of Impact: Technology	**Abstract:** BACKGROUND: Mobile wireless devices (mHealth) have been used to deliver cardiovascular disease self-management interventions to educate and support patients in making healthy lifestyle changes. This systematic review aimed to determine the effectiveness of mHealth interventions on behavioural lifestyle changes and medication adherence for cardiovascular disease self-management. METHODS: A comprehensive literature search was conducted from inception through to 3 March 2015 using MEDLINE, PubMed, PsycINFO, EMBASE and The Cochrane Library. Eligible studies used an experimental trial design to determine the effectiveness of an mHealth intervention to change lifestyle behaviours in any cardiovascular disease population. Data extracted included intervention and comparison group characteristics with a specific focus on the use of behaviour change techniques. RESULTS: Seven studies met our inclusion criteria and were included in the qualitative synthesis. All interventions were delivered in part by mobile phone text messaging. Three studies were effective at improving adherence to medication and two studies increased physical activity behaviour. No effects were observed on dietary behaviour or smoking cessation, measured in one study each. Simple text messaging interventions appeared to be most effective; however, no clear relationships were found between study findings and intervention dose, duration or behaviour change techniques targeted. CONCLUSIONS: Our review found mHealth has the potential to change lifestyle behaviour. Results are still limited to a small number of trials, inconsistent outcome measures and ineffective reporting of intervention characteristics. Large scale, longitudinal studies are now warranted to gain a clear understanding of the effects of mHealth on behaviour change in the cardiovascular disease population.
Purpose: To determine the effectiveness of mobile wireless device interventions on behavioral lifestyle changes and medication adherence for cardiovascular disease management among adults.	
Timeframe: Inception–2015	
Total # of Studies: 9	
Description of Intervention(s): Included interventions that were delivered, at least in part, via health communication that was delivered using a mobile device such as a mobile phone, patient monitoring device, personal digital assistant, or other wireless device.	
Outcomes Addressed: Lifestyle behavior change: self-reported physical activity. **Sedentary Behavior an Outcome:** No	
Examine cost, cost-effectivenesss or ROI: Not reported. **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults	**Author-Stated Funding Source:** None

Mobile Phone Programs	
Systematic Review **Citation:** Schoeppe S, Alley S, Van Lippevelde W, et al. Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: a systematic review. *Int J Behav Nutr Phys Act.* 2016;13(1):127. doi:10.1186/s12966-016-0454-y.	
Level of Impact: Technology	**Abstract:** BACKGROUND: Health and fitness applications (apps) have gained popularity in interventions to improve diet, physical activity and sedentary behaviours but their efficacy is unclear. This systematic review examined the efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour in children and adults. METHODS: Systematic literature searches were conducted in five databases to identify papers published between 2006 and 2016. Studies were included if they used a smartphone app in an intervention to improve diet, physical activity and/or sedentary behaviour for prevention. Interventions could be stand-alone interventions using an app only, or multi-component interventions including an app as one of several intervention components. Outcomes measured were changes in the health behaviours and related health outcomes (i.e., fitness, body weight, blood pressure, glucose, cholesterol, quality of life). Study inclusion and methodological quality were independently assessed by two reviewers. RESULTS: Twenty-seven studies were included, most were randomised controlled trials (n = 19; 70%). Twenty-three studies targeted adults (17 showed significant health improvements) and four studies targeted children (two demonstrated significant health improvements). Twenty-one studies targeted physical activity (14 showed significant health improvements), 13 studies targeted diet (seven showed significant health improvements) and five studies targeted sedentary behaviour (two showed significant health improvements). More studies (n = 12; 63%) of those reporting significant effects detected between-group improvements in the health behaviour or related health outcomes, whilst fewer studies (n = 8; 42%) reported significant within-group improvements. A larger proportion of multi-component interventions (8 out of 13; 62%) showed significant between-group improvements compared to stand-alone app interventions (5 out of 14; 36%). Eleven studies reported app usage statistics, and three of them demonstrated that higher app usage was associated with improved health outcomes. CONCLUSIONS: This review provided modest evidence that app-based interventions to improve diet, physical activity and sedentary behaviours can be effective. Multi-component interventions appear to be more effective than stand-alone app interventions, however, this remains to be confirmed in controlled trials. Future research is needed on the optimal number and combination of app features, behaviour change techniques, and level of participant contact needed to maximise user engagement and intervention efficacy.
Purpose: To synthesize evidence for the efficacy of interventions that use apps to improve diet, physical activity (PA), and sedentary behavior for non-communicable disease prevention among adults and children.	
Timeframe: January 2006–October 2016	
Total # of Studies: 30	
Description of Intervention(s): Used an app in an intervention to influence PA or sedentary behavior: could be a standalone intervention using apps only, or a multi-component intervention.	
Outcomes Addressed: Lifestyle behavior change: PA (e.g., change in daily minutes of PA), sedentary behavior, and other outcomes, including weight status, fitness, blood pressure, and cholesterol. **Sedentary Behavior an Outcome:** Yes	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	

Populations Analyzed: Adults (18–71), children (8–17)	**Author-Stated Funding Source:** Early Career Fellowship from the Australian National Health and Medical Research Council. Future Leader Fellowships from the National Heart Foundation of Australia.

<table>
<tr><th colspan="2">Social Media</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Maher CA, Lewis LK, Ferrar K, Marshall S, De Bourdeaudhuij I, Vandelanotte C. Are health behavior change interventions that use online social networks effective? A systematic review. J Med Internet Res. 2014;16(2):e40.</td></tr>
<tr><td>Level(s) of Impact: Technology</td><td rowspan="6">Abstract: BACKGROUND: The dramatic growth of Web 2.0 technologies and online social networks offers immense potential for the delivery of health behavior change campaigns. However, it is currently unclear how online social networks may best be harnessed to achieve health behavior change. OBJECTIVE: The intent of the study was to systematically review the current level of evidence regarding the effectiveness of online social network health behavior interventions. METHODS: Eight databases (Scopus, CINAHL, Medline, ProQuest, EMBASE, PsycINFO, Cochrane, Web of Science and Communication & Mass Media Complete) were searched from 2000 to present using a comprehensive search strategy. Study eligibility criteria were based on the PICOS format, where "population" included child or adult populations, including healthy and disease populations; "intervention" involved behavior change interventions targeting key modifiable health behaviors (tobacco and alcohol consumption, dietary intake, physical activity, and sedentary behavior) delivered either wholly or in part using online social networks; "comparator" was either a control group or within subject in the case of pre-post study designs; "outcomes" included health behavior change and closely related variables (such as theorized mediators of health behavior change, eg, self-efficacy); and "study design" included experimental studies reported in full-length peer-reviewed sources. Reports of intervention effectiveness were summarized and effect sizes (Cohen's d and 95% confidence intervals) were calculated wherever possible. Attrition (percentage of people who completed the study), engagement (actual usage), and fidelity (actual usage/intended usage) with the social networking component of the interventions were scrutinized. RESULTS: A total of 2040 studies were identified from the database searches following removal of duplicates, of which 10 met inclusion criteria. The studies involved a total of 113,988 participants (ranging from n=10 to n=107,907). Interventions included commercial online health social network websites (n=2), research health social network websites (n=3), and multi-component interventions delivered in part via pre-existing popular online social network websites (Facebook n=4 and Twitter n=1). Nine of the 10 included studies reported significant improvements in some aspect of health behavior change or outcomes related to behavior change. Effect sizes for behavior change ranged widely from -0.05 (95% CI 0.45-0.35) to 0.84 (95% CI 0.49-1.19), but in general were small in magnitude</td></tr>
<tr><td>Purpose: To systematically review the current level of evidence regarding the effectiveness of online social network health behavior interventions to influence tobacco and alcohol consumption, dietary intake, physical activity, and sedentary behavior.</td></tr>
<tr><td>Timeframe: 2000–December 2012</td></tr>
<tr><td>Total # of Studies: 10</td></tr>
<tr><td>Description of Intervention(s): An online intervention delivered either wholly or in part, using an online social network to deliver a health behavior change intervention. The online social network intervention could be delivered using an existing online social networking platform (e.g., intervention delivered via either a “generic” pre-existing social networking website such as Facebook or Twitter, or a health-specific pre-existing social networking website, such as FatSecret) or a purpose-built intervention website incorporating social networking capabilities.</td></tr>
<tr><td>Outcomes Addressed: Physical inactivity, the effectiveness of behavior change (e.g., change in physical activity behavior [min/d]), and mediators of behavior change (physical activity self-efficacy).
Sedentary Behavior an Outcome: No</td></tr>
</table>

Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	and statistically non-significant. Participant attrition ranged from 0-84%. Engagement and fidelity were relatively low, with most studies achieving 5-15% fidelity (with one exception, which achieved 105% fidelity). CONCLUSIONS: To date there is very modest evidence that interventions incorporating online social networks may be effective; however, this field of research is in its infancy. Further research is needed to determine how to maximize retention and engagement, whether behavior change can be sustained in the longer term, and to determine how to exploit online social networks to achieve mass dissemination. Specific recommendations for future research are provided.
Populations Analyzed: All ages	**Author-Stated Funding Source:** University of South Australia Fellowship, Australian Research Council Australian Postdoctoral Award Fellowship

<table>
<tr><th colspan="2">Social Media</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Mita G, Ni Mhurchu C, Jull A. Effectiveness of social media in reducing risk factors for noncommunicable diseases: a systematic review and meta-analysis of randomized controlled trials. Nutr Rev. 2016;74(4):237-247. doi:10.1093/nutrit/nuv106.</td></tr>
<tr><td>Level of Impact(s): Technology</td><td rowspan="6">Abstract: OBJECTIVE: The primary aim of the current study was to synthesize evidence of the effect of social media use compared with no social media use as part of interventions to reduce risk factors for noncommunicable diseases. DATA SOURCES: Databases were searched up to June 10, 2014, using medical subject headings. A secondary aim of this study was to assess the effectiveness of social media use compared with no social media use in reducing the risk factors for noncommunicable diseases, stratifying the results by the extent of bias on outcomes, by social media use alone, and by the levels of social presence and media richness. STUDY SELECTION: Sixteen trials (n=10,711 participants) met the inclusion criteria, but interventions mostly used social media with low levels of media richness and presence (e.g., discussion boards, bulletin boards). DATA SYNTHESIS: Meta-analysis of all trials showed no significant differences (standardized mean difference [SMD] -0.14; 95%CI -0.28 to 0.01), with similar findings for physical activity (SMD 0.07; 95%CI -0.25 to 0.38), body weight (SMD 0.07; 95%CI -0.17 to 0.20), and fruit and vegetable intake (SMD 0.39; 95%CI -0.11 to 0.89). Trials assessing social media interventions aimed at modifying risk factors for noncommunicable diseases showed that social media use improved the primary outcomes, but the overall quality of the included studies limits the generalizability of these findings. CONCLUSION: Further trials are warranted, especially to isolate the effect of social media use and to fully evaluate the effect of the social presence and media richness of social media platforms.</td></tr>
<tr><td>Purpose: To examine the effectiveness of social media use in reducing a range of modifiable risk factors for noncommunicable diseases.</td></tr>
<tr><td>Timeframe: 2000–June 2014</td></tr>
<tr><td>Total # of Studies: 16</td></tr>
<tr><td>Description of Intervention(s):
Web-based social media was defined as websites that enable the creation and sharing of user-generated content or the participation in social networking. Social media included educational materials on physical activity (PA) behaviors.</td></tr>
<tr><td>Outcomes Addressed: Self-reported changes in PA: minutes per week, kilocalories per week, minutes per day.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: All ages</td><td>Author-Stated Funding Source: None</td></tr>
</table>

<table>
<tr><th colspan="2">Social Media</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Williams G, Hamm MP, Shulhan J, Vandermeer B, Hartling L. Social media interventions for diet and exercise behaviours: a systematic review and meta-analysis of randomised controlled trials. BMJ Open. 2014;4(2):e003926.</td></tr>
<tr><td>Level of Impact(s): Technology</td><td rowspan="6">Abstract: OBJECTIVES: To conduct a systematic review of randomised controlled trials (RCTs) examining the use of social media to promote healthy diet and exercise in the general population. DATA SOURCES: MEDLINE, CENTRAL, ERIC, PubMed, CINAHL, Academic Search Complete, Alt Health Watch, Health Source, Communication and Mass Media Complete, Web of Knowledge and ProQuest Dissertation and Thesis (2000-2013). STUDY ELIGIBILITY CRITERIA: RCTs of social media interventions promoting healthy diet and exercise behaviours in the general population were eligible. Interventions using social media, alone or as part of a complex intervention, were included. STUDY APPRAISAL AND SYNTHESIS: Study quality was assessed using the Cochrane Risk of Bias Tool. We describe the studies according to the target populations, objectives and nature of interventions, outcomes examined, and results and conclusions. We extracted data on the primary and secondary outcomes examined in each study. Where the same outcome was assessed in at least three studies, we combined data in a meta-analysis. RESULTS: 22 studies were included. Participants were typically middle-aged Caucasian women of mid-to-high socioeconomic status. There were a variety of interventions, comparison groups and outcomes. All studies showed a decrease in programme usage throughout the intervention period. Overall, no significant differences were found for primary outcomes which varied across studies. Meta-analysis showed no significant differences in changes in physical activity (standardised mean difference (SMD) 0.13 (95% CI -0.04 to 0.30), 12 studies) and weight (SMD -0.00 (95% CI -0.19 to 0.19), 10 studies); however, pooled results from five studies showed a significant decrease in dietary fat consumption with social media (SMD -0.35 (95% CI -0.68 to -0.02)). CONCLUSIONS: Social media may provide certain advantages for public health interventions; however, studies of social media interventions to date relating to healthy lifestyles tend to show low levels of participation and do not show significant differences between groups in key outcomes.</td></tr>
<tr><td>Purpose: To conduct a systematic review of randomized controlled trials examining the use of social media to promote healthy diet and exercise in the general population, to identify how social media is being used as an intervention and determine whether it is effective.</td></tr>
<tr><td>Timeframe: 2000–May 2013</td></tr>
<tr><td>Total # of Studies: 22</td></tr>
<tr><td>Description of Intervention(s): Social media programs, alone or as part of an intervention, promoting exercise behaviors in the general population.</td></tr>
<tr><td>Outcomes Addressed: Changes in physical activity levels: accelerometer or self-reported questionnaire.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: All ages</td><td>Author-Stated Funding Source: Canadian Institutes of Health Research and Alberta Innovates-Health Solutions</td></tr>
</table>

<table>
<tr><th colspan="2">Telephone</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Goode AD, Reeves MM, Eakin EG. Telephone-delivered interventions for physical activity and dietary behavior change: an updated systematic review. Am J Prev Med. 2012;42(1):81-8. doi:10.1016/j.amepre.2011.08.025.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: CONTEXT: Telephone-delivered interventions targeting physical activity and dietary change have potential for broad population reach and thus have a role to play in addressing increasing rates of lifestyle-related chronic diseases. The purpose of this systematic review is to update the evidence for their potential to inform translation, including effectiveness in promoting maintenance, reporting on implementation, and costs. EVIDENCE ACQUISITION: A structured search of PubMed, MEDLINE, and PsycINFO (January 2006 to April 2010) was conducted. Included studies reported on physical activity and/or dietary change in adults, delivered at least 50% of intervention contacts by telephone, and included a control group (except in dissemination studies). Detailed information on study design, intervention features, and behavioral outcomes was extracted, tabulated, and summarized. EVIDENCE SYNTHESIS: Twenty-five studies (27 comparisons) were included: 16 for physical activity, two for diet, and seven for combined interventions. Twenty of 27 comparisons found evidence for initiation of behavior change (14 of 17 comparisons for physical activity; two of two for diet; four of eight for combined interventions). Ten of 25 studies evaluated post-intervention maintenance of change, with three reporting that maintenance was achieved for at least 50% of outcomes. Dissemination studies were rare (n=3), as were dose-response (n=2) and cost-effectiveness analyses (n=2). CONCLUSIONS: Given the strength of evidence for telephone-delivered physical activity and dietary change interventions, greater emphasis on dissemination studies is warranted.</td></tr>
<tr><td>Purpose: To update the evidence for the potential of telephone-based interventions to inform translation, including effectiveness in promoting maintenance, reporting on implementation, and costs.</td></tr>
<tr><td>Timeframe: January 2006–April 2010</td></tr>
<tr><td>Total # of Studies: 27</td></tr>
<tr><td>Description of Intervention(s): Telephone-based interventions where the telephone was the predominant method of delivery (i.e., at least 50% of the total number of intervention contacts were conducted by telephone).</td></tr>
<tr><td>Outcomes Addressed: Changes in physical activity behavior (measurement method not included).
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Queensland Health Core Research Infrastructure Grant and National Health and Medical Research Council Program Grant funding</td></tr>
</table>

<table>
<tr><th colspan="2">Wearable Activity Monitors</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: de Vries HJ, Kooiman TJ, van Ittersum MW, van Brussel M, de Groot M. Do activity monitors increase physical activity in adults with overweight or obesity? A systematic review and meta-analysis. Obesity (Silver Spring). 2016;24(10):2078-2091. doi:10.1002/oby.21619.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: OBJECTIVE: To systematically assess contemporary knowledge regarding behavioral physical activity interventions including an activity monitor (BPAI+) in adults with overweight or obesity. METHODS: PubMed/MEDLINE, Embase, CINAHL, PsycINFO, CENTRAL, and PEDro were searched for eligible full-text articles up to 1 July 2015. Studies eligible for inclusion were (randomized) controlled trials describing physical activity outcomes in adults with overweight or obesity. Methodological quality was independently assessed employing the Cochrane Collaboration's tool for risk of bias. RESULTS: Fourteen studies (1,157 participants) were included for systematic review and 11 for meta-analysis. A positive trend in BPAI+ effects on several measures of physical activity was ascertained compared with both wait list or usual care and behavioral physical activity interventions without an activity monitor (BPAI-). No convincing evidence of BPAI+ effectiveness on weight loss was found compared with BPAI-. CONCLUSIONS: Behavioral physical activity interventions with an activity monitor increase physical activity in adults with overweight or obesity. Also, adding an activity monitor to behavioral physical activity interventions appears to increase the effect on physical activity, although current evidence has not yet provided conclusive evidence for its effectiveness.</td></tr>
<tr><td>Purpose: To establish whether receiving a behavioral physical activity intervention with an activity monitor (BPAI+) increases physical activity in adults with overweight or obesity compared with both wait list and usual care; and to establish the added value of activity monitoring in existing interventions on increments of physical activity.</td></tr>
<tr><td>Timeframe: Inception–July 2015</td></tr>
<tr><td>Total # of Studies: 11</td></tr>
<tr><td>Description of Intervention(s):
BPAI+ or self-reported.</td></tr>
<tr><td>Outcomes Addressed: Steps per day, total moderate-to-vigorous physical activity minutes per time unit, walking metabolic equivalent minutes per week, and physical activity kilocalories per week.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults; overweight and obese</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Wearable Activity Monitors</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Funk M, Taylor EL. Pedometer-based walking interventions for free-living adults with type 2 diabetes: a systematic review. Curr Diabetes Rev. 2013;9(6):462-471. doi:10.2174/15733998113096660084.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: Physical activity (PA) is prescribed as an important method of treatment for type 2 diabetes (T2DM), but is neglected in a majority of patients. Walking is an appropriate and safe form of PA which improves glucose utilization in inactive people diagnosed with T2DM. Pedometers have been successfully used to motivate and track progress in many types of walking programs, but there is no current review of their effectiveness compared to other methods to increase PA in people with T2DM. A systematic literature review was performed using MEDLINE, CINAHL, SPORTDiscus, ERIC, and Academic Search Premier to determine the effectiveness of pedometer-based walking interventions at increasing PA in free-living adults with T2DM. Ten studies from 2004 to 2011were included. All studies were randomized controlled trials except for one quasi-experimental design. Interventions lasted from 6 weeks to 6 months and only 2 studies showed significant improvements in blood glucose control following the intervention. Nine of the ten interventions were able to produce an increase in PA using a pedometer and/or other methods. Pedometers are effective means of increasing PA among T2DM patients in the short-term while several other intervention methods beyond normal treatment are also successful. Future research should include longer intervention durations, low cost methods, larger sample sizes, and dietary intervention components to further understand successful intervention techniques for patients with T2DM.</td></tr>
<tr><td>Purpose: To determine the effect of pedometer-based interventions on physical activity and health outcomes in type 2 diabetes patients.</td></tr>
<tr><td>Timeframe: Not Reported</td></tr>
<tr><td>Total # of Studies: 10</td></tr>
<tr><td>Description of Intervention(s): Pedometer-based intervention to increase the amount of physical activity.</td></tr>
<tr><td>Outcomes Addressed: Changes in number of steps per day: pedometer.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults; type 2 diabetes</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Wearable Activity Monitors</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Goode AP, Hall KS, Batch BC, et al. The impact of interventions that integrate accelerometers on physical activity and weight loss: a systematic review. Ann Behav Med. 2017;51(1):79-93. doi:10.1007/s12160-016-9829-1.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: BACKGROUND: Regular physical activity is important for improving and maintaining health, but sedentary behavior is difficult to change. Providing objective, real-time feedback on physical activity with wearable motion-sensing technologies (activity monitors) may be a promising, scalable strategy to increase physical activity or decrease weight. PURPOSE: We synthesized the literature on the use of wearable activity monitors for improving physical activity and weight-related outcomes and evaluated moderating factors that may have an impact on effectiveness. METHODS: We searched five databases from January 2000 to January 2015 for peer-reviewed, English-language randomized controlled trials among adults. Random-effects models were used to produce standardized mean differences (SMDs) for physical activity outcomes and mean differences (MDs) for weight outcomes. Heterogeneity was measured with I 2. RESULTS: Fourteen trials (2972 total participants) met eligibility criteria; accelerometers were used in all trials. Twelve trials examined accelerometer interventions for increasing physical activity. A small significant effect was found for increasing physical activity (SMD 0.26; 95 % CI 0.04 to 0.49; I 2 = 64.7 %). Intervention duration was the only moderator found to significantly explain high heterogeneity for physical activity. Eleven trials examined the effects of accelerometer interventions on weight. Pooled estimates showed a small significant effect for weight loss (MD -1.65 kg; 95 % CI -3.03 to -0.28; I 2 = 81 %), and no moderators were significant. CONCLUSIONS: Accelerometers demonstrated small positive effects on physical activity and weight loss. The small sample sizes with moderate to high heterogeneity in the current studies limit the conclusions that may be drawn. Future studies should focus on how best to integrate accelerometers with other strategies to increase physical activity and weight loss.</td></tr>
<tr><td>Purpose: To determine the effectiveness of newer activity monitoring technologies for increasing physical activity and decreasing body weight outcomes, and describe factors that impact the effectiveness of such technologies (i.e., chronic disease status, location where the device is worn on the body, the device's role in the overall intervention approach, and duration of the intervention).</td></tr>
<tr><td>Timeframe: January 2000–January 2015</td></tr>
<tr><td>Total # of Studies: 14</td></tr>
<tr><td>Description of Intervention(s):
Trials used a wide variety of adjunctive interventions in conjunction with accelerometers, including intensive diet, weight, and physical activity behavioral counseling; tailored written feedback; and web-based supportive educational modules.</td></tr>
<tr><td>Outcomes Addressed: Changes in physical activity: accelerometer.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Quality Enhancement Research Initiative</td></tr>
</table>

<table>
<tr><th colspan="2">Wearable Activity Monitors</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Mansi S, Milosavljevic S, Baxter GD, Tumilty S, Hendrick P. A systematic review of studies using pedometers as an intervention for musculoskeletal diseases. BMC Musculoskelet Disord. 2014;(2):231. doi:10.1186/1471-2474-15-231.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="7">Abstract: Background. Physical activity (PA) plays an important role in the prevention and management of a number of chronic conditions. Aim: to investigate the evidence for effectiveness of pedometer-driven walking programs to promote physical activity among patients with musculoskeletal disorders (MSDs).
Method. A comprehensive systematic review was performed using 11 electronic databases up to 20 February 2014. Keywords and MeSH terms included “musculoskeletal disorders”, “walking”, and “pedometer”. Randomized controlled trials, published in English, that examined the effects of a pedometer-based walking intervention to increase physical activity levels and improve physical function and pain in patients with musculoskeletal disorders were included.
Result. Of the 1996 articles retrieved, seven studies ranging in date of publication from 1998 to 2013 met the inclusion criteria, allowing data extraction on 484 participants with an age range of 40 to 82 years. Interventions lasted from 4 weeks to 12 months and the results across studies showed significant increases in step count ($p < 0.05$) following the intervention. Across these studies, there was a mean increase in PA of 1950 steps per day relative to baseline. Four studies reported improved scores for pain and/or physical function at the intervention completion point relative to controls.
Conclusion. This study provides strong evidence for the effectiveness of pedometer walking interventions in increasing PA levels for patients with MSDs. Our findings suggest that a combination of interventions is likely to be the most effective strategy to maximize health benefits in the short term. Further research should include larger sample sizes, and longer intervention durations are required to support the role of pedometer walking interventions as a long term intervention for management of musculoskeletal disorders.</td></tr>
<tr><td>Purpose: To investigate the evidence for pedometer-driven walking programs as an intervention in promoting physical activity and improving health-related outcomes when compared to no intervention, or a different type of intervention, among adults with musculoskeletal disorders.</td></tr>
<tr><td>Timeframe: Inception–2014</td></tr>
<tr><td>Total # of Studies: 7</td></tr>
<tr><td>Description of Intervention(s): Pedometer-based walking interventions accompanied by goal setting. The duration of the interventions ranged from 4 weeks to 12 months, with several walking protocols, including the Stepping Up to Health program, cognitive dual-tasks performance, the 5As model of behavior change, active living every day, and the walk + program as the framework for the interventions.</td></tr>
<tr><td>Outcomes Addressed: Changes in number of steps per day: pedometer.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults 40–82; musculoskeletal disorders</td><td>Author-Stated Funding Source: Otago University</td></tr>
</table>

Wearable Activity Monitors	
Meta-Analysis **Citation:** Qiu S, Cai X, Chen X, Yang B, Sun Z. Step counter use in type 2 diabetes: a meta-analysis of randomized controlled trials. *BMC Medicine*. 2014;12(1):36. doi:10.1186/1741-7015-12-36.	
Level of Impact: Technology	**Abstract:** Background While step counter use has become popular among type 2 diabetes (T2D) patients, its effectiveness in increasing physical activity (PA) and improving glycemic control has been poorly defined. The aim of this meta-analysis of randomized controlled trials (RCTs) was to evaluate the association of step counter use with PA and glycemic control in T2D patients. Methods Articles were identified by searches of PubMed, Web of Science and Cochrane Library from January 1994 to June 2013. RCTs in the English language were included, if they had assessed the effectiveness of step counters as motivating and monitoring tools in T2D patients, with reported changes in steps per day (steps/d) or glycosylated hemoglobin A1c (HbA1c), or both. Data were independently collected by 2 authors and overall estimates were made by a random-effects model. Results Of the 551 articles retrieved, 11 RCTs were included. Step counter use significantly increased PA by 1,822 steps/d (7 studies, 861 participants; 95% confidence interval (CI): 751 to 2,894 steps/d) in patients with T2D. Step counter use with a PA goal showed a bigger increase in PA (weighted mean difference (WMD) 3,200 steps/d, 95% CI: 2,053 to 4,347 steps/d) than without (WMD 598 steps/d, 95% CI: −65 to 1,260 steps/d). Further subgroup analysis suggested step counter use with a self-set PA goal (WMD 2,816 steps/d, 95% CI: 1,288 to 4,344 steps/d) made no difference in increasing PA from a 10,000 steps/d goal (WMD 3,820 steps/d, 95% CI: 2,702 to 4,938 steps/d). However, no significant HbA1c change was observed by step counter use (10 studies, 1,423 participants; WMD 0.02%, 95% CI: −0.08% to 0.13%), either with (WMD 0.04%, 95% CI: −0.21% to 0.30%) or without a PA goal (WMD 0.01%, 95% CI: −0.10% to 0.13%). Conclusions Step counter use is associated with a significant increase in PA in patients with T2D. However, evidence regarding its effect in improving glycemic control remains insufficient.
Purpose: To evaluate the association of step counter use with physical activity (PA) as measured by steps per day, and glycemic control as represented by HbA1c; and to determine the association between PA goal-setting and improvement in PA and glycemic control in patients with type 2 diabetes.	
Timeframe: January 1994–June 2013	
Total # of Studies: 11	
Description of Intervention(s): Device-based behavioral modification programs to increase PA. Goal setting and behavioral coaching were components in most interventions.	
Outcomes Addressed: Changes in steps per day: pedometer. **Sedentary Behavior an Outcome:** No	
Examine cost, cost-effectivenesss or ROI: Not reported **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults; type 2 diabetes	**Author-Stated Funding Source:** Key Program of Jiangsu Natural Science Foundation

Wearable Activity Monitors	
Meta-Analysis **Citation:** Qiu S, Cai X, Ju C, et al. Step counter use and sedentary time in adults: a meta-analysis. *Medicine (Baltimore).* 2015;94(35):e1412. doi:10.1097/MD.0000000000001412.	
Level of Impact: Technology	**Abstract:** Although step counters are increasingly being used in walking programmes to promote sedentary behavior changes in adults, their effectiveness remains unknown. The aim of this meta-analysis of randomized controlled trials (RCTs) was to assess the effectiveness of step counter use in reducing sedentary time among adults.English-language RCTs from 3 databases were searched up to December 2014. Studies were included if they evaluated the effects of step counter use in adult populations and reported outcomes in sedentary time. Summary estimates (Cohen d with 95% confidence intervals [CIs]) were pooled using a random-effects model. Subgroup analyses and random-effects meta-regression analyses based on the characteristics of participants or interventions were conducted to explore their associations with sedentary time changes.Fifteen RCTs with a total sample size of 3262 adults were included. Step counter use was associated with a small but significant overall effect in reducing sedentary time (d = -0.20, 95% CI -0.33 to -0.07), equating to a reduction in sedentary time of ~23 min/d compared with controls. Subgroup analyses showed that step counter use with a step goal was associated with significantly reduced sedentary time (d =- 0.32, 95% CI -0.53 to -0.11), whereas without, it had only a trend. A greater reduction in sedentary time was observed among step counter users employing objective methods than those employing subjective methods for measurement (P = 0.03). Effects of covariates on sedentary time changes were generally unclear. Step counter use is associated with reduced sedentary time among adults. Future studies are required to specify the step goal use and to employ objective as well as subjective methods for measuring both total and domain-specific sedentary time.
Purpose: To determine the association between step counter use and sedentary time, as well as to assess the importance of step goal setting in reducing sedentary time among adults.	
Timeframe: Inception-December 2014	
Total # of Studies: 15	
Description of Intervention(s): Randomized control trials, 8 weeks or longer, that used step counters (e.g., pedometers, accelerometers) as the intervention for physical activity motivation (e.g., walking more), compared with control groups that received usual care.	
Outcomes Addressed: Change in sedentary time (e.g., time spent being sedentary or sitting) stratified analysis conducted by subjective or objective methods for assessing sedentary time. **Sedentary Behavior an Outcome:** Yes	
Examine cost, cost-effectivenesss or ROI: Not Reported **Examine Cardiorespiratory Fitness as Outcome:** No	
Populations Analyzed: Adults	**Author-Stated Funding Source:** None

<table>
<tr><th colspan="2">Wearable Activity Monitors</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Ridgers ND, McNarry MA, Mackintosh KA. Feasibility and effectiveness of using wearable activity trackers in youth: a systematic review. JMIR Mhealth Uhealth. 2016;4(4):e129.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="5">Abstract: BACKGROUND: The proliferation and popularity of wearable activity trackers (eg, Fitbit, Jawbone, Misfit) may present an opportunity to integrate such technology into physical activity interventions. While several systematic reviews have reported intervention effects of using wearable activity trackers on adults' physical activity levels, none to date have focused specifically on children and adolescents. OBJECTIVE: The aim of this review was to examine the effectiveness of wearable activity trackers as a tool for increasing children's and adolescents' physical activity levels. We also examined the feasibility of using such technology in younger populations (age range 5-19 years). METHODS: We conducted a systematic search of 5 electronic databases, reference lists, and personal archives to identify articles published up until August 2016 that met the inclusion criteria. Articles were included if they (1) specifically examined the use of a wearable device within an intervention or a feasibility study; (2) included participants aged 5-19 years old; (3) had a measure of physical activity as an outcome variable for intervention studies; (4) reported process data concerning the feasibility of the device in feasibility studies; and (5) were published in English. Data were analyzed in August 2016. RESULTS: In total, we identified and analyzed 5 studies (3 intervention, 2 feasibility). Intervention delivery ranged from 19 days to 3 months, with only 1 study using a randomized controlled trial design. Wearable activity trackers were typically combined with other intervention approaches such as goal setting and researcher feedback. While intervention effects were generally positive, the reported differences were largely nonsignificant. The feasibility studies indicated that monitor comfort and design and feedback features were important factors to children and adolescents. CONCLUSIONS: There is a paucity of research concerning the effectiveness and feasibility of wearable activity trackers as a tool for increasing children's and adolescents' physical activity levels. While there are some preliminary data to suggest these devices may have the potential to increase activity levels through self-monitoring and goal setting in the short term, more research is needed to establish longer-term effects on behavior.</td></tr>
<tr><td>Purpose: To examine the effectiveness of wearable activity trackers as a tool for increasing children’s and adolescents’ physical activity (PA) levels.</td></tr>
<tr><td>Timeframe: Inception–2016</td></tr>
<tr><td>Total # of Studies: 5</td></tr>
<tr><td>Description of Intervention(s):
One study used a combination of web-based systems for self-monitoring activity levels and goal setting. Others used a combination of activity trackers and goal setting to increase PA.</td></tr>
<tr><td>Outcomes Addressed:
Changes in daily steps: activity monitors.
Sedentary Behavior an Outcome: No</td><td rowspan="2"></td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed:
Children 5–19</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Web-based or Internet-delivered</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Bossen D, Veenhof C, Dekker J, de Bakker D. The effectiveness of self-guided web-based physical activity interventions among patients with a chronic disease: a systematic review. J Phys Act Health. 2014;11(3):665-677. doi:10.1123/jpah.2012-0152.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: Background: Despite well-documented health benefits, adults with a physical chronic condition do not meet the recommended physical activity (PA) guidelines. Therefore, secondary prevention programs focusing on PA are needed. Web-based interventions have shown promise in the promotion of PA behavior change. We conducted a systematic review to summarize the evidence about the effectiveness of web-based PA interventions in adults with chronic disease. Methods: Articles were included if they evaluated a web-based PA intervention and used a randomized design. Moreover, studies were eligible for inclusion if they used a non- or minimal-treatment control group and if PA outcomes measures were applied. Seven articles were included. Results: Three high-quality studies were statistically significant to the control group, whereas 2 high- and 2 low-quality studies reported nonsignificant findings. Conclusion: Our best evidence synthesis revealed that there is conflicting evidence on the effectiveness of web-based PA interventions in patients with a chronic disease.</td></tr>
<tr><td>Purpose: To summarize the effectiveness of web-based physical activity (PA) interventions in patients with a chronic disease.</td></tr>
<tr><td>Timeframe: 1966–April 2011</td></tr>
<tr><td>Total # of Studies: 7</td></tr>
<tr><td>Description of Intervention(s): Web-based interventions were classified as self-guided programs operated through a website to realize PA behavior change.</td></tr>
<tr><td>Outcomes Addressed: Changes in PA: self-report questionnaire or accelerometers/pedometers.
Sedentary Behavior an Outcome:
No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults</td><td>Author-Stated Funding Source: Not Reported</td></tr>
</table>

<table>
<tr><th colspan="2">Web-based or Internet-delivered</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Connelly J, Kirk A, Masthoff J, MacRury S. The use of technology to promote physical activity in Type 2 diabetes management: a systematic review. Diabetic Med. 2013;30(12):1420-1432. doi:10.1111/dme.12289.</td></tr>
<tr><td>Level of Impact: Technology</td><td rowspan="6">Abstract: INTRODUCTION: With increasing evidence available on the importance of physical activity in the management of Type 2 diabetes, there has been an increase in technology-based interventions. This review provides a systematic and descriptive assessment of the effectiveness of technology to promote physical activity in people with Type 2 diabetes. For this review, technology included mobile phones and text messages, websites, CD-ROMs and computer-learning-based technology, and excluded telephone calls.
METHODS: A systematic literature search was conducted to retrieve articles from January 2001 to March 2013 using the following databases: the Cochrane Library, EMBASE, MEDLINE, PsycINFO and PubMed. Articles had to describe an intervention that used technology to promote physical activity in people with Type 2 diabetes. A methodological quality assessment of the studies was conducted and data synthesis was performed.
RESULTS: In total, 15 articles were eligible for review: web-based (9), mobile phone (3), CD-ROM (2) and computer based (1). All studies found an increase in physical activity but only nine were significant. The use of a personal coach, logbooks and reinforcement strategies such as phone calls and email counselling were found to be effective components for behaviour change. No studies were ranked as low in terms of methodological quality.
CONCLUSIONS: Technology-based interventions to promote physical activity are effective; using further methods to promote participant adherence is associated with greater benefit. Further research should look into strategies to enhance adherence and sustainability in order to increase the effectiveness of technology-based physical activity intervention in diabetes care.</td></tr>
<tr><td>Purpose: To provide a systematic and descriptive assessment of the effectiveness of technology interventions that promote physical activity (PA) in the management of type 2 diabetes.</td></tr>
<tr><td>Timeframe: January 1991–March 2013</td></tr>
<tr><td>Total # of Studies: 15</td></tr>
<tr><td>Description of Intervention(s): Technology to increase PA. Web-based interventions were the most common, followed by mobile phones (excluding phone calls), CD-ROMs, and computer-learning multimedia lessons.</td></tr>
<tr><td>Outcomes Addressed: Changes in PA levels (measurement techniques not included).
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not Reported
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults; type 2 diabetes</td><td>Author-Stated Funding Source: Lifescan</td></tr>
</table>

<table>
<tr><th colspan="2">Web-based or Internet-delivered</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Davies CA, Spence JC, Vandelanotte C, Caperchione CM, Mummery WK. Meta-analysis of internet-delivered interventions to increase physical activity levels. Int J Behav Nutr Phys Act. 2012;9:52. doi:10.1186/1479-5868-9-52.</td></tr>
<tr><td>Level(s) of Impact: Technology</td><td rowspan="6">Abstract: Many internet-delivered physical activity behaviour change programs have been developed and evaluated. However, further evidence is required to ascertain the overall effectiveness of such interventions. The objective of the present review was to evaluate the effectiveness of internet-delivered interventions to increase physical activity, whilst also examining the effect of intervention moderators. A systematic search strategy identified relevant studies published in the English-language from Pubmed, Proquest, Scopus, PsychINFO, CINHAL, and Sport Discuss (January 1990 - June 2011). Eligible studies were required to include an internet-delivered intervention, target an adult population, measure and target physical activity as an outcome variable, and include a comparison group that did not receive internet-delivered materials. Studies were coded independently by two investigators. Overall effect sizes were combined based on the fixed effect model. Homogeneity and subsequent exploratory moderator analysis was undertaken. A total of 34 articles were identified for inclusion. The overall mean effect of internet-delivered interventions on physical activity was d = 0.14 (p = 0.00). Fixed-effect analysis revealed significant heterogeneity across studies (Q = 73.75; p = 0.00). Moderating variables such as larger sample size, screening for baseline physical activity levels and the inclusion of educational components significantly increased intervention effectiveness. Results of the meta-analysis support the delivery of internet-delivered interventions in producing positive changes in physical activity, however effect sizes were small. The ability of internet-delivered interventions to produce meaningful change in long-term physical activity remains unclear.</td></tr>
<tr><td>Purpose: To comprehensively synthesize the effect of Internet interventions on physical activity (PA) levels and variations in PA outcomes due to potential moderating variables.</td></tr>
<tr><td>Timeframe: 1990–June 2011</td></tr>
<tr><td>Total # of Studies: 34</td></tr>
<tr><td>Description of Intervention(s): Intervention delivery was via the Internet, with either the use of a web page for the delivery and/or exchange of information or in the form of email communication, with a focus on increasing PA. Twenty-one studies (62%) included a combination of Internet and email, 9 (26%) used Internet only, and the remaining 4 (12%) used email only.</td></tr>
<tr><td>Outcomes Addressed: Change in PA, mostly measured via self-report. The overall mean effect of Internet-delivered interventions on physical activity was d = 0.14.
Sedentary Behavior an Outcome: No</td></tr>
<tr><td>Examine cost, cost-effectivenesss or ROI: Not examined
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Adults >44 and <45 years; mean age 43.06 years</td><td>Author-Stated Funding Source: National Health and Medical Research Council of Australia and National Heart Foundation of Australia</td></tr>
</table>

Table 3. Existing Systematic Reviews and Meta-Analyses Quality Assessment Chart

AMSTARExBP: SR/MA	Blackman, 2013	Bort-Roig, 2014	Bossen, 2014	Brannon, 2014	Buchholz, 2013	Connelly, 2013	Davies, 2012
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	No	No	Yes	No	No	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Partially Yes	Yes	Partially Yes	Yes
Duplicate study selection and data extraction performed.	No	No	No	No	Yes	No	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	No	No	No	No
List of studies (included and excluded) provided.	No	No	No	No	Yes	No	No
Characteristics of included studies provided.	Yes	Yes	Yes	No	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	N/A	N/A	N/A	No	N/A	N/A	N/A
Scientific quality (risk of bias) of included studies assessed and documented.	No	Partially Yes	Yes	Yes	No	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	N/A	No	Yes	Yes	N/A	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	N/A	Yes	Yes	Yes	N/A	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	N/A	N/A	N/A	Yes	N/A	N/A	Yes
Effect size index chosen justified, statistically.	N/A	N/A	Yes	Yes	N/A	N/A	Yes
Individual-level meta-analysis used.	N/A	N/A	N/A	No	N/A	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	No	No	No	No	No	No	Yes
Conflict of interest disclosed.	Yes	Yes	No	No	No	Yes	Yes

AMSTARExBP: SR/MA							
	de Vries, 2016	Fanning, 2012	Foster, 2013	Funk, 2013	Goode, 2012	Goode, 2016	Head, 2013
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	No	Yes	Yes	Yes	Yes	No
Comprehensive literature search performed.	Yes	Yes	Yes	Partially Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	Yes	Yes	Yes	No	No	Yes	No
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	No	No	No	Yes
List of studies (included and excluded) provided.	No	No	No	No	No	No	No
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	N/A	N/A	N/A	N/A	No	N/A
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	No	Yes	Yes	No
Results depended on study quality, either overall, or in interaction with moderators.	No	No	Yes	N/A	No	No	N/A
Scientific quality used appropriately in formulating conclusions.	Yes	No	Yes	N/A	No	Yes	N/A
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Effect size index chosen justified, statistically.	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Individual-level meta-analysis used.	No	No	N/A	N/A	N/A	No	No
Practical recommendations clearly addressed.	Yes	No	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	No	No	Yes	No	No	Yes	Yes
Conflict of interest disclosed.	No	Yes	Yes	No	No	Yes	No

AMSTARExBP: SR/MA							
	Liang, 2014	Maher, 2014	Mansi, 2014	Mita, 2016	Norris, 2016	Pfaeffli 2016	Qiu, 2014
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	No	Yes	Yes	No	No	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	Yes	Yes	No	No
List of studies (included and excluded) provided.	Yes	No	No	No	No	Yes	No
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	N/A	N/A	N/A	No	N/A	N/A	No
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	No	Yes	Yes	Yes	Yes	No
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Partially Yes	N/A	N/A	Yes	N/A	N/A	Yes
Effect size index chosen justified, statistically.	N/A	Yes	N/A	Yes	Yes	N/A	Yes
Individual-level meta-analysis used.	N/A	N/A	N/A	No	N/A	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	No	No	No	No	No	No	Yes
Conflict of interest disclosed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

AMSTARExBP: SR/MA						
	Qiu, 2015	Ridgers, 2016	Schoeppe, 2016	Short, 2011	Valenzuela, 2016	Williams, 2014
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	No	Yes	Yes	Yes	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	Yes	No	Yes	No	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	Yes	No	No	No	Yes
List of studies (included and excluded) provided.	No	No	No	No	No	No
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	N/A	N/A	N/A	N/A	N/A	No
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	Yes	Yes	Yes	No	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	N/A	N/A	N/A	N/A	Yes
Effect size index chosen justified, statistically.	Yes	N/A	N/A	N/A	N/A	Yes
Individual-level meta-analysis used.	No	N/A	N/A	N/A	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	No	No	No	No	Yes
Conflict of interest disclosed.	Yes	No	Yes	Yes	Yes	Yes

High-Quality Existing Reports

Table 4. High-Quality Existing Reports Individual Evidence Summary Tables

<table>
<tr><th colspan="2">Social Media</th></tr>
<tr><td colspan="2">Report: Guidelines
Citation: Physical Activity Guidelines for Americans Midcourse Report Subcommittee of the President’s Council on Fitness, Sports & Nutrition. Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth. Washington, DC: U.S. Department of Health and Human Services; 2012.</td></tr>
<tr><td>Source/Sponsor: Office of Disease Prevention and Health Promotion, President's Council on Fitness, Sports, and Nutrition, U.S. Department of Health and Human Services</td><td rowspan="5">Relevant Conclusions: Sufficient evidence is available to recommend wide implementation of multi component school-based programs. These types of programs provide enhanced physical education, as well as classroom activity breaks, activity sessions before and/or after school, and active transportation to school.</td></tr>
<tr><td>Purpose: To identify interventions that can help increase PA in youth across a variety of settings.</td></tr>
<tr><td>Timeframe: 2001–July 2012</td></tr>
<tr><td>Description of Intervention: Interventions to improve physical activity among youth. Separated by intervention setting, including school setting (multi-component school-based interventions, physical education, active transportation to school, activity breaks, school physical environment, after-school interventions), preschool and child care settings, community setting (the built environment, camps and youth organizations, other community-based programs), family and home setting, primary health care setting.</td></tr>
<tr><td>Outcomes Addressed: PA level.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Children 3–17</td><td>Author-Stated Funding Source: Not reported</td></tr>
</table>

Table 5. High-Quality Existing Reports Quality Assessment Chart

Report Quality Assessment	DHHS, 2012
Research question(s) or purpose and inclusion/exclusion criteria or scope delineated prior to search.	Yes
Inclusion criteria permitted grey literature.	No
Comprehensive search performed.	Yes
Scientific quality of sources documented.	No
Limitations reported and discussed.	Yes
Conclusions substantiated by and logically connected to evidence and findings.	Yes
Recommendations for future research provided.	Yes
Recommendations were relevant to the report and supported by evidence, findings, and conclusions.	Yes
Potential conflicts of interest explained.	No
Reference list provided.	Yes

Appendices

Appendix A: Analytical Framework

Topic Area
Physical Activity Promotion

Systematic Review Question
What interventions are effective for increasing physical activity?

a. Does the effectiveness vary by age, sex, race/ethnicity, or socio-economic status?

Population
People of all ages

Intervention
Physical activity intervention(s) at different levels of impact

- Individual
- Community setting
- Built/Neighborhood Environment
- Policy & Legislative
- Information Technology

Endpoint Health Outcomes
Physical activity behavior change

Key Definition:
Intervention: any kind of planned activity or group of activities (including programs, policies, and laws) designed to prevent disease or injury or promote health in a group of people, about which a single summary conclusion can be drawn (*The Community Guide* https://www.thecommunityguide.org/content/glossary).

Appendix B: Final Search Strategy[1]

Search Strategy: PubMed (Systematic Reviews, Meta-Analyses, and Pooled Analyses

Database: PubMed; Date of Search: 12/29/2016; 1669 results

Set	Search Strategy
Limit: Language	(English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Exclude child only	NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) AND "adult"[Mesh]))
Limit: Exclude subheadings	NOT (ad[sh] OR aa[sh] OR ci[sh] OR cn[sh] OR dh[sh] OR de[sh] OR dt[sh] OR em[sh] OR en[sh] OR es[sh] OR eh[sh] OR ge[sh] OR hi[sh] OR is[sh] OR ip[sh] OR lj[sh] OR ma[sh] OR mi[sh] OR og[sh] OR ps[sh] OR py[sh] OR pk[sh] OR pd[sh] OR po[sh] OR re[sh] OR rt[sh] OR rh[sh] OR st[sh] OR sd[sh] OR tu[sh] OR th[sh] OR tm[sh] OR tr[sh] OR ut[sh] OR ve[sh] OR vi[sh])
Limit: Publication Date (Systematic Reviews/Meta-Analyses)	AND ("2000/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Include (Systematic Reviews/Meta-Analyses)	AND (systematic[sb] OR meta-analysis[pt] OR “systematic review”[tiab] OR “systematic literature review”[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR “pooled analyses”[tiab] OR "pooled data"[tiab])
Limit: Publication Type Exclude (Systematic Reviews/Meta-Analyses)	NOT (“comment”[Publication Type] OR “editorial”[Publication Type])
Physical Activity	(("Exercise"[mh] OR "Exercise"[tiab] OR "Leisure activities"[mh] OR "Physical activity"[tiab] OR "Physical inactivity"[tiab] OR "Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Screen time"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Aerobic activities"[tiab] OR "Aerobic activity"[tiab] OR "Cardiovascular activities"[tiab] OR "Cardiovascular activity"[tiab] OR "Endurance activities"[tiab] OR "Endurance activity"[tiab] OR "Energy expenditure"[tiab] OR "Leisure activities"[tiab] OR "Resistance training"[tiab] OR "strength training"[tiab] OR

[1] Search strategy was conducted for all levels of influence (i.e., individual, community, built environment, policy, technology).

Set	Search Strategy
	"Sitting"[tiab] OR “Sedentarism”[tiab] OR “Sedentary”[tiab] OR "physical conditioning"[tiab] OR "walking"[tiab]) NOT medline[sb]))
Intervention	AND (("Intervention"[tiab] OR "Interventions"[tiab] OR "Trial"[tiab] OR "Trials"[tiab] OR "Initiative"[tiab] OR "Initiatives"[tiab] OR "behavior change"[tiab] OR "Behavioral change"[tiab] OR "strategies"[tiab] OR "program"[tiab] OR "programs"[tiab] OR "programme"[tiab] OR “programmes”[tiab] OR "Behaviour modification"[tiab] OR "Behaviour modification"[tiab] OR "Behaviour change"[tiab] OR "behavioural change"[tiab]) OR (("health education"[tiab] OR "health promotion"[tiab]) NOT medline[sb]))
Levels of Impact	AND ("technology"[tiab] OR "Technologies"[tiab] OR "social media"[tiab] OR "twitter"[tiab] OR "facebook"[tiab] OR "cell phone"[tiab] OR "smartphone"[tiab] OR "mobile phone"[tiab] OR "mobile applications"[tiab] OR "apps"[tiab] OR "text messaging"[tiab] OR "mobile health"[tiab] OR "telemedicine"[tiab] OR "web-based"[tiab] OR "electronic mail"[tiab] OR "e-mail"[tiab] OR "internet"[tiab] OR "wearable"[tiab] OR "monitoring sensors"[tiab] OR "GPS"[tiab] OR "interactive voice response"[tiab] OR "embodied conversational agent"[tiab] OR "virtual"[tiab] OR "electronic tablet"[tiab] OR "tablet-based"[tiab] OR "computers"[tiab] OR "handheld"[tiab] OR "digital health"[tiab] OR "eHealth"[tiab] OR "on-line systems"[tiab] OR "online systems"[tiab] OR "software"[tiab] OR "multimedia"[tiab] OR "activity monitor"[tiab] OR "accelerometer"[tiab] OR "actigraphy"[tiab] OR "pedometer"[tiab] OR "fitness monitor"[tiab] OR "pedometery"[tiab] OR "step counter"[tiab] OR "artificial intelligence"[tiab] OR "telehealth"[tiab] OR "mHealth"[tiab]) OR ("Individual"[tiab] OR "Individuals"[tiab] OR "Person centered"[tiab] OR "self management"[tiab] OR "home-based"[tiab] OR "lifestyle"[tiab] OR "family based"[tiab] OR "self monitoring"[tiab] OR "life style"[mh] OR "life style"[tiab] OR "quantified self"[tiab]) OR ("Built environment"[tiab] OR neighborhood*[tiab] OR neighbourhood*[tiab] OR "land use"[tiab] OR "urban form"[tiab] OR "pedestrian"[tiab] OR "health community design"[tiab] OR "mix use"[tiab] OR "environmental enhancement"[tiab] OR "objective environment"[tiab] OR "spatial"[tiab] OR "physical environment"[tiab] OR "streetscape"[tiab] OR "urban planning"[tiab] OR "walkability"[tiab] OR "pedestrian-friendly"[tiab] OR "urban renewal"[tiab] OR "active transport"[tiab] OR "active commute"[tiab] OR "Active commuting"[tiab] OR "geospatial"[tiab] OR “environment design”[tiab] OR "sidewalk"[tiab] OR "bike lane"[tiab]) OR("Community Settings"[tiab] OR "community based"[tiab] OR "community wide"[tiab] OR "state wide"[tiab] OR "nationwide"[tiab] OR "community group"[tiab] OR "organization-based"[tiab] OR "school"[tiab] OR "place of worship"[tiab] OR "church"[tiab] OR "faith-based"[tiab] OR "worksite"[tiab] OR "workplace"[tiab] OR "recreational setting"[tiab] OR "YMCA"[tiab] OR "childcare"[tiab] OR "education setting"[tiab] OR "early care"[tiab] OR "Schools"[tiab]) OR ("policy"[tiab] OR "policies"[tiab] OR "legislative"[tiab] OR "legislation"[tiab] OR "law"[tiab] OR "population-level"[tiab] OR "statute"[tiab] OR "statutes"[tiab] OR "Regulation"[tiab] OR "Regulations"[tiab] OR “Ordinance”[tiab])

Search Strategy: CINAHL (Systematic Reviews, Meta-Analyses, and Pooled Analyses)

Database: CINAHL; Date of Search: 12/29/16; 81 results
Terms searched in title or abstract

Set	Search Terms
Physical Activity	("Exercise" OR "Physical activity" OR "Physical inactivity" OR "Computer time" OR "Computer use" OR "Inactivity" OR "Physically inactive" OR "Screen time" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Leisure activities" OR "Resistance training" OR "strength training" OR "Sitting" OR "Sedentarism" OR "Sedentary" OR "physical conditioning" OR "walking")
Intervention	AND ("Intervention" OR "Interventions" OR "Trial" OR "Trials" OR "Initiative" OR "Initiatives" OR "behavior change" OR "Behavioral change" OR "strategies" OR "program" OR "programs" OR "programme" OR "programmes" OR "Behaviour modification" OR "Behaviour modification" OR "Behaviour change" OR "behavioural change" OR "health education" OR "health promotion")
Levels of Impact	AND ("technology" OR "Technologies" OR "social media" OR "twitter" OR "facebook" OR "cell phone" OR "smartphone" OR "mobile phone" OR "mobile applications" OR "apps" OR "text messaging" OR "mobile health" OR "telemedicine" OR "web-based" OR "electronic mail" OR "e-mail" OR "internet" OR "wearable" OR "monitoring sensors" OR "GPS" OR "interactive voice response" OR "embodied conversational agent" OR "virtual" OR "electronic tablet" OR "tablet-based" OR "computers" OR "handheld" OR "digital health" OR "eHealth" OR "on-line systems" OR "online systems" OR "software" OR "multimedia" OR "activity monitor" OR "accelerometer" OR "actigraphy" OR "pedometer" OR "fitness monitor" OR "pedometery" OR "step counter" OR "artificial intelligence" OR "telehealth" OR "mHealth") OR ("Individual" OR "Individuals" OR "Person centered" OR "self management" OR "home-based" OR "lifestyle" OR "family based" OR "self monitoring" OR "life style" OR "quantified self") OR ("Built environment" OR neighborhood*OR neighbourhood*OR "land use" OR "urban form" OR "pedestrian" OR "health community design" OR "mix use" OR "environmental enhancement" OR "objective environment" OR "spatial" OR "physical environment" OR "streetscape" OR "urban planning" OR "walkability" OR "pedestrian-friendly" OR "urban renewal" OR "active transport" OR "active commute" OR "Active commuting" OR "geospatial" OR "environment design" OR "sidewalk" OR "bike lane") OR ("Community Settings" OR "community based" OR "community wide" OR "state wide" OR "nationwide" OR "community group" OR "organization-based" OR "school" OR "place of worship" OR "church" OR "faith-based" OR "worksite" OR "workplace" OR "recreational setting" OR "YMCA" OR "childcare" OR "education setting" OR "early care" OR "Schools") OR ("policy" OR "policies" OR "legislative" OR "legislation" OR "law" OR "population-level" OR "statute" OR "statutes" OR "Regulation" OR "Regulations" OR "Ordinance")

Set	Search Terms
Systematic Reviews/Meta-Analyses	AND (“systematic review” OR “systematic literature review” OR metaanalysis OR "meta analysis" OR “metanalyses” OR "meta analyses"" OR "pooled analysis" OR “pooled analyses” OR "pooled data")
Limits	2000-present English language Peer reviewed Exclude Medline records Human

Search Strategy: Cochrane (Systematic Reviews, Meta-Analyses, and Pooled Analyses)

Database: Cochrane, Date of Search: 12/29/16; 580 results
Terms searched in title, abstract, or keywords

Set	Search Terms
Physical Activity	("Exercise" OR "Physical activity" OR "Physical inactivity" OR "Computer time" OR "Computer use" OR "Inactivity" OR "Physically inactive" OR "Screen time" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Leisure activities" OR "Resistance training" OR "strength training" OR "Sitting" OR "Sedentarism" OR "Sedentary" OR "physical conditioning" OR "walking")
Intervention	AND ("Intervention" OR "Interventions" OR "Trial" OR "Trials" OR "Initiative" OR "Initiatives" OR "behavior change" OR "Behavioral change" OR "strategies" OR "program" OR "programs" OR "programme" OR "programmes" OR "Behaviour modification" OR "Behaviour modification" OR "Behaviour change" OR "behavioural change" OR "health education" OR "health promotion")
Technology	AND ("technology" OR "Technologies" OR "social media" OR "twitter" OR "facebook" OR "cell phone" OR "smartphone" OR "mobile phone" OR "mobile applications" OR "apps" OR "text messaging" OR "mobile health" OR "telemedicine" OR "web-based" OR "electronic mail" OR "e-mail" OR "internet" OR "wearable" OR "monitoring sensors" OR "GPS" OR "interactive voice response" OR "embodied conversational agent" OR "virtual" OR "electronic tablet" OR "tablet-based" OR "computers" OR "handheld" OR "digital health" OR "eHealth" OR "on-line systems" OR "online systems" OR "software" OR "multimedia" OR "activity monitor" OR "accelerometer" OR "actigraphy" OR "pedometer" OR "fitness monitor" OR "pedometery" OR "step counter" OR "artificial intelligence" OR "telehealth" OR "mHealth") OR ("Individual" OR "Individuals" OR "Person centered" OR "self management" OR "home-based" OR "lifestyle" OR "family based" OR "self monitoring" OR "life style" OR "quantified self") OR ("Built environment" OR neighborhood*OR neighbourhood*OR "land use" OR "urban form" OR "pedestrian" OR "health community design" OR "mix use" OR "environmental enhancement" OR "objective environment" OR "spatial" OR "physical environment" OR "streetscape" OR "urban planning" OR "walkability" OR "pedestrian-friendly" OR "urban renewal" OR "active transport" OR "active commute" OR "Active commuting" OR "geospatial" OR "environment design" OR "sidewalk" OR "bike lane") OR ("Community Settings" OR "community based" OR "community wide" OR "state wide" OR "nationwide" OR "community group" OR "organization-based" OR "school" OR "place of worship" OR "church" OR "faith-based" OR "worksite" OR "workplace" OR "recreational setting" OR "YMCA" OR "childcare" OR "education setting" OR "early care" OR "Schools") OR ("policy" OR "policies" OR "legislative" OR "legislation" OR "law" OR "population-level" OR "statute" OR "statutes" OR "Regulation" OR "Regulations" OR "Ordinance")

Set	Search Terms
Limits	Title, abstract, keyword 2000-present Cochrane Reviews and Other Reviews Word variations not be searched

Supplemental Search Strategy: PubMed (Systematic Reviews, Meta-Analyses, and Pooled Analyses related to Primary Care)[2]

Database: PubMed; Date of Search: 5/31/2017; 65 results

Set	Search Strategy
Limit: Language	(English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Exclude child only	NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) AND "adult"[Mesh]))
Limit: Exclude subheadings	NOT (ad[sh] OR aa[sh] OR ci[sh] OR cn[sh] OR dh[sh] OR de[sh] OR dt[sh] OR em[sh] OR en[sh] OR es[sh] OR eh[sh] OR ge[sh] OR hi[sh] OR is[sh] OR ip[sh] OR lj[sh] OR ma[sh] OR mi[sh] OR og[sh] OR ps[sh] OR py[sh] OR pk[sh] OR pd[sh] OR po[sh] OR re[sh] OR rt[sh] OR rh[sh] OR st[sh] OR sd[sh] OR tu[sh] OR th[sh] OR tm[sh] OR tr[sh] OR ut[sh] OR ve[sh] OR vi[sh])
Limit: Publication Date (Systematic Reviews/Meta-Analyses)	AND ("2011/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Include (Systematic Reviews/Meta-Analyses)	AND (systematic[sb] OR meta-analysis[pt] OR “systematic review”[tiab] OR “systematic literature review”[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR “pooled analyses”[tiab] OR "pooled data"[tiab])
Limit: Publication Type Exclude (Systematic Reviews/Meta-Analyses)	NOT (“comment”[Publication Type] OR “editorial”[Publication Type])
Physical Activity	AND (("Exercise"[mh] OR "Exercise"[tiab] OR "Leisure activities"[mh] OR "Physical activity"[tiab] OR "Physical inactivity"[tiab] OR "Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Screen time"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Aerobic activities"[tiab] OR "Aerobic activity"[tiab] OR "Cardiovascular activities"[tiab] OR "Cardiovascular activity"[tiab] OR "Endurance activities"[tiab] OR "Endurance activity"[tiab] OR "Energy expenditure"[tiab] OR "Leisure activities"[tiab] OR "Resistance training"[tiab] OR "strength training"[tiab] OR

[2] A supplemental search was conducted on May 31, 2017, to capture relevant systematic reviews, meta-analyses, and pooled analyses related to primary care interventions because relevant literature was not captured in the original search.

Set	Search Strategy
	"Sitting"[tiab] OR “Sedentarism”[tiab] OR “Sedentary”[tiab] OR "physical conditioning"[tiab] OR "walking"[tiab]) NOT medline[sb]))
Intervention	AND (("Intervention"[tiab] OR "Interventions"[tiab] OR "Trial"[tiab] OR "Trials"[tiab] OR "Initiative"[tiab] OR "Initiatives"[tiab] OR "behavior change"[tiab] OR "Behavioral change"[tiab] OR "strategies"[tiab] OR "program"[tiab] OR "programs"[tiab] OR "programme"[tiab] OR “programmes”[tiab] OR "Behaviour modification"[tiab] OR "Behaviour modification"[tiab] OR "Behaviour change"[tiab] OR "behavioural change"[tiab]) OR (("health education"[tiab] OR "health promotion"[tiab]) NOT medline[sb]))
Primary Care	AND ((“Primary Health Care”[mh] OR “Physicians, Family”[mh] OR “Family Practice”[mh] OR “primary care”[tiab] OR “family physician”[tiab] OR “family doctor”[tiab]))

Supplemental Search Strategy: CINAHL (Systematic Reviews, Meta-Analyses, and Pooled Analyses related to Primary Care)

Database: CINAHL; Date of Search: 5/31/2017; 8 results
Terms searched in title or abstract

Set	Search Terms
Physical Activity	("Exercise" OR "Physical activity" OR "Physical inactivity" OR "Computer time" OR "Computer use" OR "Inactivity" OR "Physically inactive" OR "Screen time" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Leisure activities" OR "Resistance training" OR "strength training" OR "Sitting" OR "Sedentarism" OR "Sedentary" OR "physical conditioning" OR "walking")
Intervention	AND ("Intervention" OR "Interventions" OR "Trial" OR "Trials" OR "Initiative" OR "Initiatives" OR "behavior change" OR "Behavioral change" OR "strategies" OR "program" OR "programs" OR "programme" OR "programmes" OR "Behaviour modification" OR "Behaviour modification" OR "Behaviour change" OR "behavioural change" OR "health education" OR "health promotion")
Primary Care	AND ("Primary Health Care" OR "Family Practice" OR "primary care" OR "family doctor" OR "family physician")
Systematic Reviews/Meta-Analyses	AND ("systematic review" OR "systematic literature review" OR metaanalysis OR "meta analysis" OR "metanalyses" OR "meta analyses"" OR "pooled analysis" OR "pooled analyses" OR "pooled data")
Limits	2011-present English language Peer reviewed Exclude Medline records Human

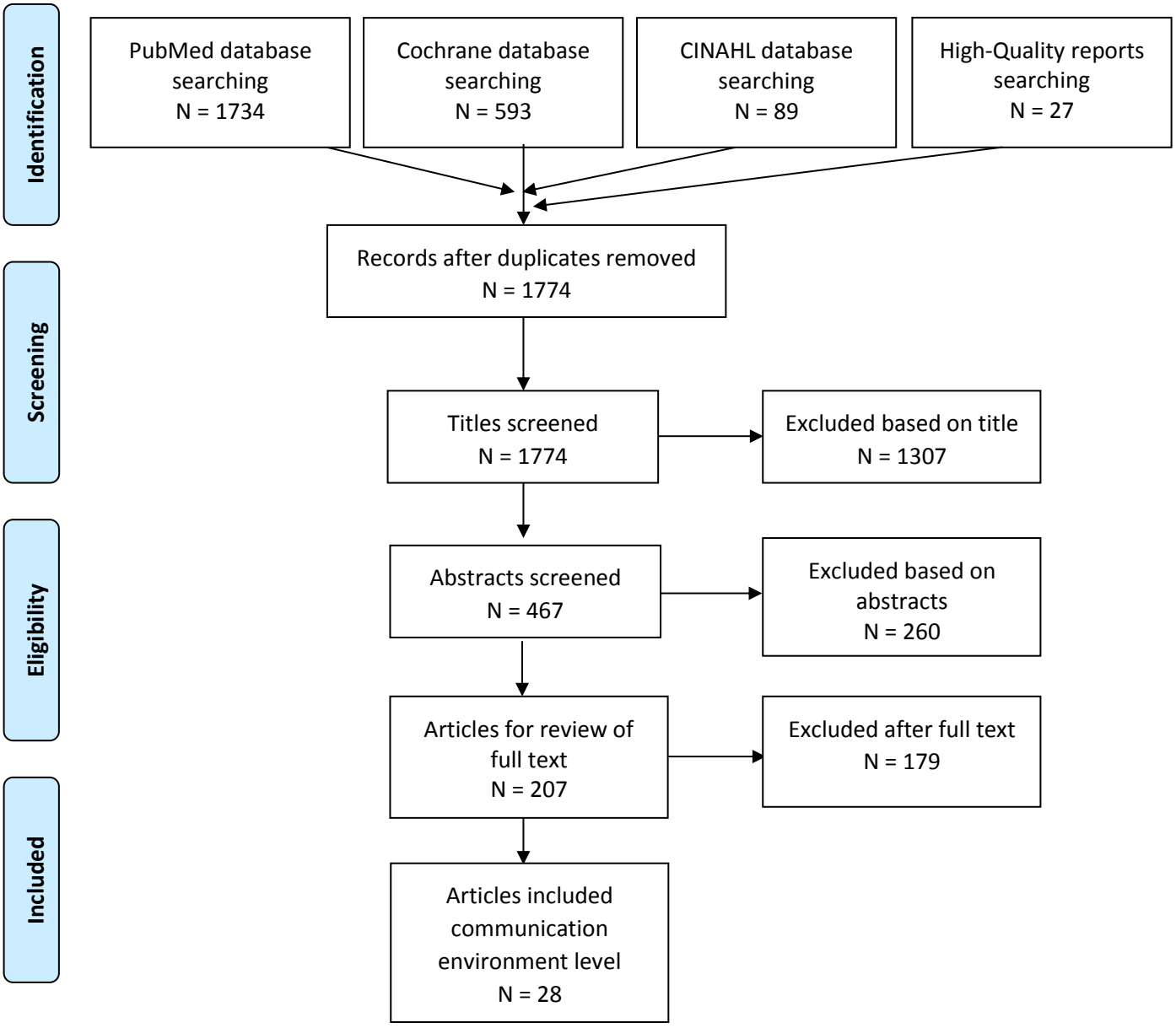
Supplemental Search Strategy: Cochrane (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports related to Primary Care)

Database: Cochrane; Date of Search: 5/31/2017; 13 results
Terms searched in title, abstract, or keywords

Set	Search Terms
Physical Activity	("Exercise" OR "Physical activity" OR "Physical inactivity" OR "Computer time" OR "Computer use" OR "Inactivity" OR "Physically inactive" OR "Screen time" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Energy expenditure" OR "Leisure activities" OR "Resistance training" OR "strength training" OR "Sitting" OR "Sedentarism" OR "Sedentary" OR "physical conditioning" OR "walking")
Intervention	AND ("Intervention" OR "Interventions" OR "Trial" OR "Trials" OR "Initiative" OR "Initiatives" OR "behavior change" OR "Behavioral change" OR "strategies" OR "program" OR "programs" OR "programme" OR "programmes" OR "Behaviour modification" OR "Behaviour modification" OR "Behaviour change" OR "behavioural change" OR "health education" OR "health promotion")
Primary Care	AND ("Primary Health Care" OR "Family Practice" OR "primary care" OR "family doctor" OR "family physician")
Limits	Title, abstract, keyword 2011-present Cochrane Reviews and Other Reviews Word variations not be searched

Appendix C: Literature Tree

Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports Literature Tree



Appendix D: Inclusion/Exclusion Criteria

Physical Activity Promotion Subcommittee
What interventions are effective for increasing physical activity?

a. Does the effectiveness vary by age, sex, race/ethnicity, or socio-economic status?

Category	Inclusion/Exclusion Criteria	Notes/Rationale
Publication Language	**Include:** • Studies published with full text in English	
Publication Status	**Include:** • Studies published in peer-reviewed journals • Reports determined to have appropriate suitability and quality by PAGAC **Exclude:** • Grey literature, including unpublished data, manuscripts, abstracts, conference proceedings	
Research Type	**Include:** • Original research* • Systematic reviews • Meta-analyses • Pooled analyses • Reports determined to have appropriate suitability and quality by PAGAC	*The initial search conducted with systematic reviews, meta-analyses, and reports. If needed, *de novo* reviews will be conducted only to supplement the reviews.
Study Subjects	**Include:** • Human subjects	
Age of Study Subjects	**Include:** • People of all ages	
Health Status of Study Subjects	**Exclude:** • Hospitalized patients • Non-ambulatory individuals	
Comparison	**Exclude:** • Studies comparing athletes to non-athletes • Studies comparing athlete types (e.g., comparing runners to soccer players)	
Date of Publication	**Include:** • Systematic reviews, meta-analyses, and reports published from 2011 to 2016 • Original research (included to supplement systematic review categories) published 2011 – 2016	The SC revised inclusion dates from 2000–2016 to 2011–2016 after the search strategy was implemented due to substantial amount of relevant recent literature.

Study Design	**Include:** • Systematic reviews • Meta-analyses • Reports determined to have appropriate suitability and quality by PAGAC • Randomized controlled trials* • Non-randomized controlled trials* • Prospective cohort studies* • Retrospective cohort studies* • Case-control studies* • Before-and-after studies* • Time series studies* • Cross-sectional studies **Exclude:** • Case Studies • Narrative reviews • Commentaries • Editorials	*Original research with these study designs will be secondary to the systematic review categories, and will be used to capture the latest evidence not reflected in the systematic reviews.
Intervention/ Exposure	**Include studies in which the exposure is:** All types of physical activity interventions or program**s** **Exclude:** • Studies that do not include a physical activity intervention or program • Studies that do not include physical activity change as a reported outcome variable • Activity studies missing physical activity (mental games such as Sudoku instead of physical activities) • Studies of a single, acute bout of exercise • Studies of a specific therapeutic exercise delivered by a medical professional (e.g., physical therapist) • Studies where the outcome is/are measures of physical fitness (e.g., cardiovascular fitness, strength, flexibility) rather than physical activity • Sedentary behavior only • Sedentary interventions or programs only	Studies will include single behavior (PA intervention alone) and multiple behavior interventions (e.g., when PA intervention is delivered along with dietary interventions).
Comparison	**Exclude:** • Studies comparing athletes to non-athletes • Studies comparing athlete types (e.g., comparing runners to soccer players)	
Outcome	**Include studies in which the outcome is:** • Physical activity change	

Appendix E: Rationale for Exclusion at Abstract or Full-Text Triage for Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Adams J, White M. Are activity promotion interventions based on the transtheoretical model effective? a critical review. *Br J Sports Med*. 2003;37(2):106-114.		X			
Allender S, Hutchinson L, Foster C. Life-change events and participation in physical activity: a systematic review. *Health Promot Int*. 2008;23(2):160-172.			X		
Amiri Farahani L, Asadi-Lari M, Mohammadi E, Parvizy S, Haghdoost AA, Taghizadeh Z. Community-based physical activity interventions among women: a systematic review. *BMJ Open*. 2015;5(4):e007210.			X		
An JY, Hayman LL, Park YS, Dusaj TK, Ayres CG. Web-based weight management programs for children and adolescents: a systematic review of randomized controlled trial studies. *Adv Nurs Sci*2009;32(3):222-240.	X				
Anderson LM, Quinn TA, Glanz K, et al. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: a systematic review. *Am J Prev Med*2009;37(4):340-357.	X				
Appelhans BM, Moss OA, Cerwinske LA. Systematic review of paediatric weight management interventions delivered in the home setting. *Obes Rev*. 2016;17(10):977-988.	X				
Arango CM, Paez DC, Reis RS, Brownson RC, Parra DC. Association between the perceived environment and physical activity among adults in Latin America: a systematic review. *Int J Behav Nutr Phys Act*. 2013;10(122):1479-5868. doi:10.1186/1479-5868-10-122.			X		
Arbesman M, Mosley LJ. Systematic review of occupation- and activity-based health management and maintenance interventions for community-dwelling older adults. *Am J Occup Ther*. 2012; 66(3):277-283. doi:10.5014/ajot.2012.003327.				X	
Arsenijevic J, Groot W. Physical activity on prescription schemes (PARS): do programme characteristics influence effectiveness? results of a systematic review and meta-analyses. *BMJ Open*. 2017;7(2):1-14.e012156. doi:10.1136/bmjopen-2016- 012156.			X		
Ashford S, Edmunds J, French DP. What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? a systematic review with meta-analysis. *Br J Health Psycho*l. 2010;15(Pt 2):265-288. doi:10.1348/135910709X461752. Epub 2009 Jul 7					X

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Ashworth NL, Chad KE, Harrison EL, Reeder BA, Marshall SC. Home versus center based physical activity programs in older adults. *Cochrane Database Syst Rev.* 2005; 25(1):CD004017. doi:10.1002/14651858.CD004017.pub2.	X				
Attwood S, van Sluijs E, Sutton S. Exploring equity in primary-care-based physical activity interventions using PROGRESS-Plus: a systematic review and evidence synthesis. *Int J Behav Nutr Phys Act*. 2016;13:60. doi:10.1186/s12966-016-0384-8.			X		
Avery L, Flynn D, van Wersch A, Sniehotta FF, Trenell MI. Changing physical activity behavior in type 2 diabetes: a systematic review and meta-analysis of behavioral interventions. *Diabetes Care*. 2012;35(12):2681-2689. doi:10.2337/dc11-2452.			X		
Baker PR, Francis DP, Soares J, Weightman AL, Foster C. Community wide interventions for increasing physical activity. *Cochrane Database Syst Rev*. 2015;1:Cd008366. doi:10.1002/14651858.CD008366.pub2.			X		
Bancroft C, Joshi S, Rundle A et al. Association of proximity and density of parks and objectively measured physical activity in the United States: a systematic review. *Soc Sci Med*. 2015;138: 2230. doi:10.1016/j.socscimed.2015.05.034. Epub 2015 May 23			X		
Barbosa Filho VC, Minatto G, Mota J, Silva KS, de Campos W, Lopes Ada S. Promoting physical activity for children and adolescents in low- and middle-income countries: an umbrella systematic review: a review on promoting physical activity in LMIC. *Prev Med*. 2016;88:115-26. doi:10.1016/j.ypmed.2016.03.025.				X	
Barte JC, Wendel-Vos GC. A systematic review of financial incentives for physical activity: the effects on physical activity and related outcomes. *Behav Med*. 2015;1-12. doi:10.1002/14651858.CD008366.pub2.			X		
Batsis JA, Gill LE, Masutani, RK, et al. Weight loss interventions in older adults with obesity: a systematic review of randomized controlled trials since 2005. *J Am Geriatr Soc.* 2017;doi:10.1111/jgs.14514. Epub 2016 Sep 19.	X				
Bautista-Castana I, Doreste J, Serra-Majem L. Effectiveness of interventions in the prevention of childhood obesity. *Eur J Epidemiol.* 2004;19(7):617-622.		X			
Baxter S, Blank L, Johnson M, Everson-Hock E, Woods HB, Goyder E, Payne N, Mountain G. Public Health Research. Interventions to promote or maintain physical activity during and after the transition to retirement: an evidence synthesis. *NIHR Journals Library 2016* Apr.			X		
Baxter S, Johnson M, Payne N, et al. E. Promoting and maintaining physical activity in the transition to				X	

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
retirement: a systematic review of interventions for adults around retirement age. *Int J Behav Nutr Phys Act*. 2016;13(1):12. doi: 10.1186/s12966-016-0336-3.					
Beets MW, Beighle A, Erwin HE, Huberty JL. After-school program impact on physical activity and fitness. a meta-analysis. *Am J Prev Med*. 2009;36(6):527-537. doi:10.1016/j.amepre.2009.01.033. Epub 2009 Apr 11.					X
Belanger-Gravel A, Godin G, Vezina-Im LA, Amireault S, Poirier P. The effect of theory-based interventions on physical activity participation among overweight/obese individuals: a systematic review. *Obes Rev*. 2011;12(6):430-439. doi:10.1111/j.1467-789X.2010.00729.x.				X	
Bellew B, Schoeppe S, Bull FC, Bauman A. The rise and fall of Australian physical activity policy 1996-2006: a national review framed in an international context. *Aust New Zealand Health Policy*. 2008;5:18. doi:10.1186/1743-8462-5-18.		X			
Bender MS, Choi J, Won GY, Fukuoka Y. Randomized controlled trial lifestyle interventions for Asian Americans: a systematic review. *Prev Med*. 2014. 67:171-181. doi:10.1016/j.ypmed.2014.07.034. Epub 2014 Jul 30.				X	
Benton JS, Anderson J, Hunter RF, French DP. The effect of changing the built environment on physical activity: a quantitative review of the risk of bias in natural experiments. *Int J Behav Nutr Phys Act*. 2016;13(1):107. doi10.1186/s12966-016-0433-3.	X				
Berg MH, Schoones JW, Vliet Vlieland TP. Internet-based physical activity interventions: a systematic review of the literature. *J Med Internet Res*.2007;9(3). doi10.2196/jmir.9.3.e26.					X
Berge JM, Everts JC. Family-based interventions targeting childhood obesity: a meta-analysis. *Child Obes*. 2011;7(2):110-121. doi:10.1089/chi.2011.07.02.1004.				X	
Berry D, Sheehan R, Heschel R, Knafl K, Melkus G, Grey M. Family-based interventions for childhood obesity: a review. *J Fam Nurs*. 2004;10(4):429-449.		X			
Best KL, Miller WC, Eng JJ, Routhier F. Systematic review and meta-analysis of peer-led self-management programs for increasing physical activity. *Int J Behav Med*. 2016;23(5):527-538. doi:10.1007/s12529-016-9540-4.			X		
Bhuyan S, Chandak A, Smith P, Carlton C, Duncan K, Gentry D. Integration of public health and primary care: a systematic review of the current literature in primary care physician mediated childhood obesity interventions. *Obes Res Clin Pract* 2015;9(6):539-552. doi:10.1016/j. orcp.2015.07.005.			X		
Biddle SJ O. Sedentary behaviour interventions in young people: a meta-analysis. British Journal of			X		

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Sports Medicine. 2011;45(11):937-942. doi.org/10.1136/bjsports-2011-090205.					
Bird EL, Baker G, Mutrie N, Ogilvie D, Sahlqvist S, PowellJ. Behavior change techniques used to promote walking and cycling: a systematic review. *Health Psychol*. 2013;32(8):829-838. doi:10.1037/a0032078.			X		
Bloss CS, Madlensky L, Schork NJ, Topol EJ. Genomic information as a behavioral health intervention: can it work? *Per Med*. 2011;8(6):659-667. doi:10.2217/pme.11.73.		X			
Blue CL, Black DR. Synthesis of intervention research to modify physical activity and dietary behaviour. *Res Theory Nurs Pract*. 2005;19(1):25-61.		X			
Board on Health Sciences Policy, Institute of Medicine. Promising and best practices in total worker health: workshop summary. 2014; doi:10.17226/18947.		X			
Bock C, Jarczok MN, Litaker D. Community-based efforts to promote physical activity: a systematic review of interventions considering mode of delivery, study quality and population subgroups. *J Sci Med Sport*. 2014;17(3):276-282. doi:10.1016/j.jsams.2013.04.009.			X		
Bodde AE, Seo DC. A review of social and environmental barriers to physical activity for adults with intellectual disabilities. *Disabil Health J*. 2009;2(2):57-66. doi:10.1016/j.dhjo.2008.11.004.					X
Bonell C, Jamal F, Harden A et al. Systematic review of the effects of schools and school environment interventions on health: evidence mapping and synthesis. *Public Health Research*.2013. doi:10.3310/phr01010.			X		
Bonell C, Wells H Harden, et al. The effects on student health of interventions modifying the school environment: systematic review. *J Epidemiol Community Health.* 2013;67(8):677-681 doi: 10.1136/jech-2012-202247.				X	
Bourdeaudhuij I, Cauwenberghe E, Spittaels H et al. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. *Obes Rev*. 2011;12(3):205-216. doi: 10.1111/j.1467-789X.2009.00711.x.				X	
Bourke L, Homer KE, Thaha MA, et al. Interventions to improve exercise behaviour in sedentary people living with and beyond cancer: a systematic review. *British Journal of Cancer*. 2014;110(4):831-841. doi: 10.1038/bjc.2013.750.	X				
Bourke L, Homer KE, Thaha MA, et al. Interventions for promoting habitual exercise in people living with and beyond cancer. *Cochrane Database Syst Rev.* 2013; Sep 24;(9):CD010192. doi:10.1002/14651858.CD010192.pub2.					X

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Bradshaw T, Lovell K, Harris N. Healthy living interventions and schizophrenia: a systematic review. *J Adv Nurs*. 2005. 49(6):634-654. doi:10.1111/j.1365-2648.2004.03338.x.	X				
Brauer P, Royall D, O'Young O, et al. Key features of effective structured behavioural programs in primary care: what are they? *Can J Diet Pract Res*), 2015; 76(3): e12-3. 2015;76(3):e12-3		X			
Breitenstein SM, Gross D, Christophersen R. Digital delivery methods of parenting training interventions: a systematic review. *DARE*. 2014;(2):168-176.	X				
Brinkley A, McDermott H, Munir F. What benefits does team sport hold for the workplace? a systematic review. *J Sports Sci.* 2017;35(2):136-148. doi:10.1080/02640414.2016.1158852	X				
Brown DR, SoaresJ, Epping JM et al. Stand-alone mass media campaigns to increase physical activity: a Community Guide updated review. *Am J Prev Med*. 2012;43(5):551-561. doi:10.1016/j.amepre.2012.07.035.			X		
Brown EC, Buchan DS, Baker JS, Wyatt FB, Bocalini DS, Kilgore L. A Systematised review of primary school whole class child obesity interventions: effectiveness, characteristics, and strategies. *Biomed Res Int.* 2016;2016:4902714. doi:10.1155/2016/4902714.	X				
Brown HE, Atkin AJ, Panter J, Wong G, Chinapaw MJ, van Sluijs EM. Family-based interventions to increase physical activity in children: a systematic review, meta-analysis and realist synthesis. *Obes Rev.* 2016;17(4):345-360. doi:10.1111/obr.12362. Epub 2016 Jan 12.			X		
Brown T, Avenell A, Edmunds LD, et al. Systematic review of long-term lifestyle interventions to prevent weight gain and morbidity in adults. *Obes Rev*. 2009;10(6):627-638. doi:10.1111/j.1467-789X.2009.00641.x.	X				
Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obes Rev*. 2009;10(1):110-141. doi:10.1111/j.1467-789X.2008.00515.x. Epub 2008 Jul 30.					X
Bull ER, Dombrowski SU, McCleary N, Johnston M. Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? a systematic review and meta-analysis. *BMJ Open.* 2014;4(11)e006046. doi:10.1136/bmjopen-2014-006046.			X		
Bully P, Sanchez A, Zabaleta-del-Olmo E, Pombo H, Grandes G. Evidence from interventions based on theoretical models for lifestyle modification (physical activity, diet, alcohol and tobacco use) in primary			X		

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
care settings: a systematic review. *Prev Med.* 2015;76(Suppl):S76-S93. doi:10.1016/j.ypmed.2014.12.020. Epub 2015 Jan 5.					
Cai, X, Qiu SH, Yin H et al. Pedometer intervention and weight loss in overweight and obese adults with Type 2 diabetes: a meta-analysis. *Diabet Med.* 2016;33(8):1035-1044. doi:10.1111/dme.13104. Epub 2016 Mar 25.	X				
Cai Y, Richards EA. S)ystematic review of physical activity outcomes of rural ifestyle interventions. *West J Nurs Res.* 2016;38(7):909-927. doi:10.1177/0193945915625922. Epub 2016 Jan 3.			X		
Cairns JM, Bambra C, Hillier-Brown FC, Moore HJ, Summerbell CD. Weighing up the evidence: a systematic review of the effectiveness of workplace interventions to tackle socio-economic inequalities in obesity. *J Public Health (Oxf)*. 2015;37(4):659-670. doi:10.1093/pubmed/fdu077.	X				
Calogiuri G, Chroni S. The impact of the natural environment on the promotion of active living: an integrative systematic review. *BMC Public Health*. 2014;Aug:14:873. doi:10.1186/1471-2458-14-873.			X		
Cardona-Morrell M, Rychetnik L, Morrell,SL, Espinel PT, Bauman A. Reduction of diabetes risk in routine clinical practice: are physical activity and nutrition interventions feasible and are the outcomes from reference trials replicable? a systematic review and meta-analysis . *BMC Public Health.* 2010;10:653(2). doi:10.1186/1471-2458-10-653.			X		
Carroll JK, Yancey AK, Spring B, et al. What are successful recruitment and retention strategies for underserved populations? examining physical activity interventions in primary care and community settings. *Transl Behav Med.* 2011;1(2):234-251. doi:10.1007/s13142-011-0034-2.				X	
Carvalho de Menezes M, Bedeschi LB, Santos LC, Lopes AC. Interventions directed at eating habits and physical activity using the Transtheoretical Model: a systematic review. *Nutr Hosp.* 2016;33(5):586. doi: 10.20960/nh.586.				X	
Centers for Disease Control and Prevention. School health guidelines to promote healthy eating and physical activity. 2011 Sept;60(RR05):1-71.				X	
Cerin E, Nathan A, van Cauwenberg J, Barnett DW. The neighbourhood physical environment and active travel in older adults: a systematic review and meta-analysis. *IJBNPA*;14:15. doi:10.1186/s12966-017-0471-5.			X		
Chambers, D, Booth A, Baxter SK, Johnson M, Dickinson KC, Goyder EC. *HS&DR*. Evidence for models of diagnostic service provision in the community: literature mapping exercise and focused rapid reviews. 2016 Dec.			X		
Chaplais E, Naughton G, Thivel D, Courteix D, Greene D. Smartphone interventions for weight treatment	X				

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
and behavioral change in pediatric obesity: a systematic review. *Telemed J E Health.* 2015;21(10):822830. doi:10.1089/tmj.2014.0197. Epub 2015 Aug 20.					
Chau JY, Ploeg HP, Uffelen JG, Wong J, et al. Are workplace interventions to reduce sitting effective? a systematic review. *Preve Med*. 2010;51(5):352-356. doi:10.1016/j.ypmed.2010.08.012.			X		
Chaudhry ZW, Brown RV, Fawole OA, et al. Comparative effectiveness of strategies to prevent weight gain among women with and at risk for breast cancer: a systematic review. *Springerplus*. 2013;2(1):277. doi: 10.1186/2193-1801-2-277. Print 2013 Dec.	X				
Chen JL, Wilkosz ME. Efficacy of technology-based interventions for obesity prevention in adolescents: a systematic review. *Adolesc Health Med Ther*. 2014;5:159-70. doi: 10.2147/AHMT.S39969. eCollection 2014.				X	
Cheok G, Tan D, Low A, Hewitt J. Is Nintendo Wii an effective intervention for individuals with stroke? a systematic review and meta-analysis. *J Am Med Dir Assoc.* 2015. 16(11):923-32. doi:10.1016/j.jamda.2015.06.010. Epub 2015 Aug 4.	X				
Chu AH, Ng SH, Tan CS, Win AM, Koh D, Muller-Riemenschneider F. A systematic review and meta-analysis of workplace intervention strategies to reduce sedentary time in white-collar workers. *Obes Rev*. 2016;17(5):467-81. doi: 10.1111/obr.12388. Epub 2016 Mar 15.			X		
Claes J, Buys R, Budts W, Smart N, Cornelissen VA. Longer-term effects of home-based exercise interventions on exercise capacity and physical activity in coronary artery disease patients: a systematic review and meta-analysis. *Eur J Prev Cardiol*. 2017; 24(3):244-256. doi:10.1177/2047487316675823. Epub 2016 Oct 27.			X		
Clark AM, McAlister FA, Hartling L, Vandermeer B. Randomized trials of secondary prevention programs in coronary artery disease: a systematic review. *AHRQ Technology Assessments*. 2005 Dec.				X	
Clark IN, Taylor NF, Baker F. Music interventions and physical activity in older adults: a systematic literature review and meta-analysis. *J Rehabil Med*. 2012;44(9):710-719. doi: 10.2340/16501977-1025.				X	
Cohen DA, McKenzie TL, Sehgal A, Williamson S, Golinelli D, Lurie N. Contribution of public parks to physical activity.. *Am J Public Health.* 2007;97(3):509-514. doi:10.2105/AJPH.2005.072447. Epub 2007 Jan 31.					X
Colquitt JL, Loveman E, O'Malley C, et al. Diet, physical activity, and behavioural interventions for the treatment of overweight or obesity in preschool children up to the age of 6 years. *Cochrane Database*	X				

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Syst Rev. 2016;(3). doi:10.1002/14651858.CD012105.					
Commissaris DA, Huysmans MA, Mathiassen SE, Srinivasan D, Koppes LLj, Hendriksen IJ. Interventions to reduce sedentary behavior and increase physical activity during productive work: a systematic review. *Scand J Work Environ Health*. 2016;42(3):181-191. doi:10.5271/sjweh.3544. Epub 2015 Dec 18.			X		
Conn VS, Hafdahl AR, Cooper PS, Brown LM, Lusk SL. Meta-analysis of workplace physical activity interventions. *Am J Prev Med.* 2009;37(4):330-339. doi: 10.1016/j.amepre.2009.06.008.					X
Conn VS, Hafdahl AR, Mehr DR. Interventions to increase physical activity among healthy adults: meta-analysis of outcomes. *Am J Public Health.* 2011;101(4):751-758. doi:10.2105/AJPH.2010.194381. Epub 2011 Feb 17.			X		
Conn VS, Isaramalai S, Banks-Wallace J, Ulbrich S, CochranJ. Evidence-based interventions to increase physical activity among older adults. *Act Adapt Aging*. 2002;27(2):39-52. doi:10.1300/J016v27n0204.		X			
Conn VS, Minor MA, Burks KJ, Rantz MJ, Pomeroy SH. Integrative review of physical activity intervention research with aging adults. *J Am Geriatr Soc.* 2003;51(8):1159-1168.					X
Conn VS, Valentine JC, Cooper HM. Interventions to increase physical activity among aging adults: a meta-analysis. *Ann Behav Med.* 2002;24(3):190-200.					X
Corona E, Flores YN, Arab L. Trends in evidence-based lifestyle interventions directed at obese and overweight adult Latinos in the US: a systematic review of the literature. *J Community Health*. 2016;41(3):667-673. doi:10.1007/s10900-015-0119-9	X				
Coughlin SS, Smith SA. A review of community-based participatory research studies to promote physical activity among African Americans. *J Ga Public Health Assoc.* 2016;5(3):220-227.			X		
Cox NS, Alison JA, Holland AE. Interventions for promoting physical activity in people with cystic fibrosis. *Cochrane Database Syst Rev*. 2013; (12):Cd009448. doi:10.1002/14651858.CD009448.pub2.				X	
Cradock, AL, Barrett, JL, Kenney, EL, et al. Using cost-effectiveness analysis to prioritize policy and programmatic approaches to physical activity promotion and obesity prevention in childhood. *Prev Med.* 2017;95 Suppl:S17-S27. doi: 10.1016/j.ypmed.2016.10.017. Epub 2016 Oct 20.		X			
Cugelman B, Thelwall M, Dawes P. Online interventions for social marketing health behavior change campaigns: a meta-analysis of psychological architectures and adherence factors. *J Med Internet Res.* 2011;13(1):e17. doi:10.2196/jmir.1367.				X	

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Cushing CC, Brannon EE, Suorsa KI, Wilson DK. Systematic review and meta-analysis of health promotion interventions for children and adolescents using an ecological framework. *J Pediatr Psychol.* 2014;8(39):949-962. doi:10.1093/jpepsy/jsu042.			X		
Dallery J, Kurti A, Erb P. A new frontier: integrating behavioral and digital technology to promote health behavior. *Behav Anal*. 2015;38(1):1949. doi:10.1007/s40614-014-0017-y.		X			
De Meester, F, van Lenthe FJ, Spittaels H, Lien N, De Bourdeaudhuij I. Interventions for promoting physical activity among European teenagers: a systematic review. *Int J Behav Nutr Phys Act.* 2009;6:82. doi:10.1186/1479-5868-6-82.					X
DeMattia L, Lemont L, Meurer L. Do interventions to limit sedentary behaviours change behaviour and reduce childhood obesity: a critical review of the literature. *Obes Rev*. 2007;8(1):69-81. doi:10.1111/j.1467-789X.2006.00259.x.		X			
Demetriou Y, Honer O. Physical activity interventions in the school setting: a systematic review. *Psychol Sport Exerc.* 2012;13(2):186-196. doi:10.1016/j.psychsport.2011.11.006.			X		
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Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
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Olsen JM, Nesbitt BJ. Health coaching to improve healthy lifestyle behaviors: an integrative review. *Am J Health Promot.* 2010;25(1):e1-e12.					X
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Parra MT, Porfírio GJM, Arredondo EM. Physical activity interventions in faith-based organizations: a systematic review. *Am J Health Promot.* 2017. doi:10.1177/0890117116688107.			X		
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Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
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