

Interventions with potential to reduce sedentary time in adults – systematic review and meta-analysis

Online only supplementary material

Search strategy for Ovid Medline

1. exp adult/
2. exp men/
3. exp women/
4. adult*.tw.
5. (men or women).tw.
6. exp child/
7. or/1-5
8. 7 not 6
9. exp health promotion/
10. health education/
11. behavior therapy/
12. lifestyle/
13. Healthy People Programs/
14. (health\$ adj3 (promot\$ or educat\$ or lifestyle)).tw.
15. lifestyle intervention*.tw.
16. behavi?r change.tw.
17. Health Knowledge, Attitudes, Practice/
18. exp physical activity/
19. (activ\$ adj3 (break or breaks)).tw.
20. ((sitting or standing) adj3 break).tw.
21. active travel*.tw.
22. or/9-21
23. sedentary lifestyle/
24. (sedentary adj3 (behavi?r\$ or lifestyle or time)).tw.
25. "screen time".tw.
26. "sitting time".tw.
27. "media time".tw.
28. inactiv\$.tw.
29. video games/
30. television/
31. (television or TV).tw.
32. ((computer or video) adj3 gam\$).tw.
33. ((sitting or screen or transport or indoor) adj3 time).tw.
34. "prolonged sitting".tw.
35. or/23-34
36. 8 and 22 and 35
37. perception/
38. belief/

39. view/
40. (belief\$ or view\$ or perception\$ or experience\$).tw.
41. acceptance.tw.
42. barrier\$.tw.
43. or/37-42
44. randomized controlled trial.pt.
45. controlled clinical trial.pt.
46. randomi#ed.ab.
47. non-randomi#ed.ab.
48. quasi-random*.tw.
49. randomly.ab.
50. allocat\$.ab.
51. trial.ab.
52. group.ab.
53. controlled trial.ab.
54. quasi-experiment\$.tw.
55. exp animals/ not humans.sh.
56. or/44-54
57. 56 not 55
58. 36 and 57
59. qualitative research/
60. (qualitative adj3 (study or method or research or approach)).tw.
61. focus group/
62. interview/
63. focus group\$.ab.
64. interview\$.ab.
65. group discussion\$.ab.
66. ethnography/
67. or/59-66
68. 36 and 43 and 67
69. 58 or 68
70. limit 69 to english language
71. remove duplicates from 70

1 **Table 1: Characteristics and authors' conclusions of intervention effect of included studies**

Study ID, Country, Funding source	Participant characteristics	Study design	Intervention	Intervention setting	Intervention duration	Control condition	Attrition rates	SB primary outcome	Author's conclusion
Abascal 2008a USA National Cancer Institute	N: I=153, C=155, Mean age across groups: 43.9 ± 8.0y Gender: all males	RCT	"iPace Men in Motion": Use of a pedometer, web-based activities which included learning about and applying new behavioral skills, and reading diet and physical activity topics . Encouragement to log on weekly to report weight and progress on goals (at least 10,000 steps (5-7 d/wk) and participating in strength training two times per week).	Home based	12 months	Waiting list: Access to an alternate website and encouragement to log on monthly. The control website contained general health information of interest to men but not likely to lead to changes in diet or physical activity behaviors.	I = 32%, C = 29%, Total = 30%	no - BMI change	Decreased sedentary behaviour in favour of the intervention group
Abascal 2008b USA National Cancer Institute	N: I=140, C=146 Mean age across groups: 41.2 ± 8.7y Gender: all females	RCT	"iPace Women in Balance": Initial web-based assessment, health behavior counseling follow-up intervention via the web , and periodic phone and email interaction with a health counselor . Target behaviors for the intervention included increasing physical activity (30-60 minute goal), fruit and vegetable intake, fiber intake, and decreasing dietary fat .	General practise/home	12 months	Usual-care: Consisted of previously scheduled provider visits without health behavior counseling and a standard set of materials summarizing diet and activity recommendations	I= 32%, C = 25%, total = 29%	no - diet and PA behaviour change	No significant intervention effects on sedentary behaviour
Adams 2012 USA Funding source not reported	N: I=40, C=24 Mean age: 58.47±12.55y Gender: all female	cluster RCT (cluster size: I=4, C=3)	"On our Feet": face-to-face interactions and email messages . The content was intended to increase self-efficacy for reducing sedentary behaviour and for increasing light physical activity by highlighting mastery experiences related to both behaviors.	community	6 weeks	waiting list	I= 14%, C= 14%, Total = 18%	yes	No significant intervention effects on sedentary behaviour
Allen 2008 USA Funding source not reported	N: I=27, C=25 Mean age across groups: 57y Gender: male+female,	RCT	Provision of an activity monitor at week 1. Participants received 90 min of individualized education and physical activity counselling . This counselling protocol was designed to change efficacy beliefs about physical activity	home/community	8 weeks	Alternative treatment: The control group received 90 min of individualized diabetes education based on major components from the International Diabetes Center curriculum	Not reported	no - PA and self-efficacy behavior	Decreased combined sedentary behavior and light physical activity in favor of the intervention

	proportions not obtainable								group.
Anand 2007 Australia Funding source not reported	N (include children): I=88, C=86 Mean age: I= 41y, C= 37y Gender: not reported for adults	cluster RCT (cluster size: I=29, C= 28)	“SHARE-AP ACTION”: The intervention consisted of a regular home visit by Aboriginal health counsellors who were trained to assess and set dietary and physical activity goals for each household member.	home based	6 months	Usual care: families received Canada’s Food Guide to Healthy Eating and Canada’s Physical Activity Guide to Healthy Active Living.		no - lower Ei, more PA	No significant intervention effects on sedentary behavior on cluster level.
Andersen 2012 Norway Norwegian Extra Foundation for Health and Norwegian School of Sport Sciences, Department of Sport Medicine	N 6-months: I=76, C=50; N 12-months: I=59, C=38 Mean age: I=35.7 ±6.1y, C=39.7 ±9.2y Gender: all male	RCT	“Physical Activity and Minority Health”: The programme included structured group exercise sessions led by an exercise physiologist twice a week, two group lectures, one individual counselling session, written material and a phone call.	community	6 months	Waiting list: organised exercise (once a week for four months), one group lecture and written material after the end of the intervention.	16%/35%	No - increase of PA	Decreased sedentary behaviour in favour of the intervention group
Baker 2010 UK Scottish Government	N: I=39, C=40 Mean age: I= 47.3 ±9.3y, C= 51.2 ±7.9y Gender across groups: 20% men, 80% women	RCT	“Walking for Well-being in the West”: Physical activity consultation and pedometer-based walking program. The consultations were focused on promoting increases in walking. The overall goal was to increase mean daily step-count by 3,000 accumulated steps above baseline value on 5 days/week.	community	12 weeks	Waiting list: asked to maintain their normal walking levels	INT = 18%, CON = 20%	no - increase of walking	Decreased sedentary behaviour in favour of the intervention group

Barwais 2013 Australia Funding source not reported	N: I=18, C=15 Mean age across groups: 27 ± 4y Gender across groups: 67% men, 33% women	RCT	Interaction with an online personal activity monitor . The device was designed to motivate a reduction in sedentary behavior and increase physical activity in the activities of daily living. Data subsequently provide the user with a visualization of daily activity patterns.	home based	4 weeks	No treatment: instructed to follow the normal, daily lifestyle patterns.	0%	yes	Decreased sedentary behaviour in favour of the intervention group
Burke 2013 Australia Australian National Health and Medical Research Council grant	N: I=375, C=199 Mean age: I= 65.8±3.0y, C= 65.8 ±3.2y Gender: I=53%men, 47% women, C=51% men, 49% women	RCT	“Physical Activity and Nutrition for Seniors”: specially designed booklet that provided participants with information and promoted dietary and physical activity goal setting . Supplementary materials were an exercise chart, calendar, bi-monthly newsletters, resistance bands and pedometers. Trained group guides provided support for participants.	home based	6 months	no treatment	INT = 29%, CON = 13%	yes - (PA and nutrition behaviour)	Decreased sedentary behaviour in favour of the intervention group
Canuto 2012 Australia Australian National Health and Medical Research Council grant	N: I=51, C=49 Mean age: I=39.8y C= 40.7y Gender: all females	RCT	Women’s Fitness Program: structures 45-60min group aerobic and resistance exercise 2x/week, provision of pedometers and encouragement to reach 10,000 steps/week, 4 group nutrition and healthy lifestyle workshops	community	12 weeks	Waiting list	Not available for primary outcome	yes	Results on secondary outcomes available only
Carlson 2012 USA Funding source not reported	N: I=163, C=189 Mean age: I=44.3± 7.9y, C=42.2 ±8.7y Gender: I = 47.2% men, 52.8% women, C=48.1% men,	RCT	An interactive web-based program to help participants set goals relative to their initial status on each of the behavioral targets. Goals: increasing fruit and vegetable intake to 5–9+servings/day; decreasing total fat to 30% of total calorie consumption; increasing PA to 30–60 min/day 5–7 days/week ; increasing steps/day measured by pedometer to ≥10,000 (men only) ; and participating in	home based	12 months	Waiting list (women), attention control (men): In the men’s study, the control condition had access to a website that contained general health information topics (e.g., information on sun exposure protection and worksite injury prevention).	INT = 32%, CON = 23%	no - weight loss through dietary and physical activity changes	Decreased sedentary behaviour in favour of the intervention group

	51.9% women		strength training twice/ week targeting at least two body areas (upper-body, lower-body and core; men only).						
Chin A Paw 2006 The Netherlands Dutch Health Research Council, 'Stichting Ouderen in Beweging West-Friesland', Regional Health Care Insurance Company Univé, TechnoGym Benelux B.V. and Nijha Lochem B.V.	N: I1=40, I2=41, I3= 45, C=31 Mean age: I1=81.0±5.8y I2=82.1±4.9y I3=80.9±6.3y C=81.3±4.4y Gender: I1=27% men, 73% women, I2= 20% men, 80% women, I3=16% men, 84% women, C=16% men, 84% women	RCT	Arm 1: The resistance training program was performed twice a week in groups. Resistance increased until two sets of 8–12 repetitions were possible. Resistance was to be increased after the participant could complete two sets of 12 repetitions for two consecutive sessions. Arm 2: The functional-skills training program was performed twice a week during six months in groups consisting of 5–10 min of warm-up activities, 30–35 min of skills training in game-like and cooperative activities and cool-down period (5–10 min) Arm 3: Combination group performed once weekly the resistance training and once weekly the allround functional-skills training protocol.	home based	6 months	Attention control: Group discussions about topics of interest to older people such as history of the 20th century, music, relaxation etc.. Sessions were organized two days of the week during six months for 45–60 min in groups of 7–15 participants, supervised by a professional creative therapist.	resistance training 30%, functional-skills training 27%, combined training 21% and control group 39%. 8 participants discontinued the intervention because they found the exercise program too intensive.	no -effect on habitual PA and constipation	No significant intervention effects on sedentary behaviour
De Cocker 2012 Belgium Research Foundation Flanders, National Health and Medical Research Council of Australia' and National Heart Foundation of Australia	N: I=45 (28 sitting), C=47 (35 sitting) Mean age: I=46.6±10.9y C=47.7±11.4y Gender: I= 38% men, 62% women, C=45% men, 55% women	RCT	Pedometer intervention supplemented with computer-tailored step advice .	home based	3 months	Alternative treatment: pedometer provision	INT = 29%, CON = 22%	no - acceptability, step count	No significant intervention effects on sedentary behaviour

De Greef 2010	N: I=21,C=20 Mean age: I=61.3±6.3y, C=61.3±6.9y Gender: I=62%, 38% women, C=75% men, 25% women	RCT	Lifestyle intervention (dietary and physical activity) that consisted of five cognitive-behavioural group sessions of 90 min. In addition participants received a pedometer and a pedometer diary as motivational tools.	Community/home	12 weeks	Usual care: one single-group education on the effects of PA on diabetes care.	Week 13 (immediate post-intervention): was 9.7% (two persons in each group); Week 52 (follow up): the average dropout was 12.2% (one more participant from the IG lost interest)	yes	Decreased sedentary behaviour in favour of the intervention group
De Greef 2011	N: I=60, C=32 Mean age for both groups: 62±9y Gender for both groups: 69% men, 31% women	RCT	Consisted of a face-to-face session, a pedometer and telephone support . 30 min face-to-face sessions started with a motivational interview phase. The psychologist together with the participants made an individualized lifestyle plan . After this session patients started the telephone support program given by the psychologist.	Hostpital /home based	24 weeks	Usual care	two patients in each group dropped out	yes	Decreased sedentary behaviour in favour of the intervention group
Dunn 1998	N: I=121, C=114 Mean age: I=45.9±6.8y, C=46.2±6.5y Gender: I= 50% men, 50% women, C= 49.1% men, 50.9% women	RCT	“Project Active”: Lifestyle physical activity programme: Encouragement to engage in daily 30 min MVPA, behaviour change methods (e.g. problem solving) applied in group sessions	Community (Fitness centre)	24 months	Alternative treatment: structured exercise programme	INT = 18%, CON = 22%	no- increase in Physical Activity Energy Expenditure	Decreased sedentary behaviour in favour of the control group
Evans 2012	N: I=14, C=14 Mean age: I=49±8y, C= 39±10y Gender:	RCT	Education programme (see control group) and Point of Choice PC software: advice window that reminded participants to take a break appeared on the monitor for 1 minute every 30 minutes from	work place	5 days	Alternative treatment: 30 min. education programme on sedentary behaviour and breaking prolonged sitting time, information leaflet		Yes	Decreased duration and number of sitting events in favour of the intervention

	I= 29%men, 71% women, C= 29%men, 71% women		the time the PC was started. The window could not be minimized or moved, but participants could work in any opened windows around it.						group.
Fitzgibbon 2005 USA National Cancer Institute and Postdoctoral Research Supplement for Underrepresented Minorities	N: I _{Cohort 1} =12, I _{Cohort 2} =14, C _{Cohort 1} = 13, C _{Cohort 2} = 18 Mean age for both groups in each cohort: Cohort 1 = 44.4±7.9y, Cohort 2 = 45.1±6.9y Gender: all female	RCT	The first 90-min weekly meeting was divided into a 45-min interactive didactic component and a 45-min exercise component (structured aerobics and walking). The second weekly meeting consisted of a 45-min exercise session .	community	20 weeks	Attention control: received weekly newsletters by mail. These newsletters focused on general health topics such as first aid, smoking cessation, and screening for cancers other than breast cancer.	Cohort 1 = 17%, Cohort 2 = 5%	No - The intervention was designed to decrease weight, decrease dietary fat intake, increase physical activity, and increase BSE proficiency	No significant intervention effects on sedentary behaviour
Fitzsimons 2012 UK Scottish Government	N: I=39, C=40 Mean age: I = 47.3±9.3y, C= 51.2±7.9y Gender: I= 21% men, 79% women, C=20% en, 80% women	RCT	“Walking for Well-being in the West”: Following the 12 week walking programme (Baker 2010), participants received a second individual physical activity consultation focusing on relapse prevention strategies, encouragement and maintenance of activity. At 24 weeks participants received a written physical activity advice leaflet and at 36 weeks remote support in the form of a short telephone consultation .	community based	12 months	Alternative treatment: individualised 12 week walking programme five minutes of brief advice and a pedometer		No - increased walking	Decreased sedentary behaviour in favour of the intervention group
Gilson 2009 UK, Australia Funding source not reported	N: I1 = 60, I2 = 59, C=60 Mean age: I1=42.1±9.2y I2= 41.0±9.7y C= 40.8±11.4y Gender: I1=25% men,	RCT	Pedometer use and weekly group emails as a motivational and self-regulatory tool, participants with > 10,000 daily steps at pre-intervention were encouraged to maintain this level of workday walking and add additional steps where possible. <u>Arm 1</u> : directed to achieve step	workplace - white-collar university employees	10 weeks	Waiting list: Control group participants were asked to maintain their normal behavior over a ten-week period	missing data: 16%	yes - through increased walking/less sitting	No significant intervention effects on sedentary behaviour.

	75% women, I2= 20% men, 80% women, C = 18% men, 82% women		goal through brisk, sustained, route-based walking during work breaks campus walks supported by maps, times (10-to-45 minutes) and step count. <u>Arm 2</u> : asked to engage in incidental walking and accumulate step counts during working tasks (e.g. walking and talking to colleagues)						
Hansen 2012 Denmark TrygFonden	N: I=4435, C=4509 Mean age: I= 50.7±13.6y C=50.4±13.7y Gender: I=35% men, 65% women, C= 35% men, 65% women	RCT	Automated web-based physical activity intervention : The website was structured as three major parts: (1) a personal page, which included individually tailored PA advice and a personal profile, (2) a page with training programs and general recommendations, and (3) a forum and discussion page for questions from participants.	home based, web based	3 months?	no treatment	43.80% participation rate. Attrition rates in the 3-month questionnaire were I=42%; C=33%. Attrition rate at 6 months follow-up: I=41%, C=33%	no - increased PA	No intervention effects on sedentary behaviour
Hu 2012 China European Foundation for the Study of Diabetes (EFSD), Chinese Diabetes Society (CDS), Lilly Programme for Collaborative Research between China and Europe, Tianjin Public Health Bureau	N: I=192, C=212 Mean age: I= 32.3±3.5y, C=32.4±3.6y Gender: All females	RCT	A 2-week “run-in” period with 2 classes on general principles of lifestyle intervention for the prevention of type 2 diabetes and obesity. Dietary intervention : one-on-one meetings with a dietitian and provision of daily menu for 5 days. The physical activity goal is to gradually increase the physical activity from 15 to 30 min/day over the first 4 weeks. The level of physical activity increased to at least 30 min/day, 7 days/week over the whole trial.	home	1 year, year 2 maintenance period	Usual care: Education regarding general principles of healthy lifestyle that benefits type 2 diabetes and obesity prevention, and information about the current evidence showing that the lifestyle intervention is effective in women at high risk for type 2 diabetes.	I=67%, C=64%	no - gestational diabetes prevention	Decreased sedentary behaviour in favour of the intervention group

Jago 2013 UK British Heart Foundation	1st follow-up: INT = 23; 2nd follow-up: INT = 22 Mean age: not reported Gender: I=100% women, C=97.5% women, 2.5% men	RCT	“Teamplay”: parenting program , The content drew heavily on key issues that affected parental PA and SV behaviors . A Teamplay leader manual was produced which gave detailed session plans for the 8-week course in order to ensure consistency of delivery across groups and the meeting of learning objectives.	community	8 weeks, + 2 months follow up	no treatment: provided with written materials summarizing the intervention content at the end of the study	1st follow up: I= 8%, C=35%; 2nd follow-up: I=12%, C=52%	yes	Both groups reduced weekday TV viewing time. Group differences not assessed.
Judice 2013 Portugal Portuguese Institute of Hydration and Health	N:I=10, C=11? Mean across groups: 24.3 ± 4.5y Gender: all male	RCT (cross-over)	5 mg of caffeine per kg of body mass per day was administered. The dose of caffeine was divided into two equal parts (2.5 mg kg-1) to be orally consumed through capsules in the morning and after lunch.		4 days	placebo controlled : maltodextrin as placebo, dose (5 m kg-1day-1) and number of placebo capsules, of the same color as the caffeine capsules, containing maltodextrin were provided for the placebo condition.		yes	No intervention effects on sedentary behaviour
Kallings 2009 Schweden Swedish National Institute of Public Health, The Swedish Heart and Lung Foundation, Swedish National Centre for Research in Sports, Tornspiran Foundation, Karolinska Institutet Founds and	N: I=47, C=54 Mean age in both groups: 68y Gender: I=43% men, 57% women, C=43% men, 57% women	RCT	“Physical Activity on Prescription (PAP)”: 30 minutes of patient centred counselling and individualized written prescription of PAP . Participants in the intervention group were encouraged to reduce their time spent in sedentary behaviour .	GP practice	6 months	Alternative treatment: low-intensity intervention, with one page of written general information about the importance of PA for health.	INT = 13%, CON = 7%	yes	No group differences in sedentary behaviour

Capio Foundation.									
Katzmarzyk 2011 USA ARS/USDA cooperative agreement, Louisiana Public Facilities Authority Endowed Chair in Nutrition.	N: I=20, C=23 Mean age: I=52.7±8.8y, C=50.3±7.7y Gender: I= 20.0% men, 89% women, C= 13.0% men, 87% women	RCT	Education +pedometer: physical activity brochure (for description see control group) and pedometer. Walking with an interventionist for approximately 10 minutes to build self-efficacy for walking at MVPA and to observe how quickly steps accrued. Specific strategies discussed and encouragement to increase steps/day by an amount that would approximate USDA guidelines for the prevention of weight gain.	home	1 week	Alternative treatment: brochure detailing the importance of physical activity for maintaining health, the physical activity guidelines, and strategies to increase physical activity levels	INT = 23%, CON = 18%	no - increase in MVPA	No intervention effects on sedentary behaviour
Lakerveld 2013 The Netherlands Netherlands Organization for Health Research and Development	N at 6 months: I =267, C=269, N at 1 year: I=249, C=253, N 2 years: I=242,C=249 Mean age: I= 43.6± 5.1y, C=43.4± 5.5y Gender: I=43% men, 57% women, C= 59% men, 41% women	RCT	“Hoorn Prevention Study”: In a maximum of six individual 30-min counseling sessions, followed by 3-monthly sessions by phone , an innovative combination of motivational interviewing and problem solving treatment were used. The participants were free to choose which lifestyle component(s) (smoking, physical activity or diet) they wanted to change.	GP practice	6 months	Alternative treatment: health brochure with information and guidelines with regard to healthy physical activity levels, a healthy diet and smoking cessation.	6month: INT = 15%, CON = 13%, 1 year: INT = 21%, CON = 18%, 2 years: INT = 23%, CON = 19%	yes	No intervention effects on sedentary behaviour. Stratified analyses for educational attainment revealed a small and temporary between-group difference in favour of the intervention group, in those who finished secondary school.

Lane 2010 Ireland Funding source not reported	N: I=55,C=57 Age: 84% were aged between 21y and 49y Gender: all female	RCT	The intervention consisted of two print booklets , specific to initial and later stages of motivational readiness. The booklets contained information and strategies designed to alter self-efficacy, social support, outcome expectancy and barriers to physical activity .	home	6 weeks	Attention control: Healthy eating and nutrition booklet developed by the Irish Heart Foundation, An Bord Bia and the Health Promotion Unit.	INT = 35%, CON = 37%	no - PA and self-efficacy behaviour	Reduced sitting time in favour of the control group
Lioret 2012 Australia Funding source not reported	N: I=179,C=178 Mean age: I=32.5±4.2y, C=32.0±4.4y Gender: all female	cluster RCT cluster size = 14 local government areas	“Melbourne InFANT Program”: focused on parenting skills and behaviors that aimed to promote the development of healthy eating and physical activity behaviors in infants, along with reduced sedentary behaviors . This dietician-delivered intervention comprised six 2-hour sessions delivered quarterly during the regular meeting time of the first-time parents’ group. Intervention materials incorporated six key messages within a DVD and written handouts.	home based	18 months	Usual care/attention control: newsletters regarding generic issues in child health	INT = 10%, CON = 8%	yes	No significant intervention effect on sedentary behaviour
Lopez-Fontana 2009 Spain Navarra Government, CIBERobn, and the Special Research Line of Nutrition, Obesity and Health of the University of Navarra, Friend’s	N: I=19, C=21 Mean age: I=34.2±6.2y, C=34.5±7.9y Gender: all female	RCT	Low-CHO–high-fat diet : Each volunteer received a plan detailing the food distribution, quantities of each food, weekly meal menu, quantity of oil permitted per day, recipes and cooking techniques, and specific suggestions.		10 weeks (Sedentary behaviour assessment after 5 weeks)	Alternative treatment: high-carbohydrate–low-fat diet . Each volunteer received a plan detailing the food distribution, quantities of each food, weekly meal menu, quantity of oil permitted per day, recipes and cooking techniques	0% in each group	no - weight change/loss	No post-intervention group differences in sedentary behaviour reported

Association of the University of Navarra									
Marshall 2003	N: I=327, C=328	RCT	PA program delivered via an interactive stage-targeted website and e-mail. The "Active Living" website was based on the content of the "Active Living" booklets. The website included interactive and animated features, stage-based quizzes with feedback on responses, as well as personalized sections on goal setting, activity planning, determining target heart rates, and a PA readiness questionnaire.	home based	8 weeks	Alternative treatment: Physical activity program delivered via print. The print intervention included the previously tested "Active Living" booklets, additional behavioral reinforcement letters were sent to participants every 2 weeks	INT = 24%, CON = 20%	no - increase in PA	Reduced weekday sitting time in favour of the intervention group
Australia National Heart Foundation of Australia	Mean age: I= 43±10y, C=43±11y Gender: I=50% men, 50% women, C=47% men, 53% women								
McGuire 2001	N: I=306, I2=305, C=613	RCT	Arm 1: Education only group which received monthly newsletters that emphasized self-weighing, increased servings of fruits and vegetables, decreased servings of high-fat foods, and walking. The monthly newsletters were mailed to participants for the 3y of the intervention. Arm 2: Education plus lottery incentive group. This group received the same monthly newsletters as the education-only group but, in addition, they were entered into a lottery drawing for \$100 if they returned their adherence postcard.	community	3 yrs	no treatment	Not reported	no - weight gain prevention	No group effects reported
USA Funding source not reported	Mean age across groups: 35.2±6.3y Gender across all groups: 21% men, 79% women								
Morrison 2013	N: I=16, C=12	RCT	Children, parents and the pet dog being physically active together by providing information on dog walking routes and promoting various forms of active play with the dog both indoors and outdoors. Intervention families received	family	10 weeks	no treatment	INT = 6%, Con = 0%	No - feasibility, increase the frequency, intensity, and duration of dog-walking/playing with the family	No significant intervention effect on sedentary behaviour
UK Henry Dryerre Scholarship,	Mean age for groups: 44.8 y Gender for								

administered by the Carnegie Trust for the Universities of Scotland. Medical Research Council Population Health Scientist Fellowship	both groups: 18% men, 82% women,		one home visit in week 0 (at baseline following outcome measures) from a qualified animal behaviourist and two further home visits in weeks 1 and 6 from a PA research assistant. In addition, intervention families received telephone calls (weeks 2 and 8) and text messages (weeks 4 and 10) to review goal progress, address questions and provide encouragement.					dog	
Mutrie 2012 UK Chief Scientist Office [CSO] Scotland NHS Research and Development from Greater Glasgow and Clyde and the Scottish Primary Care Research Network.	N: I=20, C=19 Mean age: I=71.6±6.0y, C=70.0±4.3y Gender: I= 35% men, 65% women, C= 29% men, 71% women	RCT	Two 30-minute physical activity consultations were delivered individually to each participant by a practice nurse. The consultations followed recommended guidelines. The initial consultation aimed to increase walking participation . A 12-week individualized graduated walking programme in the form of a specially designed booklet and pedometer was given to participants.	GP practice	12 weeks	Waiting list: asked to continue normal PA for the first 12 weeks	INT = 0%, CON 1st follow-up = 10%, 2nd follow-up = 19%	No - feasibility and increased walking	Decrease of sedentary behaviour in favour of the intervention group
Opdenacker 2008 Belgium Funding source not reported	N: I=33, C=33 Mean age: I=38.8±11.4, C=39.9±9.9 Gender: Men+ women, proportion not reported	RCT	For both groups, the coaching program started with a face-to-face intake session . During this session the coach designed an individualized physical activity program in accordance with the preferences and habits of the participant. The main goal was to attain the recommended ACSM/CDC amount of physical activity . The coach further provided a brochure that included information, tips, and	workplace - University: professors, academic assistants, technical assistants	3 months	Alternative treatment: coach designed an individualized physical activity program in accordance with the preferences and habits of the participant in a face-to-face session. The coach further provided the employee with a 20-page colorful brochure that included information, tips, and examples on how to	both groups 27%	no - effect on PA and mental health	Reduced sitting time in both groups with no significant group differences

			examples on how to become more physically active. In the face-to-face group, these 4 support contacts were in person.			become more physically active. Further support was given by telephone			
Ostbye 2009 USA National Institute of Diabetes and Digestive and Kidney Diseases	N: I=214, C=207 Mean age: I=30.6±5.8y C=31.2± 5.3y Gender: all female	RCT	Eight healthy eating sessions (Mom's Time Out [MTO] classes); ten physical-activity group sessions (ACTIVMOMS classes); and six telephone-counseling sessions (20 minutes). They were also provided with a study notebook with exercises, recipes, and other intervention-related information; and a pedometer. Given the intervention's strong emphasis on walking , a sport stroller was provided to encourage walking for exercise outside of class and after the end of the intervention.	Community	9 months	Usual care: received biweekly newsletters with general tips for postpartum mothers	INT = 18%, CON = 23%	no - postpartum weight management	No significant intervention effects for reducing sedentary behaviour
Papalazarou 2010 Greece Funding source not reported	N: I=15, C=15 Mean age: I=32.7±1.6y, C=33.4±2.0y Gender: all female	RCT	Instruction to follow a liquid diet of very low calorie content for 4 weeks. Following this period, soft and solid foods were gradually introduced to the diet of both groups. Additional 40min of individual counseling: Aim of the intervention was to help patients to overcome barriers and regulate their body weight by adopting healthier eating habits and a less sedentary lifestyle .	Dietetics Department	3 years	Usual care: Instructed to follow a liquid diet of very low calorie content for 4 weeks. Following this period, soft and solid foods were gradually introduced to the diet of both group. During these assessment sessions general information was provided on adopting healthier eating and physical habits.	Not reported	no - weight loss and maintenance, dietary and PA behaviour	Decreased TV viewing time in favour of the intervention group
Parry 2013 Australia Funding source not reported	N: I1=19, I2=14, C=29 Mean age across the groups: 43.5y Gender across the groups: 19% men, 81% women	cluster RCT	<u>Arm 1</u> : 'active office work' intervention - access to a single ' Active Workstation ' which consisted of an electronically height adjustable desk with integrated treadmill or a treadmill plus a stationary cycle ergometer. It was recommended that the Active Workstation be used for short periods several times a day, starting at 10 minutes and building up to 30 minutes per session.	work place - office workers (clerical, data entry and call centre workers) from 3 government	12 weeks	Alternative treatment /attention control: 'office ergonomics' intervention which focused on computer workstation setup, 'active' sitting (moving whilst in the chair) and breaking up computer tasks	INT 1 = 61%, INT 2 = 53%, Con = 46%	yes	Both groups reduced sitting time and increased sitting breaks without significant groups differences

			Arm 2: traditional physical activity' intervention - focused on strategies to promote light to moderate activity in breaks between productive work times and increasing the use of active transport before and after work. Participants were all provided with a pedometer to use as a motivational tool	organisations					
Pederson 2013 Australia Funding source not reported	N: I=17, C=17 Mean age: I=41.5± 12.4y, C=43.9± 9.7y Gender across groups: 24% men, 76% women	RCT	15-minute educational session on the negative health effects associated with prolonged sitting , general instructions on performing appropriate workplace physical activity (20 minutes), and an information session on using the Exertime software (30 minutes). This software was designed to prompt employees to periodically break long periods of sitting by standing up to engage in a short period of physical activity during their work hours. The prompting intervention automatically deactivated employees' computer screens every 45 minutes and the end-users were unable to exit the program or ignore the prompt.	workplace - desk-based Tasmania Police 174 employees from across several metropolitan sectors	13 weeks	Alternative treatment /waiting list: 15-minute educational session on the negative health effects associated with prolonged sitting, general instructions on performing appropriate workplace physical activity (20 minutes), and an information session on using the Exertime software (30 minutes). No e-health software loaded on their computers for a 13 week period.	INT = 0%, CON = 0%	yes	Decreased sitting behaviour at work in favour of the intervention group
Poston 2013 UK National Institute for Health Research, Guys and St.Thomas' Charity, Chief Scientist Office, Tommy's Charity	N: I= 56, C=54 Mean age: I=30.4±5.7y, C=30.7±4.9y Gender: all female	RCT	Participants attended a one to-one appointment where women were provided with a participant handbook , a pedometer , a log book for weekly SMART goals and related behaviours (steps, PA and diet) and a DVD of a specially devised pregnancy exercise regime and were invited to weekly group sessions for 8 consecutive weeks from approximately 19 weeks' gestation. All women attended routine antenatal care appointments and received	hospital and community children's centre	28 weeks	Usual care: routine antenatal visits	Actigraph data: INT = 62%, CON = 56%	no - changes in diet and physical activity behaviours	No significant intervention effect on sedentary behaviour

			advice regarding diet and physical activity (PA) in accordance with local policies, which draw on UK NICE guidelines.						
Reynor 2013a USA Feasibility grant from the University of Tennessee Obesity Research Center	N: I=12, C=12 Mean age: I= 53.3±8.0y C=51.7±10.0y Gender: I=10% men, 90% women C=20% men, 80% women	RCT	Energy restriction + TV decrease: Participants were instructed to consume a standard energy- and fat-restricted diet. Intervention consisted of 8, 60-minute group meetings . Participants were instructed to gradually reduce their TV watching time to 10 hours per week .	research centre/home	8 weeks	Alternative treatment: Energy restriction and instruction to gradually increase MVPA to at least 40 minutes per day, 5 days per week. Participants were encouraged to do brisk walking and accumulate time spent in MVPA. 8 group meetings	I = 25%, C = 17%	yes	No significant intervention effect for TV viewing time
Reynor 2013b USA Feasibility grant from the University of Tennessee Obesity Research Center	N: I=14, C=14 Mean age: I= 54.9±7.4y C=53.3±9.1y Gender: I=27% men, 73% women C=27% men, 73% women	RCT	Energy restriction + TV decrease + PA increase: Intervention consisted of 8, 60-minute group meetings. Participants were instructed to consume a standard energy- and fat-restricted diet, to reduce TV watching to 10 hours/week and to gradually increase MVPA to at least 40 minutes per day, 5 days/week. Participants were encouraged to do brisk walking and accumulate time spent in MVPA. Participants were given a pedometer . Home visits occurred so that the code that the participants used to watch TV on the TV Allowances was set to limit TV watching accordingly to meet target.	research centre/home	8 weeks	Alternative treatment: Energy restriction and instruction to gradually increase MVPA to at least 40 minutes per day, 5 days/week. Participants were encouraged to do brisk walking and accumulate time spent in MVPA. Provision of a pedometer.	I= 36%, C = 14%	yes	Reduced TV viewing time in favour of the intervention group

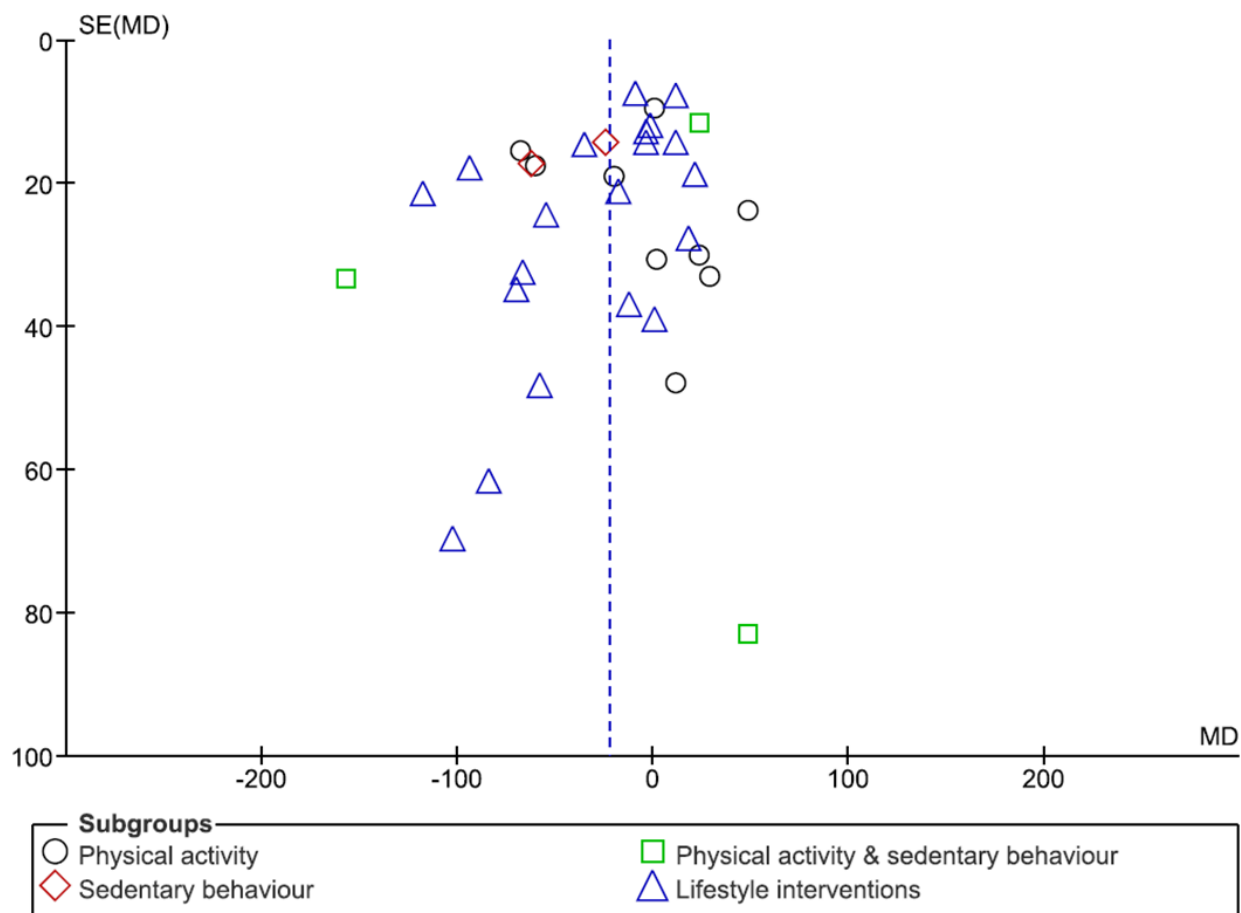
Robertson 2013	N: I=11, C=11 Mean age: I=43.2± 10.4y C=46.2±12.5y Gender: all female	RCT	Ergonomics training: sit-stand workstation. 1,5 h group coaching and mandatory experiential practice period , where participants were asked to stand once for 5 min in the middle of the 50min session, and three days later to stand once for 20 min in the middle of the 50 min session. Reminders were also presented once every three days in the morning and they contained three helpful tips regarding office ergonomics principles.	workplace	4 weeks	Alternative treatment: Sit-stand workstation with separate adjustments for the monitor and main table work surface. Group received no coaching, ergonomics reminders, or mandatory sit/stand periods.	Not reported	no - musculo-skeletal discomfort	Reduced sitting time at work in favour of the intervention group
Rosenberg 2010	N: I=46, C=41 Mean age across the groups: 84.1y (range: 69-98y) Gender across the groups: 34% men, 66% women	cluster RCT; (ICC for sedentary behaviour = 0)	Provision of pedometer , Information provided in print materials included: safe walking tips, benefits of walking, overcoming barriers to walking, and summaries of recommendations for walking with health conditions. Group meetings lasted approximately 30 minutes and included a check-in with residents to share any relevant walking stories from the previous week, a brief didactic on the weekly topic, and time for residents to problem-solve difficulties as a group. To deliver individualized feedback and assistance, brief (5-10 minutes) biweekly individual telephone counseling . Provision of walking maps.	Retirement community	12 weeks	Alternative treatment: handouts on goal-setting so participants could set their own step goals.	I=22%, C=32%	No - increased walking	No intervention effect on sedentary behaviour
Slootmaker 2009	N 3 months: I = 46, C=42; N 8 months: I= 38, C=38 Mean age: I=32.5±3.4y, C=31.2±3.5y Gender: I=39% men,	RCT	The intervention group received the Personal Activity Monitor (PAM) and was provided with Web-based tailored physical activity advice (PAM COACH) . Based on the user's uploaded PAM score for the first week, the PAM COACH assigns a lower goal that increases daily until the PAM goal score is reached at the end of the intervention period.	workplace - office workers	3 months	Alternative treatment: single written information brochure with brief general PA recommendations and health benefits of PA.	3 months: I= 6%, C=2%; 8 months: I=25%, C=18%	yes	No intervention effect on sedentary behaviour

Development	61% women, C= 41% men, 59% women		The uploaded PAM scores are automatically accompanied by tailored physical activity advice and motivational tips for increasing physical activity.						
Spring 2012 USA Three different National Institutes of Health grants	N: I= 53, I2= 44, C1=47, C2=48 Mean age: I1=30.8±10.8y I2=35.0±12.1y C1=31.9±9.7y C2=33.4±10.8y Gender: I1=23% men, 77% women I2=25% men, 75%women C1=17%men, 83% women C2=29% men, 71% women	RCT	Make better choices: (behavioural choice theory) ARM 1 - ↓Fat ↓Sedentary behaviour: decrease saturated fat consumption to < 8% per day and decrease targeted sedentary leisure activity to < 90 minutes/day; ARM 2 - ↑Fruits & Vegetables (FV) ↓Sedentary behaviour: increase FV consumption to > 5/day and decrease sedentary leisure activity to < 90 min/day. For the first week of treatment, daily goals were set midway between the baseline behavior and the ultimate daily goal. Beginning the second treatment week, full goals were set for the 2 targeted behaviors. During the 3 treatment weeks, participants uploaded data daily (PDA) and communicated as needed with their coaches via telephone or e-mail , per preference, to overcome challenges.	home based	3 weeks	Alternative treatment: ARM 1 - decrease saturated fat to < 8%/day and increase physical activity to > 60 min/day ARM 2 - increase fruit and vegetable consumption to >5/day and increase moderate-vigorous physical activity to >60 minutes/day	I1 = 25%, I2 = 0%, C1= 4%, C2 = 0%	no - general health behaviour change	Significant reduction of sedentary behaviour in intervention arm 2 compared to other intervention groups
Steeves 2012 USA Plus One Active Research Grant on Wellness from the American College of Sports Medicine Foundation	N: I=29, C=29 Mean age: I=53.8±6.8y C=50.2±9.8y Gender: I=20% men, 80% women, C=32% men, 68% women	RCT	Instructed to stand and “briskly” step in place, or “briskly” walk continuously around the room/ house for the duration of each commercial break during at least 90 min of TV programming at least 5 d/wk. Participants were instructed to step in place at a “moderate pace” (e.g., 100–120 steps per minute), Participants reviewed appropriate stepping-in-place or walking around the room pace and technique during each the first 3 face-to-face meetings.	home based	6 months	Alternative treatment: Walking group. Participants were instructed to walk “briskly” for at least 30 min at least 5 d/wk. Participants built up to walking 30 min/d over the first 3 weeks; increasing duration from 10 min/d in week 1, to 20 min/d in week 2, to 30 min/d for the remainder of this study. Participants were instructed to walk for 30	I=21%, C=17%	no - feasibility, increase of PA	Both groups decreased TV viewing time with no significant group differences.

						min continuously or break their walking up into bouts of at least 10 min.			
Sternfeld 2009 USA Centre for Disease Control	N: I=351, C=436 Mean age: I=44.8±10.0y, C=43.5±11.0y Gender: I=27% men, 73% women C=25% men, 75% women	cluster RCT cluster size= 192 departments of a health care delivery system	“ALIVE”: delivered by e-mail designed to increase both the consumption of fruits and vegetables and physical activity and to decrease the consumption of saturated fats, trans fats, and added sugars. Participants choose to work on one of three paths (increasing physical activity; increasing fruits and vegetables [fruits/vegetables]; or decreasing fats and sugars [fats/sugars]); the messages they subsequently receive are specific to the chosen path. The participant chooses one or two of those goals for the week; once a selection is made, a personal home page opens with tips for achieving the selected goal(s), along with other modules.	work site - the nation’s oldest and largest nonprofit , integrated healthcare-delivery system	16 weeks	no treatment	16 weeks: I=34%, C=27%; 4 months: I=49%, C=41%	no	No intervention effect on sedentary behaviour
Thompson 2008 USA Funding source not reported	N: I=100, C=100 Mean age: I=29.6±6.6y C=28.9±6.7y Gender: All female	RCT	The final intervention consisted of five discussion-format group sessions (one per month for five months). Sessions lasted 2 to 2.5 hours and included learning to read food labels, strategies for choosing healthier foods when eating out or snacking, taste-testing of healthy meals, and dissemination of inexpensive recipes for at-home preparation of foods to increase vegetable and fruit intake and decrease saturated fats. Weather permitting, the facilitator led a 15-minute outdoor walk at the beginning of each session.	community	18 months	Attention control : participants received mailings of a Native health magazine	Across groups: 6 months : 18% ; 12 months: 23%; 18 months: 32%	no - diabetes prevention, diet + increased physical activity	Both groups decreased TV viewing time. No significant group difference.

van Berkel 2014 The Netherlands Nuts Ohra Foundation	N: I=129, C=128 Mean age: I=46.0±9.4y C= 45.1±9.6y Gender: I= 37% men, 63% women, C=29% men, 71% women	RCT	The Mindful VIP intervention comprised 8 weeks of in company mindfulness training with homework exercises, followed by 8 sessions of e-coaching . The weekly mindfulness training sessions took 90 minutes and were held in a room at the worksite in a group setting. The homework exercises comprised a variety of meditation and informal exercises such as breathing exercises when starting up the computer, and grocery shopping mindfully and took approximately 30 min/day on 5 days/week. Materials for this training consisted of 2 cd's with guided meditation exercises and a booklet with examples of workplace situations, background and (workplace) exercises. Lunch walking routes, and a buddy-system were offered as supportive tools.	work site - employees from two Dutch research institutes	6 months	no treatment	6 months: I=6%, C=11%, 12 months: I=6%, C=13%	yes	No intervention effect on sedentary behaviour
Verweij 2012 The Netherlands The Netherlands Organisation for Health Research and Development	N: I=210, C=206 Mean age: I= 46±8y, C=48±9y Gender: I=62%men, 38% women C=65% men, 35% women	cluster RCT cluster size = 16 practices of occupational physicians	Guideline based care: Prevention at the environmental level (advice for the employer), (b) prevention at the individual level (advice for the employee) and (c) evaluation and maintenance of a) + b). Physician led behaviour change counselling to promote employees' healthy lifestyle in five 20-30 min counselling sessions. In the first counselling session, employees could choose which target behaviour they would like to discuss (increasing physical activity, decreasing sedentary behaviour, increasing fruit consumption or reducing the energy intake derived from snacks). Employees were provided with a toolkit containing a waist	work site - Employees of Occupational Physicians	6 months	Usual care: health risk appraisal with anthropometric measurements and a subsequent health advice	I = 23%, C = 17%	yes	Reduced sedentary behaviour at work in favour of the intervention group but not during leisure time

			circumference measure tape, a pedometer, leaflets on physical activity and nutrition from the Dutch Heart Foundations and the Netherlands Nutrition Centre						
--	--	--	---	--	--	--	--	--	--



Supplement figure 1: Funnel plot of the intervention effect for reducing sitting time in minutes/day in adults by type of intervention

Sensitivity analyses for effect of interventions with the potential to reduce sedentary behaviour in adults

Sensitivity analyses were used to test the influence of study characteristics on the robustness of the review results. The effect of the following characteristics was explored: ‘high risk’ of performance and attrition bias (Tables 2 and 3), cluster designs (Table 4), usual care or alternative treatment control groups (Table 5). The tables show the pooled intervention effects when studies meeting the above characteristics were excluded from the analyses.

Table 2: Sensitivity analysis for studies of ‘high’ risk of performance bias

Outcome or Subgroup	n Studies	n Participants	Statistical Method	Effect Estimate [min/day]
All interventions	20	3818	Mean Difference (IV, Random, 95% CI)	-17.38 [-35.55, 0.80]
Physical activity	9	1729	Mean Difference (IV, Random, 95% CI)	-6.60 [-33.27, 20.07]
Sedentary behaviour	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
Physical activity & sedentary behaviour	1	257	Mean Difference (IV, Random, 95% CI)	23.60 [0.78, 46.42]
Lifestyle interventions	10	1832	Mean Difference (IV, Random, 95% CI)	-35.48 [-65.26, -5.69]

Table 3: Sensitivity analysis for studies of ‘high’ risk of attrition bias

Outcome or Subgroup	n Studies	n Participants	Statistical Method	Effect Estimate [min/day]
All interventions	21	3054	Mean Difference (IV, Random, 95% CI)	-28.32 [-47.06, -9.58]
Physical activity	5	1050	Mean Difference (IV, Random, 95% CI)	-0.16 [-42.91, 42.59]
Sedentary behaviour	2	62	Mean Difference (IV, Random, 95% CI)	-41.76 [-78.92, -4.60]
Physical activity & sedentary behaviour	2	290	Mean Difference (IV, Random, 95% CI)	-63.46 [-239.39, 112.46]
Lifestyle interventions	12	1652	Mean Difference (IV, Random, 95% CI)	-34.22 [-59.12, -9.31]

Table 4: Sensitivity analysis for cluster RCTs

Outcome or Subgroup	n Studies	n Participants	Statistical Method	Effect Estimate [min/day]
All interventions	30	4861	Mean Difference (IV, Random, 95% CI)	-25.91 [-41.29, -10.53]
Physical activity	10	1849	Mean Difference (IV, Random, 95% CI)	-8.45 [-32.16, 15.26]
Sedentary behaviour	2	62	Mean Difference (IV, Random, 95% CI)	-41.76 [-78.92, -4.60]
Physical activity & sedentary behaviour	2	290	Mean Difference (IV, Random, 95% CI)	-63.46 [-239.39, 112.46]
Lifestyle interventions	16	2660	Mean Difference (IV, Random, 95% CI)	-33.55 [-55.90, -11.20]

Table 5: Sensitivity analysis for studies with usual care and alternative treatment as control condition

Outcome or Subgroup	n Studies	n Participants	Statistical Method	Effect Estimate [min/day]
All interventions	12	1898	Mean Difference (IV, Random, 95% CI)	-30.17 [-51.79, -8.54]
Physical activity	5	772	Mean Difference (IV, Random, 95% CI)	-32.14 [-61.49, -2.80]
Sedentary behaviour	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
Physical activity & sedentary behaviour	2	290	Mean Difference (IV, Random, 95% CI)	-63.46 [-239.39, 112.46]
Lifestyle interventions	5	836	Mean Difference (IV, Random, 95% CI)	-17.62 [-36.94, 1.70]

References

REFERENCES

1. Barnes J, Behrens TK, Benden ME, et al. Letter to the Editor: Standardized use of the terms "sedentary" and "sedentary behaviours". *Applied Physiology Nutrition and Metabolism-Physiologie Appliquee Nutrition Et Metabolisme* 2012;**37**(3):540-42.
2. Owen N, Salmon J, Koohsari MJ, et al. Sedentary behaviour and health: mapping environmental and social contexts to underpin chronic disease prevention. *Br J Sports Med* 2014;**48**(3):174-7.
3. de Rezende LFM, Lopes MR, Rey-López JP, et al. Sedentary Behavior and Health Outcomes: An Overview of Systematic Reviews. *PloS one* 2014;**9**(8):e105620.
4. Dempsey PC, Owen N, Biddle SJ, et al. Managing sedentary behavior to reduce the risk of diabetes and cardiovascular disease. *Current diabetes reports* 2014;**14**(9):1-11.
5. Dunstan DW, Howard B, Healy GN, et al. Too much sitting--a health hazard. *Diabetes research and clinical practice* 2012;**97**(3):368-76.
6. Katzmarzyk PT, Church TS, Craig CL, et al. Sitting time and mortality from all causes, cardiovascular disease, and cancer. *Med Sci Sports Exerc* 2009;**41**(5):998-1005.
7. Matthews CE, George SM, Moore SC, et al. Amount of time spent in sedentary behaviors and cause-specific mortality in US adults. *The American journal of clinical nutrition* 2012;ajcn. 019620.
8. Seguin R, Buchner DM, Liu J, et al. Sedentary behavior and mortality in older women: the Women's Health Initiative. *Am J Prev Med* 2014;**46**(2):122-35.
9. Van der Ploeg HP, Chey T, Korda RJ, et al. Sitting time and all-cause mortality risk in 222 497 Australian adults. *Archives of internal medicine* 2012;**172**(6):494-500.
10. Healy GN, Dunstan DW, Salmon J, et al. Breaks in Sedentary Time: Beneficial associations with metabolic risk. *Diabetes Care* 2008;**31**(4):661-66.
11. Bailey DP, Locke CD. Breaking up prolonged sitting with light-intensity walking improves postprandial glycemia, but breaking up sitting with standing does not. *Journal of science and medicine in sport / Sports Medicine Australia* 2014.
12. Peddie MC, Bone JL, Rehrer NJ, et al. Breaking prolonged sitting reduces postprandial glycemia in healthy, normal-weight adults: a randomized crossover trial. *The American Journal of Clinical Nutrition* 2013.
13. Dunstan DW, Kingwell BA, Larsen R, et al. Breaking up prolonged sitting reduces postprandial glucose and insulin responses. *Diabetes Care* 2012;**35**(5):976-83.
14. Proper KI, Singh AS, van Mechelen W, et al. Sedentary Behaviors and Health Outcomes Among Adults A Systematic Review of Prospective Studies. *American Journal of Preventive Medicine* 2011;**40**(2):174-82.
15. Rezende LF, Rey-Lopez J, Matsudo VK, et al. Sedentary behavior and health outcomes among older adults: a systematic review. *BMC Public Health* 2014;**14**(1):333.
16. Chau JY, Grunseit AC, Chey T, et al. Daily sitting time and all-cause mortality: a meta-analysis. *PloS one* 2013;**8**(11):e80000.
17. Thorp AA, Owen N, Neuhaus M, et al. Sedentary behaviors and subsequent health outcomes in adults: a systematic review of longitudinal studies, 1996–2011. *American journal of preventive medicine* 2011;**41**(2):207-15.

18. Wilmot E, Edwardson C, Achana F, et al. Sedentary time in adults and the association with diabetes, cardiovascular disease and death: systematic review and meta-analysis. *Diabetologia* 2012;**55**:2895-905.
19. Healy GN, Clark BK, Winkler EAH, et al. Measurement of Adults' Sedentary Time in Population-Based Studies. *American Journal of Preventive Medicine* 2011;**41**(2):216-27.
20. Harvey J, Chastin S, Skelton D. Prevalence of Sedentary Behavior in Older Adults: A Systematic Review. *International Journal of Environmental Research and Public Health* 2013;**10**(12):6645-61.
21. Rhodes RE, Mark RS, Temmel CP. Adult Sedentary Behavior: A Systematic Review. *American journal of preventive medicine* 2012;**42**(3):e3-e28.
22. Biddle SJ, Petrolini I, Pearson N. Interventions designed to reduce sedentary behaviours in young people: a review of reviews. *British journal of sports medicine* 2014;**48**(3):182-86.
23. Prince SA, Saunders TJ, Gresty K, et al. A comparison of the effectiveness of physical activity and sedentary behaviour interventions in reducing sedentary time in adults: a systematic review and meta-analysis of controlled trials. *Obesity Reviews* 2014;**15**(11):905-19.
24. Martin A, Saunders D, Jepson R, et al. Interventions to influence sedentary behaviour in adults: systematic review and meta-analysis. http://www.crd.york.ac.uk/PROSPERO_REBRANDING/display_record.asp?ID=CRD42014007064: PROSPERO International prospective register of systematic reviews, 2014.
25. Higgins JPT, Green S, editors. *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]*: The Cochrane Collaboration., 2011.
26. GRADEpro [program]. 3.2 for Windows version, 2008.
27. Review Manager [program]. 5.2 version. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2012.
28. Aadahl M, Linneberg A, Witte D, et al. Reduction of sitting time in sedentary men and women. A randomized controlled trial (Sedentary Intervention Trial). *Journal of Science and Medicine in Sport Conference: Be Active 2012*;**15**(pp S302).
29. Abascal LB. The effect of depression and adherence in a dietary and physical activity intervention for overweight and obese adults. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2008;**69**(4-B):2614.
30. Allen NA, Fain JA, Braun B, et al. Continuous glucose monitoring counseling improves physical activity behaviors of individuals with type 2 diabetes: A randomized clinical trial. *Diabetes Research & Clinical Practice* 2008;**80**(3):371-9.
31. Andersen E, Burton NW, Anderssen SA. Physical activity levels six months after a randomised controlled physical activity intervention for Pakistani immigrant men living in Norway. *International Journal of Behavioral Nutrition & Physical Activity* 2012;**9**:47.
32. Barwais FA, Cuddihy TF, Tomson LM. Physical activity, sedentary behavior and total wellness changes among sedentary adults: A 4-week randomized controlled trial. *Health and Quality of Life Outcomes* 2013;**11**(1).
33. Burke L, Lee AH, Jancey J, et al. Physical activity and nutrition behavioural outcomes of a home-based intervention program for seniors: a randomized

- controlled trial. *International Journal of Behavioral Nutrition & Physical Activity* 2013;**10**:14.
34. Carlson JA, Sallis JF, Ramirez ER, et al. Physical activity and dietary behavior change in Internet-based weight loss interventions: comparing two multiple-behavior change indices. *Preventive Medicine* 2012;**54**(1):50-4.
 35. Chin APMJ, Poppel MN, Mechelen W. Effects of resistance and functional-skills training on habitual activity and constipation among older adults living in long-term care facilities: a randomized controlled trial. *BMC Geriatrics* 2006. <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/914/CN-00566914/frame.html>.
 36. De Cocker K, Spittaels H, Cardon G, et al. Web-based, computer-tailored, pedometer-based physical activity advice: development, dissemination through general practice, acceptability, and preliminary efficacy in a randomized controlled trial. *Journal of Medical Internet Research* 2012;**14**(2):e53.
 37. De Greef K, Deforche B, Tudor-Locke C, et al. A cognitive-behavioural pedometer-based group intervention on physical activity and sedentary behaviour in individuals with type 2 diabetes. *Health Education Research* 2010(5):724-36.
 38. De Greef KP, Deforche BI, Ruige JB, et al. The effects of a pedometer-based behavioral modification program with telephone support on physical activity and sedentary behavior in type 2 diabetes patients. *Patient Education & Counseling* 2011;**84**(2):275-9.
 39. Dunn AL, Marcus BH, Kampert JB, et al. Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: a randomized trial. *JAMA* 1999;**281**(4):327-34.
 40. Evans RE, Fawole HO, Sheriff SA, et al. Point-of-choice prompts to reduce sitting time at work: a randomized trial. *American Journal of Preventive Medicine* 2012;**43**(3):293-7.
 41. Fitzsimons CF, Baker G, Gray SR, et al. Does physical activity counselling enhance the effects of a pedometer-based intervention over the long-term: 12-month findings from the Walking for Wellbeing in the west study. *BMC Public Health* 2012;**12**:206.
 42. Hu G, Tian H, Zhang F, et al. Tianjin Gestational Diabetes Mellitus Prevention Program: study design, methods, and 1-year interim report on the feasibility of lifestyle intervention program. *Diabetes Research & Clinical Practice* 2012;**98**(3):508-17.
 43. Jago R, Sebire SJ, Turner KM, et al. Feasibility trial evaluation of a physical activity and screen-viewing course for parents of 6 to 8 year-old children: Teamplay. *The International Journal of Behavioral Nutrition and Physical Activity* 2013. <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/090/CN-00864090/frame.html>.
 44. Judice PB, Matias CN, Santos DA, et al. Caffeine Intake, Short Bouts of Physical Activity, and Energy Expenditure: A Double-Blind Randomized Crossover Trial. *PLoS ONE* 2013;**8**(7).
 45. Lakerveld J, Bot SDM, Van der Ploeg HP, et al. The effects of a lifestyle intervention on leisure-time sedentary behaviors in adults at risk: The Hoorn Prevention Study, a randomized controlled trial. *Preventive Medicine* 2013;**57**(4):351-56.

46. Marshall AL, Leslie ER, Bauman AE, et al. Print versus website physical activity programs: a randomized trial. *American Journal of Preventive Medicine* 2003;**25**(2):88-94.
47. McGuire MT, Jeffery RW, French SA, et al. The relationship between restraint and weight and weight-related behaviors among individuals in a community weight gain prevention trial. *International Journal of Obesity & Related Metabolic Disorders: Journal of the International Association for the Study of Obesity* 2001;**25**(4):574-80.
48. Mutrie N, Doolin O, Fitzsimons CF, et al. Increasing older adults' walking through primary care: results of a pilot randomized controlled trial. *Family Practice* 2012;**29**(6):633-42.
49. Opdenacker J, Boen F. Effectiveness of face-to-face versus telephone support in increasing physical activity and mental health among university employees. *Journal of Physical Activity & Health* 2008;**5**(6):830-43.
50. Ostbye T, Krause KM, Lovelady CA, et al. Active Mothers Postpartum: a randomized controlled weight-loss intervention trial. *American Journal of Preventive Medicine* 2009;**37**(3):173-80.
51. Papalazarou A, Yannakoulia M, Kavouras SA, et al. Lifestyle intervention favorably affects weight loss and maintenance following obesity surgery. *Obesity* 2010;**18**(7):1348-53.
52. Raynor HA, Steeves EA, Bassett DR, Jr., et al. Reducing TV watching during adult obesity treatment: Two pilot randomized controlled trials. *Behavior Therapy* 2013;**44**(4):674-85.
53. Sloopmaker SM, Chinapaw MJM, Schuit AJ, et al. Feasibility and effectiveness of online physical activity advice based on a personal activity monitor: randomized controlled trial. *Journal of Medical Internet Research* 2009;**11**(3):e27.
54. Spring B, Schneider K, McFadden HG, et al. Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology. *Archives of Internal Medicine* 2012;**172**(10):789-96.
55. Steeves JA, Bassett DR, Fitzhugh EC, et al. Can sedentary behavior be made more active? A randomized pilot study of TV commercial stepping versus walking. *International Journal of Behavioral Nutrition & Physical Activity* 2012;**9**:95.
56. Thompson JL, Allen P, Helitzer DL, et al. Reducing diabetes risk in American Indian women. *American Journal of Preventive Medicine* 2008;**34**(3):192-201.
57. Fitzgibbon ML, Stolley MR, Schiffer L, et al. A combined breast health/weight loss intervention for Black women. *Preventive Medicine* 2005; (4). <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/377/CN-00511377/frame.html>.
58. Hansen AW, Grønbaek M, Helge JW, et al. Effect of a Web-based intervention to promote physical activity and improve health among physically inactive adults: a population-based randomized controlled trial. *Journal of Medical Internet Research* 2012; (5). <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/871/CN-00841871/frame.html>.
59. Katzmarzyk PT, Champagne CM, Tudor-Locke C, et al. A short-term physical activity randomized trial in the lower mississippi delta. *PLoS ONE* 2011;**6**(10).

60. Lane A, Murphy N, Bauman A, et al. Randomized controlled trial to increase physical activity among insufficiently active women following their participation in a mass event. *Health Education Journal* 2010;**69**(3):287-96.
61. López-Fontana CM, Sánchez-Villegas A, Martínez-Gonzalez MA, et al. Daily physical activity and macronutrient distribution of low-calorie diets jointly affect body fat reduction in obese women. *Applied physiology, nutrition, and metabolism = Physiologie appliquee, nutrition et metabolisme* 2009; (4). <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/007/CN-00722007/frame.html>.
62. Kallings LV, Sierra Johnson J, Fisher RM, et al. Beneficial effects of individualized physical activity on prescription on body composition and cardiometabolic risk factors: results from a randomized controlled trial. *European journal of cardiovascular prevention and rehabilitation : official journal of the European Society of Cardiology, Working Groups on Epidemiology & Prevention and Cardiac Rehabilitation and Exercise Physiology* 2009;**16**(1):80-84.
63. Pedersen SJ, Cooley PD, Mainsbridge C. An e-health intervention designed to increase workday energy expenditure by reducing prolonged occupational sitting habits. *Work: A Journal of Prevention, Assessment and Rehabilitation* 2013.
64. Baker G, Gray SR, Wright A, et al. The effect of a pedometer-based community walking intervention. *International Journal of Behavioral Nutrition and Physical Activity* 2008;**5**(1):44.
65. Gilson ND, Puig-Ribera A, McKenna J, et al. Do walking strategies to increase physical activity reduce reported sitting in workplaces: a randomized control trial. *Int J Behav Nutr Phys Act* 2009;**6**:43.
66. Morrison R, Reilly JJ, Penpraze V, et al. Children, parents and pets exercising together (CPET): exploratory randomised controlled trial. *BMC public health* 2013;**13**(1):1096.
67. Poston L, Briley AL, Barr S, et al. Developing a complex intervention for diet and activity behaviour change in obese pregnant women (the UPBEAT trial); assessment of behavioural change and process evaluation in a pilot randomised controlled trial. *BMC pregnancy and childbirth* 2013;**13**(1):148.
68. Robertson MM, Ciriello VM, Garabet AM. Office ergonomics training and a sit-stand workstation: Effects on musculoskeletal and visual symptoms and performance of office workers. *Applied ergonomics* 2013;**44**(1):73-85.
69. Canuto K, Cargo M, Li M, et al. Pragmatic randomised trial of a 12-week exercise and nutrition program for Aboriginal and Torres Strait Islander women: clinical results immediate post and 3 months follow-up. *BMC public health* 2012;**12**(1):933.
70. van Berkel J, Boot CR, Proper KI, et al. Effectiveness of a worksite mindfulness-based multi-component intervention on lifestyle behaviors. *International Journal of Behavioral Nutrition and Physical Activity* 2014;**11**(1):9.
71. Lioret S, Campbell KJ, Crawford D, et al. A parent focused child obesity prevention intervention improves some mother obesity risk behaviors: the Melbourne infant program. *International Journal of Behavioral Nutrition & Physical Activity* 2012;**9**:100.

72. Rosenberg DE. Outcomes of a multilevel walking intervention for older adults living in retirement communities. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2011;**71**(8-B):5143.
73. Sternfeld B, Block C, Quesenberry CP, Jr., et al. Improving diet and physical activity with ALIVE: a worksite randomized trial. *American Journal of Preventive Medicine* 2009;**36**(6):475-83.
74. Verweij LM, Proper KI, Weel ANH, et al. The application of an occupational health guideline reduces sedentary behaviour and increases fruit intake at work: results from an RCT. *Occupational & Environmental Medicine* 2012;**69**(7):500-7.
75. Anand SS, Davis AD, Ahmed R, et al. A family-based intervention to promote healthy lifestyles in an aboriginal community in Canada. *Canadian journal of public health = Revue canadienne de santé publique* 2007; (6). <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/774/CN-00668774/frame.html>.
76. Adams MM. On our feet: Feasibility trial of an intervention to reduce sedentary behavior and increase physical activity. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2013;**73**(10-B(E)):No Pagination Specified.
77. Parry S, Straker L, Gilson ND, et al. Participatory Workplace Interventions Can Reduce Sedentary Time for Office Workers—A Randomised Controlled Trial. *PloS one* 2013;**8**(11):e78957.
78. Andersen E, Høstmark AT, Anderssen SA. Effect of a physical activity intervention on the metabolic syndrome in Pakistani immigrant men: a randomized controlled trial. *Journal of immigrant and minority health / Center for Minority Public Health* 2012; (5). <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/646/CN-00848646/frame.html>.
79. Peddie MC, Bone JL, Rehrer NJ, et al. Breaking prolonged sitting reduces postprandial glycemia in healthy, normal-weight adults: a randomized crossover trial. *American Journal of Clinical Nutrition* 2013;**98**(2):358-66.
80. Aadahl M, Linneberg A, Møller TC, et al. Motivational Counseling to Reduce Sitting Time. *American Journal of Preventive Medicine* 2014;**47**(5):576-86.
81. Carr LJ, Karvinen K, Peavler M, et al. Multicomponent intervention to reduce daily sedentary time: A randomised controlled trial. *BMJ Open* 2013;**3**(10).
82. Otten JJ, Jones KE, Littenberg B, et al. Effects of television viewing reduction on energy intake and expenditure in overweight and obese adults: a randomized controlled trial. *Archives of Internal Medicine* 2009;**169**(22):2109-15.
83. Chau JY, der Ploeg HPv, van Uffelen JG, et al. Are workplace interventions to reduce sitting effective? A systematic review. *Preventive medicine* 2010;**51**(5):352-56.
84. Neuhaus M, Eakin EG, Straker L, et al. Reducing occupational sedentary time: a systematic review and meta-analysis of evidence on activity-permissive workstations. *Obesity Reviews* 2014;**15**(10):822-38.
85. Torbeyns T, Bailey S, Bos I, et al. Active Workstations to Fight Sedentary Behaviour. *Sports Medicine* 2014:1-13.
86. Shrestha N, Ijaz S, Kukkonen-Harjula Katriina T, et al. Workplace interventions for reducing sitting at work. *Cochrane Database of Systematic Reviews* 2014; (1). <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD010912/abstract>.

87. Owen N, Sugiyama T, Eakin EE, et al. Adults' sedentary behavior: determinants and interventions. *American journal of preventive medicine* 2011;**41**(2):189-96.
88. Michie S, Johnston M. Theories and techniques of behaviour change: Developing a cumulative science of behaviour change. *Health Psychology Review* 2012;**6**(1):1-6.