PROMOTING DIET AND PHYSICAL ACTIVITY IN NURSES: A SYSTEMATIC REVIEW

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WORD COUNT

Abstract= 225 ; Text+References= 5104; Text+References+Tables= 5998

ABSTRACT

Objective. To systematically review the effectiveness of intervention studies promoting diet and physical activity (PA) in nurses.

Data source. English language manuscripts published between 1970 and 2014 in PubMed, Scopus and CINAHL, EMBASE and PICO tool.

Study Inclusion and Exclusion Criteria. Inclusion criteria (1) nurses/student nurses working in a health care setting; (2) Interventions where PA and/or diet behaviours were the primary outcome. Exclusion criteria (1) non-peer reviewed articles or conference abstracts; (2) interventions focused on treatment of chronic conditions or lifestyle factors other than PA or diet in nurses.

Data Extraction. Seventy-one full-texts were retrieved and assessed for inclusion by two reviewers. Data was extracted by one reviewer and checked for accuracy by a second reviewer.

Data synthesis. Extracted data was synthesised in a tabular format and narrative summary.

Results. Nine (n=737 nurses) studies met the inclusion criteria. Quality of the studies was low to moderate. Four studies reported an increase in self-reported PA, through structured exercise and goal-setting. Dietary outcomes were generally positive, but were only measured in three studies with some limitations in the assessment methods. Two studies reported improved body composition without significant changes in diet or PA.

Conclusions. Outcomes of interventions to change nurses' PA and diet behaviour are promising, but inconsistent. Additional and higher quality interventions that include objective and validated outcome measures and appropriate process evaluation are required.

KEYWORDS. Systematic review, Health promotion, Workplace, Nutrition, Physical Activity.

INDEXING WORDS: Manuscript format: literature review; Research purpose: descriptive;

Study design: Systematic review; Outcome measure: behavioral; Setting: workplace; Health focus: physical activity, nutrition. Strategy: behaviour change; Target population: adult nurses; Target population circumstances: all education levels, all income levels, all locations, all races/ethnicities.

OBJECTIVE

The majority of the adult population is in the workforce, with individuals spending more than a third of their waking hours at work. Both the workplace and job characteristics have a significant impact on an individual's lifestyle.[1] Nursing is an occupation where overtime, irregular shifts, and stress, both physical and emotional, are common. An Australian cross-sectional study reported that 60% of nurses are overweight and obese,[2] which is higher than the 55% reported for the Australian female population.[3] Although nursing seems to be an occupation that includes frequent walking bouts, almost 50% of nurses reported low physical activity levels,[4-8] with occupational energy expenditure negatively associated with leisure time physical activity and meeting physical activity guidelines.[9,10] Other unhealthy behaviours associated with this job include emotional eating, irregular meals, and frequent high-energy snacking.[4,11-13] Physical activity and diet play a major role in obesity development and the onset of non-communicable disease. These behavioural factors are strong independent predictors of all-cause mortality,[14,15] and are key targets of interventions designed to prevent chronic disease.[16-18]

Diet and physical activity promotion at the workplace has gained popularity in recent years, because of the potential to reach large numbers of adults.[1] Workplace interventions in hospital settings have effectively improved physical activity levels, BMI and dietary patterns.[8,19-25] Employees included in those interventions, such as technical staff, allied health,

administrative, are different from nurses whose shifts are usually longer and more irregular due to the 24-h patient care service.[26] Nurses' working environment is also different, as it has been described as particularly hostile and unsupportive.[27] Therefore, nurses' job may impact their availability and time to engage with health promotion programs, together with lack of motivation for self-care, as suggested by an online survey.[28] Previous studies in hospital settings have not provided a nurse sub-group analysis, therefore the extent of nurse participation and benefits from diet and physical activity intervention is not well understood.

A 2012 systematic review of interventions aimed to improve a variety of health behaviours in nurses (e.g. smoking, alcohol intake, diet and physical activity) found just three studies.[29] However, only one study aimed to improve physical activity and the other two targeted smoking cessation.

The aim of this systematic review was to assess the effectiveness of any workplace intervention studies specifically promoting diet and/or physical activity behaviour in nurses.

METHODS

Data sources

This systematic review was performed according to the PRISMA statement (Preferred Reported Items for Systematic Reviews and Meta-Analyses) guidelines.[30] Relevant studies were identified through a comprehensive search, using four electronic databases (PubMed, Scopus, CINAHL, and EMBASE). PICO tool (PubMed-NIH) and snowball search from relevant papers were also used. Databases were searched from the earliest time point until October 2014 using a combination of key words related to population and limited to English language (e.g. ' Nurs*', 'Health care', 'health care worker'), settings (e.g. 'Workplace',

'Worksite', 'Hospital'), type of study (e.g. 'Lifestyle intervention', 'workplace intervention', 'intervention'), and intervention outcomes (e.g. 'Exercise', 'Physical Activity', 'Nutri*', 'Diet', 'lifestyle'). We used broad search terms in order to capture all relevant studies, including any intervention design and publication year.

Inclusion and exclusion criteria

Studies were considered eligible for inclusion if they met the following criteria regarding population, intervention, comparator, outcomes, and study design:

- Nurses or nursing students currently working in a health care setting
- Physical activity and/or nutrition intervention
- Any control condition (e.g. usual diet and physical activity) or no control (e.g. pre-post test)
- Outcome measures of change in either diet and/or physical activity behaviour. Secondary health outcomes such as BMI and weight were included in the review where reported.
- Randomised or non-randomised controlled trials (cluster or individual), clinical controlled trials, quasi-experimental, pilot studies or single group pre-post studies with or without control group.

We excluded studies that were not published in a peer-reviewed journal, editorials, opinions, and studies available only as conference abstracts. Papers were excluded if the intervention was directed towards patients and led by nurses. Studies were also excluded if the main purpose was to treat other conditions in nurses (e.g. musculoskeletal pain, burnout and stress, anxiety, depression). Interventions that focused only on improving physical fitness and/or

with supervised exercise, as opposed to physical activity, or aimed to change other lifestyle factors (e.g. limit alcohol intake and smoking), were also excluded.

Data Extraction

The study selection process followed three steps. First, one author (LT) reviewed all abstracts and titles and excluded irrelevant studies, which was checked by the second reviewer (TP). Secondly, full-text were retrieved for the papers selected in Step 1. All authors reviewed the full papers for eligibility and decisions on inclusions were made by consensus. Thirdly, two studies met all inclusion criteria except they included a mix of nurses and other health professionals. The authors of these two manuscripts were contacted to ascertain study population and availability of nurses' only data, leading to their inclusion.[31,32] Third, one author (LT) extracted data following a standardised data extraction form. This process was checked by the other three authors (ML, TP, TKA). Data extracted included patient characteristics (e.g. sex, age, marital status), intervention characteristics (e.g. duration, delivery method), control group conditions, outcomes measures, and study quality. Study design was classified as randomized controlled trial (RCT), quasi-experimental and quasi-experimental pre-post test (no control group).

Data synthesis

Results were grouped in three different outcomes of interest to the aims of the study: Physical activity, Diet and Body composition. Characteristics of studies, interventions and participants were summarised in tables. Risk of bias and study quality was assessed using previously published criteria relevant to controlled studies.[33,34] Bias categories included 1) Random sequence generation (selection bias), 2) Allocation concealment (selection bias), 3) Blinding of outcome assessment (detection bias, patient-reported outcomes), 4) Baseline

characteristics, 5) Statistical power calculation, 6) Intention to treat analysis; 7) Missing data reported (incomplete outcome data), and 8) Handling of missing data addressed (attrition bias). All authors assessed study quality independently, agreeing on scores by consensus.

RESULTS

Search outcome

Our bibliographic search yielded 17,065 articles, from which 71 full-text manuscripts were retrieved. After full review, 62 articles were excluded, mainly based on type of study or type of outcomes (*see Figure 1*). Nine studies were identified as meeting the inclusion criteria.

Characteristics of the included studies

Characteristics of the included studies are summarised in Table 1. Of the nine studies, three were RCT and six were quasi-experimental studies (including two pilot, two pre-post design) with a total of 737 participants. Study settings were different across the interventions: three were based at University's Health services and Hospital,[32,35,36] two in nursing home/long term care,[37,38] one within 3 medical surgical units,[39] and three in general hospitals and health centers.[31,40,41]

The shortest interventions were one and two days,[31,36] and the longest was 6 months.[37] Six interventions were between 8 and 12 weeks in length.[35,38-41] Intervention strategies included individual-based exercise and self-monitoring of physical activity[39]; education material and individual planning to improve physical activity and diet[34]; lectures and workshops about physical activity and/or diet[30,35,36]; on-site exercise sessions, toolkit and manipulation of workplace with social reinforcement[38]; and a nurse champion to deliver information, on-going motivation and on-site exercise classes[37]. All studies collected data at baseline, and

immediately after the intervention, with the exception of one study[35] where data was collected two months after the intervention. Only three studies performed additional follow-up measurements at six- and twelve-months.[32,38,41] Characteristics of interventions are presented in Table 1.

Inclusion and exclusion criteria varied across the studies; all studies included participants older than 18 years, and currently working as a nurse or nursing aid. One study included nurse managers only.[40] This study was included in the review because Furukawa et al.[40] reported that these participants face similar barriers to healthy lifestyle as Registered Nurses, in particular for physical activity. Only one study required participants have 1.5 years minimum of work experience.[39] Two studies restricted the target population to workers from minority groups, African American women,[38] and working mothers with children of 1-16 years old.[39] In the later, participants with chronic disease and current smokers were excluded. Pregnancy was considered an exclusion factor by three studies.[38-40]

Characteristics of participants are summarised in Table 1. The participants' age ranged from 19-67 years. All the participants were female in five studies, and the female participants in the remaining four studies ranged from 72-97%[31,35-37].The majority of participants were Caucasians (range 79.6-100%).

Intervention outcomes are presented in Table 1. Outcome measures varied between interventions and can be summarised into three key risk factors: physical activity, body composition, and diet. All studies included physical activity behaviour outcomes, such as: increasing number of daily steps, aerobic minutes, weekly exercise sessions and energy expenditure. Body composition was investigated in six studies, using different outcomes such

as BMI, weight, fat/lean indexes and waist circumference.[31,32,35,38,39,41] Only four studies measured dietary outcomes using measures of fruit and vegetable intake, diet behaviour and nutrition health promoting behaviour.[31,35,36,38] Additionally, two studies mentioned nutritional education classes as part of the intervention, but no information about the strategy or expected outcomes was provided.[37,41] Finally, two studies measured cardiovascular disease risk factors including glucose metabolism, insulin, lipid profile and blood pressure.[38,40]

Risk of bias and study quality

Table 2 summarises the results of risk of bias and study quality. Only the RCTs generated a random allocation sequence and detailed allocation concealment.[35,37,40] Although outcome blinding of participants and intervention staff is not always feasible for these types of studies, Brox & Frøystein[37] blinded outcome researchers, and Luszczynska & Haynes[35] blinded participants, where the the intevention was based on planning. The reporting of missing data was detailed for most studies, and the handling of missing data for five out of nine studies. Power analysis was reported for five of the nine studies, with intention to treat analysis only reported for the RCT studies.[35,37,40] All studies were similar at baseline. Overall the quality of the RCT studies was good,[35,37,40] the quality of the quasi-experimental studies was low,[31,36,39,40] and the quality of the pre-post studies was low to moderate.[32,41]

Physical activity outcomes

Six studies reported significant intervention effects in either energy expenditure[32,40] or physical activity levels.[36-38,41] Providing individual-based exercise plans and walking targets significantly increased steps (+1795±1630 vs. +629±1372 steps/day), exercise energy expenditure (+1.14±0.98 vs. +0.46±0.68 kcal/kg/d), and total energy expenditure (+2.3±2.2 vs. +0.9±1.3 kcal/kg/d) in the intervention group compared with the control condition.[40] Total

energy expenditure was significantly enhanced in the intervention group (Baseline: 805.07±112.52, 3-month: 2235.57±259.87, 6-month: 2014.57±267.27 kcal/week) by a step-up jogging program specifically designed for inactive woman.[32] Interactive lectures and 1h/week of aerobic exercise classes significantly increased physical activity levels.[36,37] However, McElligott et al.[36] used the HPLP tool (Health Promoting Lifestyle Profile- identifies behavioural outcomes assigning overall and subscale scores) to report changes in the physical activity score. And Brox & Frøystein[37] assessed physical activity with self-report methods without providing any p-values. Although reported to be significant changes, both studies showed small effects.

Having a nurse champion and 3x10-min exercise breaks at work, only increased average aerobic minutes at 12-wk (60 steps/min and walk for at least 10 consecutive min).[42] This was 9.54±12.77 average daily minutes for the experimental group and 6.00±16.49 in the control group.[38] Sitting behaviour was assessed in one study.[41] Sitting time was significantly reduced from356.68±250.52 minutes/weekday at baseline, to 286.60±193.90 minutes/weekday at the end of the program (8-wk), to 249.19±166.51 at 6-month follow up, for nurses participating in a pedometer challenge and a website where they could monitor their physical activity. The remaining studies did not found any significant changes in the measured outcomes, including steps, MET/mins of physical activity and physical activity levels.[31,35,38,39]

Overall, findings indicate that only half of the interventions showed significant changes in physical activity outcomes. These included steps, physical activity daily minutes, energy expenditure and sitting time.[32,38,40,41]

Diet outcomes

Although dietary behaviour and nutrition was targeted in six studies, only four assessed changes and they all used different outcome measures.[31,35,36,38] Luszczynska and Haynes[35] reported a higher fruit and vegetable intake in the experimental group (2.65±0.99 portions/day) compared to the control group (2.41±0.84 portions/day). They provided educational materials and encouraged participants to make their own plan to increase fruit and vegetable intake. Seemingly, McElligott et al.[36] asked nurses to design a self-care plan strategy to improve their diet. The Health Promoting Lifestyle Profile tool (HPLP) was used to assess health-promoting behaviours towards nutrition, with experimental scores increasing significantly at post-test (Experimental group score: 2.33±0.64, control group: 2.25±0.76). Group education lectures achieved a significant increase of Diet Outcomes Expectations scores in the experimental group (9.71±0.76) compared to the control group (7.17±3.82).[38] Finally, in the fourth study, the frequency of avoiding saturated fat intake (1-10 scale) increased in the control group rather than the intervention group (6.7±12 vs 5.6 ±8.4, respectively).[31]

Despite some of the interventions providing diet and nutrition education, they did not perform pre and post intervention measurements.[31,37,41] These interventions included nutrition and stress management classes,[37] lectures and activities promoting healthy food choices,[31] and 1-h lunch lectures together with fruit and vegetable intake self-monitoring on program's website.[41]

Body composition

Six studies assessed different body composition parameters as secondary outcomes,[31,32,35,38,39,41] but only two found significant changes.[35,39] Tucker et al.[39] reported

277 significant changes between intervention and control groups in fat index (-0.23 vs -0.04
278 Kg/m^2), fat mass (-0.60 vs -0.09 Kg), median fat mass (-1.06 vs +0.04 %), and median lean
279 mass (+1.05 vs - 0.05%), respectively. The second study only found changes in BMI when
280 doing sub-group analysis of participants with BMI>25 at baseline.[35] At 4-month follow up,
281 BMI in the intervention group was 28.89±7.68 compared with 31.79±7.77 in the control
282 group.
283
284 Overall there were modest improvements on participants' BMI and body composition.
285 However, the inconsistencies in the physical activity and diet measures make it unclear
286 whether changes were a result of increased physical activity, improved diet or a combination
287 of both.
288
289 **DISCUSSION**

290 The main finding from this systematic review was that there is inconsistent evidence on the
291 effectiveness of workplace health promotion programmes in nurses for diet and physical
292 activity behaviour. The evidence is largely inconsistent due to the limited number and quality
293 of studies, and heterogeneity in outcome measures used, rather than an absence of effect. In
294 particular, RCTs lacked appropriated outcome measures, which lead to unclear intervention
295 effects despite having good scientific rigour.
296
297 Overall, there was a positive outcome on physical activity behaviour including energy
298 expenditure, steps and sitting time. However, these outcomes were observed in four out of
299 nine studies.[32,38,40,41] Strategies including tailored intervention programmes and pedometer
300 challenges seemed to be more effective for promoting physical activity behaviours, compared
301 with more passive strategies such as educational material and lectures. Education strategies

also showed limited effects on diet outcomes. This is in line with current evidence in practice[43] and similar interventions in other populations and settings.[44-47] Compared with educational messages used in the control condition, tailored material (e.g. goals, information)[46,47] and pedometers[44] favoured intervention group for increased physical activity.

Given the lack of proper diet behaviour assessment, there was insufficient evidence to support effectiveness or indicate which strategies are more effective at improving nurses' dietary behaviour. Among the six interventions that included a diet and nutrition component, three did not assess any diet outcomes; whereas the others presented heterogeneous outcome measures (e.g. fruit and vegetable intake, diet self-efficacy, diet behaviour based on a general lifestyle tool score). Quality of measurement tools and reporting was poor. Interventions used self-report and indirect behaviour measures of diet instead of validated tools, and in some cases, baseline measures were missing or were reported without control and experimental group distinction. Clearly further research is warranted to determine if diet behaviours can be improved in nurse populations.

This review highlights the scarcity of interventions designed to promote diet and physical activity behaviours in nurses. This is consistent with the lack of studies promoting healthy lifestyle, reported by an earlier review[29] that included only three studies (two targeted smoking behaviour and only one promoted physical activity). Our review included eight additional papers that were not considered previously, which allows for a better consideration of the potential impact of interventions on nurses' lifestyle behaviours and health. Although the evidence on effectiveness was limited, our results add to the existing literature by indicating some strategies that could increase nurses' physical activity.

Nurses' poor dietary habits and low levels of physical activity places them at increased risk for chronic disease and should therefore be prioritised as a target group for workplace health promotion initiatives. Nurses' health can challenge both recruitment and retention rates, which have a significant impact on health care delivery.[48] Health and absenteeism are predictors of turnover. Health influences absenteeism, which increases the working pressure of the staff left behind. In turn, this negatively impacts remaining staff's motivation to go to work, triggering the withdrawal process that leads to turnover.[49] A cohort study showed how nurses with poor self-rated health were more likely to take long sick leave and resign (odds ratio 2.16 and 1.35, respectively).[50] Here, two in ten nurses who originally reported poor health left their job after only three years. Good health was also associated with lower sick days in another similar study.[51] On the other hand, a nurses weight-loss intervention did not significantly change short sickness absence but did improve productivity after 3-months in the treatment group.[52] Promoting diet and physical activity has the potential to improve nurses' health and perhaps contribute to limit the current high rates of turnover. This is of vital importance for the Health Care industry, as turnover negatively affects both patient outcome and costs, which are estimated to be AUD$150,000/year per nurse.[53] The Health Care industry is the major employer of Australia, with nursing being the largest workforce here (55% of total health professionals).[54]

Prior studies in similar settings suggest that workplace interventions can be effective. Previous workplace physical activity and diet interventions in hospital and health care settings reported significant improvements on employee's health (physical activity levels, BMI, fruit and vegetables and fat intake).[8,19-25] Strategies in these studies included cholesterol screening and dietary intervention[19] lifestyle advice and setting of health targets[20] information materials for diet and pedometer goals,[22] dietary advice and cognitive behavioural training,[24] worksite

manipulation,[8] free fruit and tailored exercise program,[23] internet support, goal-setting and self-monitoring of weight, diet and exercise.[21,25] However, the extent of nurses' participation and benefit was not clear in those studies, due to the targeting of all hospital employees (including technicians, administration employees, allied health, etc.), whose job and shifts are usually different from nurses'. Because of their occupation, nurses are exposed to many traumatic events in their workplace such as patient injuries, suffering, death, and even verbal and physical aggression.[55,56] These events influence their attitude towards diet and physical activity behaviours.[57] Their workload is also different to other health professionals, as patient care is nurses' main responsibility and priority, directly influencing their working hours, shifts and days off.[27] Therefore, nurses' ability to engage with general staff health promotion programs might be limited by their availability, time, job characteristics and needs. For this reason, nurse-only intervention studies are needed to determine effective strategies and factors influencing participation and effectiveness in this population.

Limitations

Every effort was made to reduce potential bias in this review. We conducted this study following the PRISMA statement and performing a comprehensive search that yielded high number of studies We used electronic searches including searching of reference lists of included studies and predefined inclusion criteria, which were applied by consensus across two or more reviewers. However, some studies may have been overlooked, for example, as a result of the English language search filter. Further, due to the differing and poor outcome measurement tools we were unable to synthesize the data quantitatively through meta-analysis. Although the majority of studies were either North American or European, there was one East Asian and one Middle Eastern study to support the generalizability of the review.

CONCLUSION

We found inconsistent evidence on the effectiveness of workplace health promotion in nurses. Although there was a modest increase in some measures of physical activity and a positive effect on participants' BMI and body composition, results should be interpreted with caution. Future studies should include appropriate theoretical frameworks and validated objective tools for outcome measures. Understanding how best to promote diet and physical activity in nurses is important because they represent one of the largest health workforces at increased risk of chronic disease development.

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Authors have not received any external funding to conduct this study and prepare this manuscript.

SO WHAT? *Implications for Health Promotion Practitioners and Researchers*

What is already known on this topic?

Diet and physical activity are well-know behavioural risk factors for the onset of chronic disease. There is sufficient evidence to support the effectiveness and beneficial effects of workplace health promotion interventions. Job characteristics detrimental effect on nurses' lifestyle, have been widely described in the literature. However, a previous review highlighted the general lack of health promotion interventions for this workforce.

What does this article add?

This article adds to the literature by reviewing and discussing the effectiveness of contemporary interventions targeting nurses, and focused on diet and physical activity promotion. It offers information about the evidence and effectiveness of intervention

strategies, and given the need for better design studies, it provides recommendations for future interventions.

What are the implications for health promotion practice or research?

Nurses' working days and hours depend on patient load and care demand, which leads to alternating day and night shift-work, with long working hours. Intervention should be feasible to limit the burden of participation. Future interventions should include a clear theoretical framework, and tailored to participants' needs and feedback, with objective and validated measures of physical activity and diet, such as accelerometers and food records.

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588 **Figure 1**
589 **Flowchart of research outcome and study selection**

Table 1

Summary of studies examining diet and physical activity interventions in nurses

Study, design, and intervention length	Participants and Setting	Intervention description	Main outcomes	Results*
Furukawa et al., 2003[39] • RCT • Duration: 12-weeks • 12-week follow up	• Ex: n= 26; con: n= 26 • Attrition: ex 8%; con 4% • Mean age: ex 40.8±5.1; con 42.1±6.9 • Gender (female): 100% • General Hospital, Kinki, Japan	• Individual-based exercise plan • Walking pattern (encouraging brisk walking) and a target for level of exercise energy expenditure. • PA self-monitoring through electronic device • Control: oral information about brisk walking	• Total Energy Expenditure (kcal/kg/d) • Exercise EE (kcal/kg/d) • Steps	+ + +
Brox &Frøystein, 2005[36] • RCT • Duration: 6 months • 6-month follow up	• Ex: n=63; Con: n= 56 • Attrition: ex 27%; con 9% • Mean age: 42.5 • Gender (female): 97% • Nursing home in Norway	• 1-hour light aerobic exercise classes held twice weekly • Classes regarding nutrition and stress management • Control: No intervention, usual work.	• "Increase in physical activity"	+/-
Luszcynska & Haynes, 2009[34] • RCT • Duration: 9-weeks • 4-month follow up	• Ex: n= 104; Con: n=78 • Attrition: 34% • Mean age: 28.7±9.51 • Gender (female): 89% • University South-Western England	• Hand outs with education material • Planning forms to make own plans about PA • Nutrition hand outs with education material • Making own plans about fruit and vegetable intake • Control: education materials	• Number of weekly PA sessions • Portions of fruit and veg • BMI	- + +/-
Shahar et al., 2009[30] • Quasi-experimental • Duration: 2-days • 6-month follow up	• Ex: n=41; Con: n=6 • Attrition: 0% • Mean age: 49.2±1.4 • Gender (female): 72% • Maccabi Health Services, Israel	• Demonstration and activities about PA • Lectures, demonstration and activities promoting healthy dietary choices • Control: No intervention, usual work.	• PA (hours/week) • Saturated fat reduction (1-10 likelihood) • BMI • Waist circumference	- +/- +/- +/-
McElligott et al., 2010[35] • Quasi-experimental • Duration: 1-day • 3-month follow up	• Ex: n=73; Con: n=85 • Attrition: ex 29%; con 17% • Age (range): 39 (23-64) • Gender (female): 95% • Academic medical centre, USA	• Eight-hour program with interactive lectures on the Collaborative Care Model • Design of self-care plan for PA based on HPLP II (Health Promoting Lifestyle Profiles II) survey results • Self-care plan for diet based on HPLP II results • Control: No intervention, usual work.	• PA (HPLP II scores) • Nutrition (HPLP II scores) • BMI	+ + -

Tucker et al., 2011[38] • Quasi-experimental (pilot) • Duration: 10-weeks • 10-week follow up	• Ex: n=30; Con: n=28 • Attrition: ex 7%; con 0% • Mean age: ex 34±6.85; con 36±6.94 • Gender (female): 100% • Medical surgical units in USA	• One 30- to 60-min introduction session • Manipulation of the worksite and social reinforcements (e.g. cues for taking stairs) • Toolkit to promote PA at and away from work. • Daily 30-min walking treadmill/standing workstations. • Extra activity with Nintendo Wii, 3min Energy-Burst video • Control: No intervention, usual work.	• Mean daily steps + • Fat index + • Fat mass (Kg) +
Flannery et al., 2012[37] • Quasi-experimental (pilot) • Duration: 3-months • 3 and 6-month follow up	• Ex: n=24; Con: n= 15 • Attrition: ex 25%; con 33% • Mean age: ex 43.3±13.07; con 39.3±13.06 • Gender (female): 100% • Long-term care facilities, Maryland USA	• Nurse specifically trained (WHIIP nurse) to deliver information, on-going motivation and lead PA. • 3x10-min physical activity breaks each day, exercise classes leaded by the WHIIP nurse. • One 30min group education lecture held by the WHHIP nurse, using self-efficacy enhancement techniques and daily diet tips. • No control	• Mean steps - • Mean 'aerobic' steps - • Mean 'aerobic' minutes +
Baschung Pfister et al., 2013[31] • Quasi-experimental (pre-post) • Duration: 12-weeks • 3 and 12-month follow up	• n= 22 • Attrition: 36% • Mean age: 53.43±3.92 • Gender (female): 100% • University Hospital of Zurich, Switzerland	• Step-up jogging training, delivered 2x/week by physical therapist • Program specifically designed for inactive women, aimed to train participants to run 5km. • Motivational flyers about exercise, behaviour change and health • No control	• Energy expenditure (kcal) + • BMI -
Lavoie-Tremblay et al., 2014[40] • Quasi-experimental (pre-post) • Duration: 8-weeks • 2 and 12-month follow up	• n=60 • Attrition: 15% • Mean age: 47.9±8.91 • Gender (female): 100% • Multisite health care centre, Canada	• Pedometer challenge (10,000 step goal) • Tracking PA and Health assessment on dedicated website • 1-hour lecture on PA and diet (baseline only) • Tracking fruit and vegetable consumption on dedicated website • No control	• Total PA (METs) - • Vigorous PA (METs) - • Moderate PA (METs) - • Walking (METs) - • Steps - • Sitting +

Ex = experimental group; Con = control group; kcal/kg/d = kilocalories/kilogram/day; PA = physical activity; BMI = body mass index; METS = metabolic equivalents
* + = $p<0.05$; +/- = marginal change or p value not reported; - no significant change

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Table 2
Risk of Bias

	Random sequence generation	Allocation concealment	Outcome blinding	Similar baseline characteristics	Power analysis	Intention to treat analysis	Missing data reported	Handling of missing data
Furukawa et al., 2003[39]	+	+	-	+	+	+	+	+
Brox &Frøystein 2005 [36]	+	+	+	+	+	+	+	+
Luszcynska & Haynes, 2009[34]	+	+	+	+	+	+	+	+
Shahar et al., 2009[30]	-	-	-	+	-	-	-	-
McElligott et al., 2010[35]	-	-	-	+	+	-	+	-
Tucker et al., 2011 [38]	-	-	-	+	-	-	+	+
Flannery et al., 2012 [37]	-	-	-	+	-	-	+	+
Baschung Pfister et al., 2013[31]	NA	NA	-	+	-	-	+	-
Lavoie-Tremblay et al., 2014[40]	NA	NA	-	+	+	-	+	-

+ = Reported; **-** = not reported; NA = not applicable to study design