# Prevention of Overweight/Obesity in Children and Youth:

# A Systematic Review with Meta-analyses

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# Abstract

**Background:** Childhood overweight/obesity is accelerating with considerable concern for potential impacts on child and adult health. This review synthesized evidence on behavioural interventions for preventing child/adolescent overweight/obesity.

**Methods:** Systematic review and meta-analyses. Multiple databases were searched up to August, 2013. Studies had to be randomized trials and report changes in body mass index, body mass index z-score and/or prevalence of overweight/obesity; include healthy normal weight or mixed weight children/youth aged 0-18; and examine interventions feasible for conducting in primary-care, including in conjunction with community resources.

**Results:** Ninety studies were included, all with mixed weight populations leaving the question of primary prevention unanswered. Compared to controls, prevention interventions showed a very small effect of lowered body mass index/body mass index z-score [standardized mean difference -0.07 (95% confidence interval (CI) -0.10, -0.03); $I^2$=74%], a greater reduction in body mass index [mean difference -0.09 kg/$m^2$ (95% CI -0.16, -0.03); $I^2$=76%] and a reduced prevalence of overweight/obesity [$RR_{intervention}$-$RR_{control}$ 0.94 (95% CI 0.89, 0.99); $I^2$=0%; number needed to treat 51 (95% CI 29, 289)]. Across other health outcomes (total cholesterol, triglycerides, high and low density lipoproteins, systolic and diastolic blood pressure, overall quality of life, physical fitness), there was a small effect in favour of intervention participants for change in high density lipoproteins and physical fitness only. Little evidence was available on harms of prevention interventions.

**Interpretation:** Behaviourally-based prevention interventions are associated with very small improvements in weight outcomes in mixed weight child/adolescent populations but it is questionable whether benefits are maintained over time.

**Registration**: The protocol was registered with PROSPERO (# CRD42012002754)

## Introduction

Childhood and adolescence are characterized by substantial physical growth and development. Weight gain is expected and desirable as children get taller and older. However, children and teens who are overweight or obese face social, emotional and physical challenges, and if excess weight is retained into adulthood, there is greater risk for developing obesity-related health problems.[1-5] Almost one-third (31%) of Canadian elementary and secondary school-aged children and youth are overweight or obese.[6] This situation is ripe for preventive efforts to promote healthy weight in childhood and adolescence as an end in itself, but also as a means to build a strong foundation for maintaining healthy weight in adulthood.

Treatment of child and adolescent obesity is an active area of research and a number of systematic reviews have been published recently.[7-13] Reviews have also been published about prevention of obesity in children [14], including community-based [15], home-based [16] and school-based [17-19] interventions, and considering diverse approaches such as educational programs [20], reduction of screen-time [21], and behavioural strategies associated with diet and physical activity.[22] While many reviews exist, this review provides a synthesis of effectiveness of childhood obesity prevention interventions appropriate for primary-care practitioners to conduct in office or for referal in the community.

# Methods

The protocol was registered with PROSPERO (# CRD42012002754) (www.crd.york.ac.uk/prospero/).

The funders (Canadian Institutes of Health Research) had no role in design, analyses, interpretation or decision to submit the paper for publication.

Search Strategy

A recent high quality (11/11 AMSTAR rating [23]) Cochrane review examined obesity prevention interventions for children.[17] To avoid duplication, our protocol was designed to update their search. We searched EMBASE, Medline, Cochrane Central Registry of Controlled Trials, PsychINFO and CINAHL from January 2010 (the date of the last Cochrane search) to August 1, 2013. The Medline strategy appears in the *e*-File (*e*-Table 1). The Cochrane group also provided a list of citations being considered for their next update. Reference lists of included studies and pertinent reviews were searched for studies not captured by our search. A focused grey literature search of Canadian sources was undertaken for recent reports on obesity in Canada.

Population, Intervention, Comparator, Outcome and Setting Statement

The PICOS (population, intervention, comparator, outcome, setting) framework was: (P) normal or mixed weight children and youth aged 0-18 years, (I) behavioural weight gain prevention interventions (C) no intervention, usual practice or minimal component, (O) change in body mass index, body mass index z-score or prevalence of overweight/obesity, and (S) generalizable to Canadian primary-care. Additional details are provided in Box 1.

Inclusion/Exclusion Criteria

Inclusion and exclusion criteria are provided in Box 2.

Study Selection, Quality Assessment and Data Abstraction

Titles and abstracts were reviewed in duplicate. Citations marked for inclusion by either team member went to full text screening, which was also done independently in duplicate. One person completed full abstraction with verification by a second person. All data were verified again prior to analysis. Randomized controlled trials were assessed using the Cochrane Risk of Bias

tool.[24] Overall strength of the evidence (assessed as high, moderate, low or very low) was determined using the Grading of Recommendations Assessment, Development and Evaluation system.[25,26] All inter-rater conflicts were resolved through discussion.

Data Analysis

For meta-analyses, means and standard deviations (SD) were utilized for continous outcomes (e.g., body mass index) while counts data were utilized for binary outcomes (e.g., prevalence). Whenever possible, immediate post-treatment data were used, otherwise we selected the data point closest to the end of the intervention which was at least 12 weeks past baseline. The DerSimonian and Laird random effects model with inverse variance [27] was utilized to generate the summary measures of effect in the form of standardized mean difference (SMD) for body mass index/body mass index z-score (<0.2=very small effect; ≥0.2 and <0.5=small effect; ≥0.5 and <0.8=medium effect; ≥0.8=large effect) [28], mean difference (MD) for other continous outcomes, and risk ratio (RR) for binary outcomes. The SD for body mass index and body mass index z-score was obtained as the pooled SD of difference in change from baseline scores in one of the studies in the meta-analysis and to better reflect among-person variation, we selected a representative observational study with low risk of bias.[24] If studies reported data for body mass index and body mass index z-score we used only the non-standardized data. If mixed gender studies reported results for boys and for girls, we entered this data separately into the meta-analyses. For studies with more than one intervention arm, we combined data from similar intervention groups to do a pair-wise comparison with the control group.[24] If groups were substantially different we included the data for each arm compared with the control group but split the sample size for the control group to avoid a unit-of-analysis error and double counting.[24] $I^2$ statistic was used to

quantify statistical heterogeneity between studies. For the outcome of body mass index/body mass index z-score we did sensitivity analyses based on age groups (0-5, 6-12, 13-18), type of intervention (diet, exercise, diet plus exercise, lifestyle), intervention setting (non-education, education only, and education plus other settings) length of intervention (≤12 months, >12 months), gender, and study risk of bias rating (low, unclear, high).

The outcome of change in prevalence of overweight/obesity pre- and post-intervention as compared to control group was meta-analyzed using the differences in risk ratio ($RR_{Intervention}$ - $RR_{Control}$) along with its standard error (SE) and the summary measures of effect were generated utilizing the DerSimonian and Laird random effects model with inverse variance.[27] The estimate of absolute risk reduction and number needed to treat were calculated based on prevalence of overweight/obesity at post-intervention.

## Results

Figure 1 presents results of the search and selection process. One hundred twenty-three papers representing 90 studies were included. This total includes 28 studies from the 2011 Cochrane review [29-56], 16 studies the Cochrane group was considering for their update [57-72], 10 studies from the pool of as yet un-reviewed citations from the Cochrane group (some of which were also found by our search) [73-82], and 36 unique studies located in our search.[83-118] Ratings for individual study risk of bias were mostly unclear or high (*e*-File Table 2). Table 1 provides an overall summary of the included evidence; for more details about individual studies see *e*-Table 3 (Characteristics of Included Studies, *e*-File). The weight range of children in the studies varied; that is, they were unselected or mixed weight populations, not populations solely of normal weight children.

Change in Body Mass Index/Body Mass Index Z-Score

Seventy-six studies were included in the meta-analysis assessing change in body mass index/body mass index z-score.[29-48,50-63,65-67,69-75,78-91,95,96,98,99,101-105,108-110,112-114,116-118] Figure 2 shows a significantly lowered body mass index/body mass index z-score in the intervention group compared to controls but the magnitude of the effect was very small (also see Table 2). Tests for sub-group differences showed no differences in lowered body mass index/body mass index z-score across types of treatments, duration of intervention, participants gender or age, or study risk of bias rating, but did show a difference depending on the setting of intervention (Table 2). Interventions in education settings showed significant improvements for program participants compared to controls, whereas programs located in non-education settings or in combined education plus other settings showed no difference (Table 2). Sub-analysis by intervention type found only the diet plus exercise participants had a significantly lowered body mass index/body mass index z-score compared to controls (Table 2). Both boys and girls who took part in interventions showed significantly better results than controls (Table 2). Improvements were observed for intervention children aged 6-12 years and for youth, but not for children ages 0-5 (Table 2). Interventions lasting one year or less demonstrated significant benefits for participants compared to controls, but programs running more than one year did not (Table 2). Finally, more improvement was observed in the intervention group compared to the control group across all levels of study risk of bias (low, unclear and high) (Table 2).

Eight trials reported data for this outcome that could not be pooled. Most studies reported no significant difference in body mass index changes or body mass index z-scores between intervention and control groups.[64,68,77,100,111,115] One study reported significantly lower mean body mass index for intervention children compared to controls.[97] The last study

observed different effects based on age and weight status, with 3-5 year olds and already overweight/obese children showing no increase in body mass index, but 4-5 year olds and normal weight children showing increasing body mass index.[107]

Change in Body Mass Index

Fifty-seven trials were included in the meta-analysis assessing change in body mass index.[29,31,33-39,41-48,50-57,59-61,63,65,67,69-74,78-81,83,84,88,90,95,96,98,99,102,104,105,108,109,114,116,117] Results showed a significantly greater reduction in body mass index in the intervention group compared to the control group (Table 2). A sub-analysis based on intervention type (diet, exercise, diet plus exercise, lifestyle) found a significant effect only for diet plus exercise programs compared to control conditions [MD -0.15 kg/m$^2$ (95% CI -0.25, -0.03); $I^2$ 76%].

Change in Prevalence of Overweight/Obesity

Thirty studies were included in the meta-analysis assessing change in prevalence of overweight/obesity (Figure 3).[29,30,34,39,43,46,47,49,58,59,62,63,70,72,73,76,79,82,86-88,92-96,103,106,116,117] Intervention participants were more likely to show a reduction in the prevalence of overweight/obesity and less risk of being overweight/obese compared to control participants [40% overweight/obese pre-intervention to 35% overweight/obese post-intervention compared to 33% overweight/obese at baseline to 31% overweight/obese at post-assessment; Ratio of Risk Ratio 0.94 (95% CI 0.89, 0.99); $I^2$=0%; Absolute Risk Ratio 1.96%; Number Needed to Treat 51 (95% CI 29, 289)]. One trial that could not be pooled reported no difference in change in prevalence of overweight in the children who completed a lifestyle intervention focusing on physical activity, nutrition education, screen-time and sleep.[95]

Change in Other Health Outcomes

Fourteen studies provided data for the secondary health outcomes.[42,44,46,55,56,59,63,65,66,68,70,80,104,118] Pooled analyses (Table 2) showed that compared to controls, intervention participants improved more on high density lipoproteins [42,65,80] and performance on the run tests [44,55,56,59,65,104]; however no between group differences were found for changes in total cholesterol [42,44,46,63,70], triglycerides [42,46,65,70], and systolic and diastolic blood pressure.[42,44,46,63,65,66,70,118] One study that could not be pooled for these outcomes found a small but statistically significant difference between intervention and control participants in adjusted mean difference per year for total cholesterol (-0.09 mmol/L, 95% CI -0.14, -0.04), but observed no between group differences for high density lipoproteins, triglycerides, and systolic and diastolic blood pressure.[68] Two trials provided data for low density lipoproteins that could not be pooled.[44,68] For this outcome, a Canadian study found no difference between the elementary school-aged exercise intervention participants and the control group (MD -0.10 mmol/L, 95% CI -0.28, 0.08) [44], while an exercise intervention for girls in the United States showed a small adjusted mean difference in change per year (-0.08 mmol/L, 95% CI -0.12, -0.03).[68] None of the included studies reported on change in overall quality of life.

Adverse Effects

One school-based diet intervention study reported on negative impacts on body image, indicating no difference between groups, but providing no data.[43] Another study reported a diet plus exercise intervention was delivered to participants without any major incidents.[57] A third study that examined the effects of a physical activity program on more than 500 elementary school children reported 43 events, and adverse event incident rates of 0.03 in year one, 0.02 in

year two and 0.01 in year three; the authors did not define the categories, but indicated 67% were mild in nature, 21% were moderate and 12% were severe.[118]

## Interpretation

Main Findings

With no studies of exclusively normal weight children, we cannot answer the question of effectiveness of weight gain prevention interventions for that group. A substantial number of trials, but indirect evidence was found to answer most of the key questions. Compared to controls, prevention interventions in mixed weight child populations showed a very small effect in terms of a lowered body mass index/body mass index z-score, reduced prevalence of overweight/obesity and improvements in measures of high density lipoproteins and physical fitness. For overweight/obese children and youth, these changes are not clinically meaningful; although for preventing unhealthy weight gain, they could become clinically meaningful over time.

The benefits of program participation must be considered in light of any harm. Very few included studies (3/90) reported on adverse effects. Given this scant evidence, we are unable to directly answer questions regarding harmful effects of prevention interventions.

The findings of this review are similar to other recent reviews that included school-based interventions for child/adolescent obesity prevention.[14,17,18] No other reviews found studies of primary prevention of weight gain in normal weight children. It is not surprising that primary prevention programs have not been evaluated. It would be hard to separate out normal weight children in a school population or motivate them to attend an out-of-classroom intervention, or to motivate most parents to take their normal weight children to a community intervention for weight maintenance. It is unlikely that a randomized trial will be done.

Limitations

First, the included studies involved mixed weight populations which means we cannot answer the question of primary prevention and only indirect evidence is available to address the questions, reducing confidence in the estimate of effect. Second, most studies were assessed as having unclear risk of bias, primarily due to lack of information about or lack of procedures to ensure random sequence generation, allocation concealment and blinding of participants, personnel and outcome assessment as well as other sources of bias (i.e., study underpowered and/or analysis did not account for clustering). Potential reporting bias was also identified across a number of outcome/comparison-based study groupings. Third, in the main outcome of body mass index/body mass index-z-score, heterogeneity was high. This can be explained by the diversity, intensity and length of interventions and diversity in participants. Fourth, results presented for other health outcomes should be interpreted with caution as we only included studies that also reported one of our weight outcomes. A language filter was applied in our search because of limited resources available to appropriately handle (e.g., screening, translation and interpretation) papers in multiple languages; including only publications in English or French meant papers about relevant interventions available only in other languages were not captured.

Conclusions and Implications

In summary, this systematic review found small improvements in weight outcomes with questionable clinical importance. Longer term follow up with adequately powered subgroup analyses of normal weight children are required to answer the question whether behaviourally-based prevention interventions in normal weight children and youth lead to short-term or sustained healthy BMI trajectories and improved health outcomes.

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**Box 1: Population, Intervention, Comparator, Outcomes and Setting**

**Population**

- children and/or youth aged 0-18 years of normal weight or mixed weight populations

**Interventions**

- behavioural (diet, exercise and/or lifestyle) interventions for prevention of weight gain

**Comparator**

- intervention effectiveness – no intervention, usual care, minimal intervention (e.g., newsletter or single information session on healthy living)
- intervention harms – any type of comparison group or no comparison group

**Outcomes**

- intervention effectiveness – primary weight outcomes: change in body mass index, body mass index z-score and prevalence of overweight/obesity; secondary health outcomes: change in total cholesterol, high and low density lipoproteins, triglycerides, systolic and diastolic blood pressure, overall quality of life and physical fitness
- intervention harms – disordered eating; psychological distress such as anxiety; micronutrient deficits; abnormal growth trajectory; growth restriction

**Settings**

- generalizable to Canadian primary care or feasible for conducting in or referral from primary care (e.g., primary care, clinic, home, community, school, after school program, childcare, nursery and preschool)

**Box 2: Inclusion and Exclusion Criteria**

**Studies were included if they met the following criteria:**

- behavioural (diet, exercise, social support and/or lifestyle strategies) trial of weight gain prevention
- intervention targeted children or youth aged 0-18 years who were normal or mixed weight
- randomized controlled trial with a no intervention, usual practice or minimal component (e.g., single newsletter or information session on general health) comparison group – condition applied only to studies assessing intervention effectiveness
- reported data for one or more specified weight outcomes (i.e., change in body mass index, body mass index z-score or prevalence of overweight and/or obesity)
- reported data for weight outcomes of interest at least 12 weeks post baseline assessment
- no restrictions on study design, comparison group, weight outcome reporting, or timing of assessment were applied to studies that reported data for harms of intervention
- results were published in English or French

**Studies were excluded if the:**

- intervention involved surgical procedures or medications or was intended to treat obesity
- intervention recruited only already obese children/youth (considered to be focused on treatment of obesity), targeted a population with a serious illnesses or co-morbidity, or was designed to prevent obesity in pregnant adolescents
- intervention was conducted in an in-patient hospital setting (excluded as representing a level of intervention not feasible for prevention)
- only available results were published in a language other than English or French

**Figure 1: Flow Diagram of Search and Selection Process**

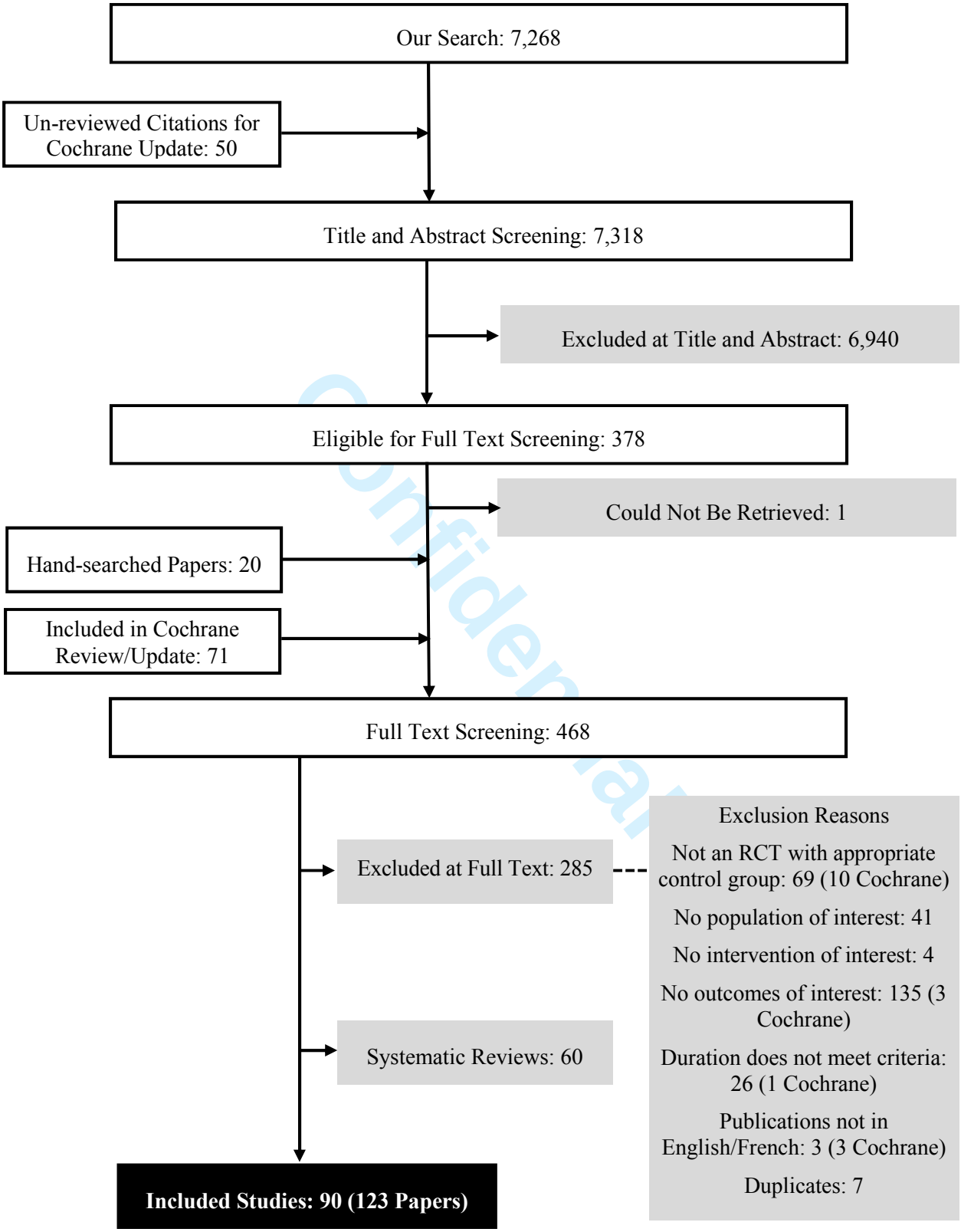

**Figure 2: Forest Plot of Effect of Prevention Interventions on Change in Body Mass Index/Body Mass Index Z-Score**

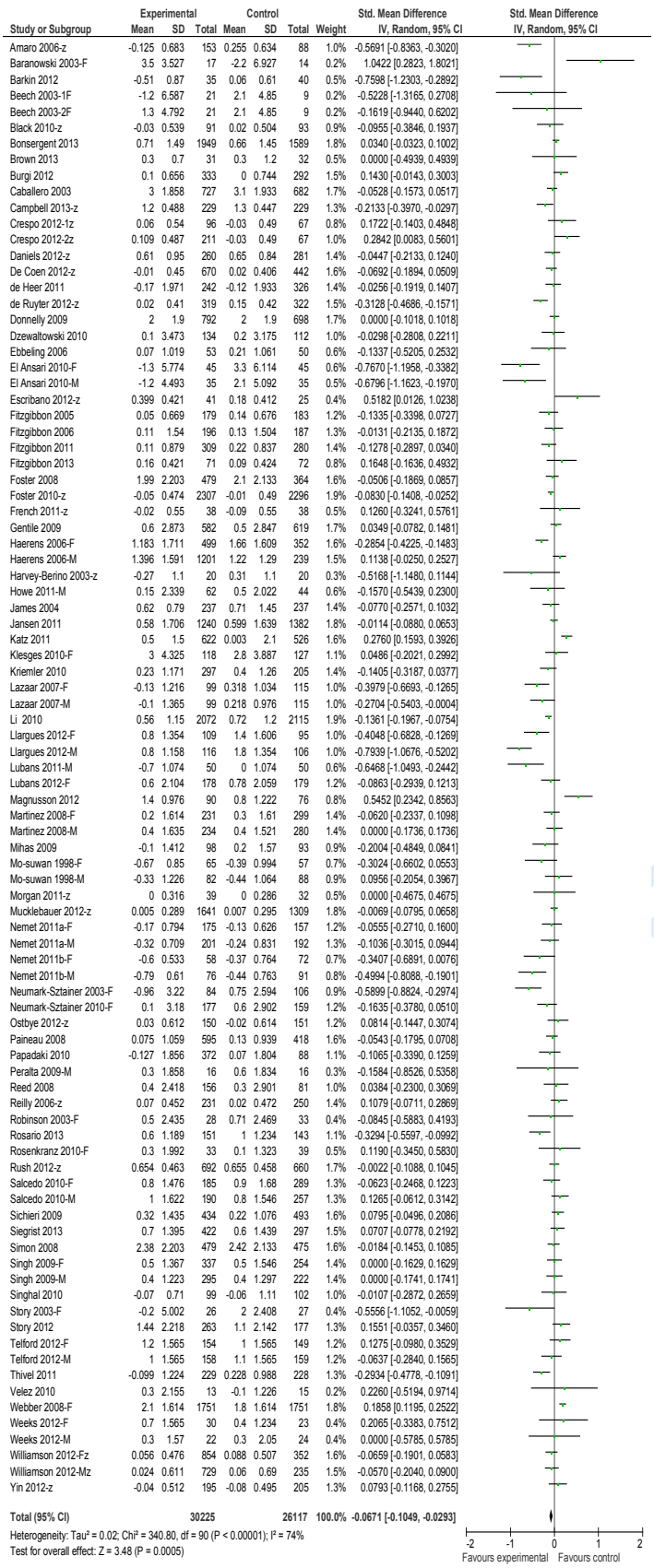

Figure 2 notations: -z extension denotes body mass index z-score; -F or -M extension denotes female or male; numerical extensions (1 and 2) used to different intervention arms of the same study; Nemet 2011a corresponds to [72], Nemet 2011b corresponds to [105]

**Figure 3: Forest Plot of Effect of Prevention Interventions on Change in Prevalence of Overweight/Obesity**

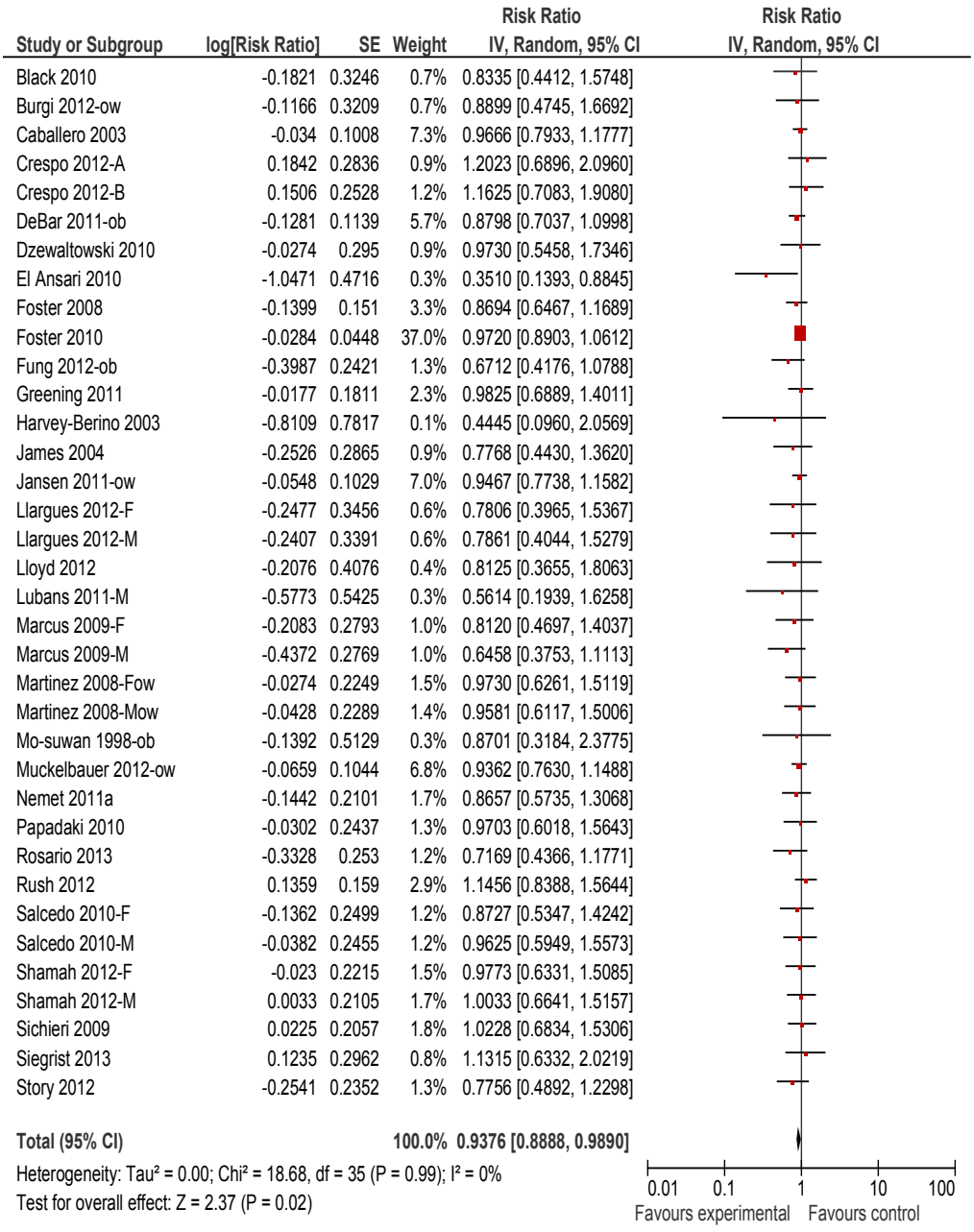


Figure 3 notations: -ow deontes overweight and -ob denotes obese (neither of these extensions denotes overweight and obese combined); -F or -M extension denotes female or male, A and B denote different intervention arms of the same study; Nemet 2011a corresponds to [72]

**Table 1: Summary of Features of the Included Evidence**

| | |
|---|---|
| **Designs** | • 90 randomized controlled trials |
| **Populations** | • Not limited to normal weight children (overweight and obese children included; not excluded in most studies)<br>• 20 interventions targeted children aged 0-5; 53 targeted children aged 6-12; 17 targeted youth aged 13-18<br>• 76 studies included boys and girls; 11 included only girls; 3 included only boys |
| **Interventions** | • 16 diet interventions, 20 exercise interventions, 32 diet plus exercise interventions, 22 lifestyle interventions<br>• 62 studies had intervention arms in educational settings, 19 had intervention arms in non-educational settings, 8 had intervention arms in education plus other settings, 1 study had two intervention arms (one offered only in an education setting and one offered in education plus other settings)<br>• 21 interventions used interactive education approaches; 25 used behavioural approaches; 8 used therapy, management or counseling; 36 used multicomponent strategies<br>• 61 interventions (68%) were 12 months or less in duration; 87 interventions (97%) were 3 years or less in duration |
| **Quality Assessment** | • 73 trials (81%) were rated as having unclear or high risk of bias for the weight outcomes<br>• Most outcomes received very low quality ratings (downgraded for risk of bias, inconsistency, indirectness; sometimes also downgraded for imprecision and occasionally also for reporting bias) |
| **Study Locations** | • 2 studies in Canada, 1 in Canada and the United States, 39 in the United States, 29 in European countries, 9 in Australia, 2 in Brazil, 2 in Israel, 1 in each of China, Egypt, India, Mexico, New Zealand and Thailand |
| **Publication Dates** | • 68 studies (76%) were published between 2009 and 2013; 22 were published between 1998 and 2008 |

**Table 2: Key Findings of Overall and Sub-group Analyses for Continuous Outcomes ***

| Group or Sub-group | Meta-analysis (95% CI) | Statistical Heterogeneity (Within Group) P-Value, $I^2$-Value | Test for Between Group Differences P-Value, $I^2$-Value | No. Participants | No. Studies | **Quality of Evidence Rating |
|---|---|---|---|---|---|---|
| **Outcome: Change in Body Mass Index/Body Mass Index Z-Score (Standardized Mean Difference)** | | | | | | |
| Overall | -0.07 (-0.10, -0.03) | <0.00001, 74% | na | 56,342 | 76 | Very Low |
| Diet | -0.08 (-0.17, 0.01) | <0.00001, 81% | 0.19, 37% | 11,568 | 15 | Very Low |
| Exercise | -0.08 (-0.16, 0.003) | <0.00001, 79% | | 15,902 | 18 | Very Low |
| Diet + Exercise | -0.10 (-0.17, -0.03) | <0.00001, 70% | | 14,923 | 26 | Very Low |
| Lifestyle | -0.003 (-0.06, 0.06) | 0.004, 53% | | 13,949 | 17 | Very Low |
| Non-Education Setting | -0.04 (-0.15, 0.08) | 0.01, 46% | 0.04, 53% | 3,070 | 18 | Very Low |
| Education Setting | -0.09 (-0.13, -0.04) | <0.00001, 78% | | 47,975 | 51 | Very Low |
| Education + Other Settings | 0.03 (-0.05, 0.12) | 0.04, 52% | | 5,297 | 8 | Very Low |
| Duration ≤12 Months | -0.08 (-0.13, -0.03) | <0.00001, 67% | 0.32, 0% | 28,220 | 54 | Very Low |
| Duration >12 Months | -0.04 (-0.11, 0.02) | <0.00001, 82% | | 28,122 | 22 | Very Low |
| Male | -0.16 (-0.29, -0.03) | <0.00001, 77% | 0.76, 0% | 5,719 | 16 | Very Low |
| Female | -0.14 (-0.24, -0.03) | <0.00001, 80% | | 10,007 | 23 | Very Low |
| Aged 0-5 Years | -0.06 (-0.15, 0.02) | 0.0001, 62% | 0.54, 0% | 6,930 | 17 | Very Low |
| Aged 6-12 Years | -0.06 (-0.10, -0.01) | <0.00001, 73% | | 36,916 | 42 | Very Low |
| Aged 13-18 Years | -0.12 (-0.22, -0.02) | <0.00001, 80% | | 12,496 | 17 | Very Low |
| Low Risk of Bias | -0.07 (-0.13, -0.0002) | 0.006, 53% | 0.30, 17% | 8,542 | 13 | Moderate |
| Unclear Risk of Bias | -0.06 (-0.11, -0.02) | <0.00001, 76% | | 47,342 | 62 | Very Low |
| High Risk of Bias | -0.21 (-0.40, -0.03) | na | | 458 | 1 | Very Low |
| **Outcome: Change in Body Mass Index ($kg/m^2$; Mean Difference)** | | | | | | |
| Overall | -0.09 (-0.16, -0.03) | <0.00001, 76% | na | 40,214 | 57 | Very Low |
| **Outcome: Change in Total Cholesterol (mmol/L; Mean Difference)** | | | | | | |
| Overall | -0.10 (-0.20, 0.01) | <0.00001, 86% | na | 2,815 | 5 | Very Low |
| **Outcome: Change in Triglycerides (mmol/L; Mean Difference)** | | | | | | |

| Group or Sub-group | Meta-analysis (95% CI) | Statistical Heterogeneity (Within Group) P-Value, $I^2$-Value | Test for Between Group Differences P-Value, $I^2$-Value | No. Participants | No. Studies | **Quality of Evidence Rating |
|---|---|---|---|---|---|---|
| Overall | -0.01 (-0.05, 0.03) | <0.0001, 81% | na | 3,097 | 4 | Very Low |
| **Outcome: Change in High Density Lipoproteins (mmol/L; Mean Difference)** | | | | | | |
| Overall | 0.07 (0.04, 0.10) | 0.54, 0% | na | 1,240 | 3 | Low |
| **Outcome: Change in Systolic Blood Pressure (mmHg; Mean Difference)** | | | | | | |
| Overall | -0.83 (-2.98, 1.31) | <0.00001, 96% | na | 4,289 | 8 | Very Low |
| **Outcome: Change in Diastolic Blood Pressure (mmHg; Mean Difference)** | | | | | | |
| Overall | -0.31 (-1.71, 1.09) | <0.00001, 93% | na | 4,289 | 8 | Very Low |
| **Outcome: Change in Physical Fitness (20 Meter Shuttle Run Test Laps/Stages; Standardized Mean Difference)** | | | | | | |
| Overall | 0.32 (0.14, 0.50) | <0.00001, 85% | na | 4,903 | 6 | Low |

*Two outcomes do not appear: Low Density Lipoproteins data could not be pooled; no evidence was found that met inclusion criteria for Quality of Life

** Moderate=downgrade: indirectness; Low=downgrade: risk of bias, indirectness; Very Low=downgrade: risk of bias, indirectness, inconsistency, imprecision and/or reporting bias

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Conceptualization, data interpretation, writing and manuscript review: Leslea Peirson, Donna Fitzpatrick-Lewis, Katherine Morrison, Donna Ciliska, Meghan Kenny, and Parminder Raina. Methods, data collection and project coordination: Leslea Peirson and Donna Fitzpatrick-Lewis. Methods, data analysis and interpretation: Ali Usman.

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# *e*-File for Child Obesity Prevention

Peirson, Fitzpatrick-Lewis, Morrison et al.

**e-Table1: Search Strategy Example – Medline OVID**

**e-Table2: Summary of Risk of Bias Assessment of Included Studies**

**e-Table 3: Characteristics of Included Studies**

**References**

***e*-Table 1: Search Strategy Example – Medline OVID**

| | |
|---|---|
| **Database** | Medline OVID |
| **Date Last Run** | August 1, 2013 |
| **Search Terms** | 1. exp Obesity/<br>2. Weight Gain/<br>3. exp Weight Loss/<br>4. obes$.af.<br>5. (weight gain or weight loss).af.<br>6. (overweight or over weight or overeat$ or over eat$).af.<br>7. weight change$.af.<br>8. ((bmi or body mass index) adj2 (gain or loss or change)).af.<br>9. or/1-8<br>10. exp Behavior Therapy/<br>11. social support/<br>12. exp Psychotherapy, Group/<br>13. ((psychological or behavio?r$) adj (therapy or modif$ or strateg$ or intervention$)).af.<br>14. (group therapy or family therapy or cognitive therapy).af.<br>15. ((lifestyle or life style) adj (chang$ or intervention$)).af.<br>16. counsel?ing.af.<br>17. social support.af.<br>18. (peer adj2 support).af.<br>19. (children adj3 parent$ adj3 therapy).af.<br>20. or/10-19<br>21. exp OBESITY/dh [Diet Therapy]<br>22. exp Diet Therapy/<br>23. Fasting/<br>24. (diets or diet or dieting).af.<br>25. (diet$ adj (modif$ or therapy or intervention$ or strateg$)).af.<br>26. (low calorie or calorie control$ or healthy eating).af.<br>27. (fasting or modified fast$).af.<br>28. exp Dietary Fats/<br>29. (fruit or vegetable*).af.<br>30. (high fat$ or low fat$ or fatty food$).af.<br>31. formula diet$.af.<br>32. or/21-31<br>33. exp Exercise/<br>34. exp Exercise Therapy/<br>35. exercis$.af.<br>36. (aerobics or physical therapy or physical activity or physical inactivity).af.<br>37. (fitness adj (class$ or regime$ or program$)).af.<br>38. (aerobics or physical therapy or physical training or physical education).af.<br>39. dance therapy.af.<br>40. Sedentary Lifestyle/ or sedentary behavio?r.af. |

| | |
|---|---|
| | 41. or/33-40<br>42. exp Complementary Therapies/<br>43. (alternative medicine or complementary therap$ or complementary medicine).af.<br>44. (hypnotism or hypnosis or hypnotherapy).af.<br>45. (acupuncture or homeopathy or homoeopathy).af.<br>46. (chinese medicine or indian medicine or herbal medicine or ayurvedic).af.<br>47. or/42-46<br>48. ((diet or dieting or slim$) adj (club$ or organi?ation)).af.<br>49. (weightwatcher$ or weight watcher$).af.<br>50. (correspondence adj (course$ or program$)).af.<br>51. (fat camp$ or diet$ camp$).af.<br>52. or/48-51<br>53. exp Health Promotion/<br>54. exp Health Education/<br>55. (health promotion or health education).af.<br>56. (media intervention$ or community intervention$).af.<br>57. health promoting school$.af.<br>58. ((school or community) adj2 program$).af.<br>59. ((school or community) adj2 intervention$).af.<br>60. (family intervention$ or parent$ intervention).af.<br>61. (parent$ adj2 (behavio?r or involve$ or control$ or attitude$ or educat$)).af.<br>62. or/53-61<br>63. exp Health Policy/<br>64. (health polic$ or school polic$ or food polic$ or nutrition polic$).af.<br>65. 63 or 64<br>66. exp OBESITY/pc [Prevention & Control]<br>67. exp Primary Prevention/<br>68. (primary prevention or secondary prevention).af.<br>69. (preventive measure$ or preventative measure$).af.<br>70. (preventive care or preventative care).af.<br>71. (obesity adj2 (prevent$ or treat$)).af.<br>72. or/66-71<br>73. randomized controlled trial.pt.<br>74. controlled clinical trial.pt.<br>75. Random Allocation/<br>76. Double-Blind Method/<br>77. single-blind method/<br>78. Placebos/<br>79. *Research Design/<br>80. intervention studies/<br>81. evaluation studies/<br>82. Comparative Study/<br>83. exp Longitudinal Studies/<br>84. cross-over studies/ |

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|---|---|
| | 85. clinical trial.tw.<br>86. clinical trial.pt.<br>87. latin square.tw.<br>88. (time adj series).tw.<br>89. (before adj2 after adj3 (stud$ or trial$ or design$)).tw.<br>90. placebo$.tw.<br>91. random$.tw.<br>92. (matched communities or matched schools or matched populations).tw.<br>93. control$.tw.<br>94. (comparison group$ or control group$).tw.<br>95. matched pairs.tw.<br>96. (outcome study or outcome studies).tw.<br>97. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask)).tw.<br>98. (quasiexperimental or quasi experimental or pseudo experimental).tw.<br>99. (nonrandomi?ed or non randomi?ed or pseudo randomi?sed or quasi randomi?ed).tw.<br>100. prospectiv$.tw.<br>101. volunteer$.tw.<br>102. or/73-101<br>103. 20 or 32 or 41 or 47 or 52 or 62 or 65 or 72<br>104. 9 and 102 and 103<br>105. Animals/<br>106. exp Child/<br>107. Adolescent/<br>108. exp Infant/<br>109. (child$ or adolescen$ or infant$).af.<br>110. (teenage$ or young people or young person or young adult$).af.<br>111. (schoolchildren or school children).af.<br>112. (pediatr$ or paediatr$).af.<br>113. (boys or girls or youth or youths).af.<br>114. or/106-113<br>115. 104 not 105<br>116. 114 and 115<br>117. limit 116 to ed=20120101-20121122<br>118. limit 116 to ed=20121122-20130801 |

## *e*-Table2: Summary of Risk of Bias Assessment of Included Studies Using Cochrane's Risk of Bias Tool [1]

| Study | Sequence Generation | Allocation Concealment | Blinding of Personnel/ Participants | Blinding of Outcome Assessors | | | Incomplete Reporting | | | Selective Reporting | Other Bias |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | OBJ | SUB | S-R | OBJ | SUB | S-R | | |
| Amaro 2006 [2] | U | U | H | | U | | | H | | L | L |
| Baranowski 2003 [3] | L | U | H | | U | | | L | | H | H |
| Barkin 2012 [4] | L | L | H | | U | | | H | | L | L |
| Beech 2003 [5] | L | U | H | | U | | | L | | H | H |
| Bellows 2013 [6] | U | U | H | | H | | | U | | L | L |
| Black 2010 [7] | L | U | H | L | L | | L | L | | L | L |
| Bonsergent 2013 [8] | U | U | H | | L | | | H | | L | L |
| Brandstetter 2012 [9] | U | U | H | | U | | | L | | L | L |
| Brown 2013 [10] | L | U | H | | U | | | L | | L | L |
| Burgi 2012 [11] | L | L | H | L | L | | L | L | | L | H |
| Caballero 2003 [12] | L | L | H | L | L | L | L | L | L | L | L |
| Campbell 2013 [13] | L | H | H | | H | | | L | | L | L |
| Crespo 2012 [14] | U | U | H | | L | | | H | | L | L |
| Cunha 2013 [15] | U | L | H | | U | | | L | | L | L |
| Daniels 2012 [16] | U | U | H | | L | | | L | | L | L |
| DeBar 2011 [17] | L | L | H | U | U | U | | L | | L | L |
| De Coen 2012 [18] | U | U | H | | U | | | L | | L | L |
| de Heer 2011 [19] | U | U | H | | U | | | L | | L | H |
| de Ruyter 2012 [20] | L | L | H | | L | | | L | | L | L |
| Donnelly 2009 [21] | U | U | H | | L | | | L | | L | L |
| Dzewaltowski 2010 [22] | L | U | H | | H | | | L | | L | L |
| Ebbeling 2006 [23] | L | L | H | L | L | L | L | L | L | L | L |
| El Ansari 2010 [24] | U | U | H | U | U | | | U | | L | L |
| Escribano 2012 [25] | H | U | H | | L | | | L | | L | H |
| Fitzgibbon 2005 [26] | U | U | H | | U | | | L | | L | L |
| Fitzgibbon 2006 [27] | U | U | H | | U | | | L | | L | H |
| Fitzgibbon 2011 [28] | U | U | H | | U | | | L | | L | L |
| Fitzgibbon 2013 [29] | U | H | H | | U | | | L | | L | L |
| Foster 2008 [30] | U | U | H | | H | | | H | | L | L |

| Study | Sequence Generation | Allocation Concealment | Blinding of Personnel/ Participants | Blinding of Outcome Assessors | | | Incomplete Reporting | | | Selective Reporting | Other Bias |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | OBJ | SUB | S-R | OBJ | SUB | S-R | | |
| Foster 2010 [31] | U | U | H | L | U | | L | L | | H | L |
| French 2011 [32] | U | U | H | | U | | | L | | L | H |
| Fung 2012 [33] | H | H | H | | U | | | L | | L | L |
| Gentile 2009 [34] | U | U | H | | U | | | U | | L | L |
| Greening 2011 [35] | U | U | H | L | U | | L | L | | L | L |
| Haerens 2006 [36] | U | L | H | | U | | | H | | L | H |
| Hakanen 2010 [37] | U | U | H | L | U | | H | H | | L | L |
| Harvey-Berino 2003 [38] | U | U | H | | L | | | L | | L | H |
| Hoffman 2011 [39] | U | U | H | | H | | | H | | L | H |
| Howe 2011 [40] | U | U | H | U | U | | U | U | | L | L |
| James 2004 [41] | L | U | H | | U | | | H | | L | L |
| Jansen 2011 [42] | L | U | H | | H | | | L | | L | L |
| Katz 2001 [43] | U | U | H | | U | | | L | | L | H |
| Klesges 2011 [44] | L | H | H | | L | | | H | | L | L |
| Kriemler 2010 [45] | L | U | H | L | L | H | L | L | L | L | L |
| Lazaar 2007 [46] | L | U | H | | U | | | L | | L | H |
| Li 2010 [47] | U | U | H | | L | | | L | | L | H |
| Llargues 2012 [48] | U | U | H | | U | | | H | | L | H |
| Lloyd 2012 [49] | U | U | H | L | L | | L | L | | L | H |
| Lubans 2011 [50] | U | U | H | | H | | | L | | L | H |
| Lubans 2012 [51] | U | U | H | L | H | | L | L | | L | L |
| Madsen 2013 [52] | U | U | H | | H | | | L | | L | L |
| Magnusson 2012 [53] | U | U | H | L | U | | H | H | | L | L |
| Marcus 2009 [54] | U | U | H | | U | | | H | | L | L |
| Martinez 2008 [55] | L | L | H | L | H | | L | L | | L | L |
| Mihas 2009 [56] | L | U | H | | H | | | L | | L | L |
| Morgan 2011 [57] | L | L | H | | H | | | L | | L | L |
| Mo-suwan 1998 [58] | U | U | H | | U | U | | L | L | L | L |
| Muckelbauer 2012 [59] | U | U | H | | U | | | H | | L | H |
| Nemet 2011a [60] | L | U | H | | L | | | L | | L | L |
| Nemet 2011b [61] | L | U | H | | L | | | L | | L | L |

| Study | Sequence Generation | Allocation Concealment | Blinding of Personnel/ Participants | Blinding of Outcome Assessors | | | Incomplete Reporting | | | Selective Reporting | Other Bias |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | OBJ | SUB | S-R | OBJ | SUB | S-R | | |
| Newmark-Sztainer 2010 [62] | U | U | H | L | U | | L | L | | L | L |
| Newumark-Sztainer 2003 [63] | U | H | H | | U | U | | L | L | L | L |
| Ostbye 2012 [64] | L | U | H | | U | U | | U | U | L | L |
| Paineau 2008 [65] | L | U | H | L | U | | L | L | | L | H |
| Papadaki 2010 [66] | L | U | H | L | U | | H | H | | L | H |
| Peralta 2009 [67] | L | U | H | | L | | | L | | L | H |
| Reed 2008 [68] | U | U | H | L | U | | L | L | L | L | L |
| Reilly 2006 [69] | L | L | H | | L | | | L | | L | L |
| Robinson 2003 [70] | L | U | H | | L | | | L | | H | H |
| Robinson 2010 [71] | U | U | H | L | L | | L | L | | L | H |
| Rosario 2013 [72] | L | U | H | | L | | | H | | L | U |
| Rosenkranz 2010 [73] | L | U | H | | U | | | L | | L | L |
| Rush 2012 [74] | L | L | H | | L | | | H | | L | L |
| Salcedo 2010 [75] | U | U | H | L | U | | H | H | | L | H |
| Shamah 2012 [76] | U | U | H | | U | | | L | | L | H |
| Sichieri 2009 [77] | U | U | H | | U | | | L | | L | L |
| Siegrist 2013 [78] | U | U | H | | U | | | L | | L | U |
| Simon 2008 [79] | U | U | H | L | U | | L | L | | L | L |
| Singh 2009 [80] | L | L | H | | H | | | L | | L | L |
| Singhal 2010 [81] | U | U | H | L | U | | L | L | | L | H |
| Story 2003 [82] | L | U | H | | U | | | L | | H | H |
| Story 2012 [83] | U | U | H | | U | | | L | | L | H |
| Telford 2012 [84] | U | U | H | | U | | U | U | | L | L |
| Thivel 2010 [85] | U | U | H | | U | | | L | | L | H |
| Velez 2010 [86] | U | U | H | L | U | | L | L | | L | H |
| Webber 2008 [87] | U | U | H | L | L | | L | L | | L | L |
| Weeks 2012 [88] | U | U | H | L | U | | L | L | | L | L |
| Wen 2012 [89] | L | L | H | | L | | | L | | L | L |
| Williamson 2012 [90] | U | U | H | U | U | | H | H | | L | L |
| Yin 2012 [91] | U | U | H | | H | | | H | | L | L |

L (green) = Low Risk; U (yellow) = Unclear Risk; H (red) = High Risk; OBJ = Objective Outcome; SUB = Subjective Outcome; S-R = Self-Reported Outcome

## *e*-Table 3: Characteristics of Included Studies

| | |
|---|---|
| **Study/Location** | Amaro 2006 [2] Italy |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Baranowski 2003 [3] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Barkin 2012 [4] United States |
| **Objective** | To test the effect of a culturally tailored, family-centered, short-term behavioural intervention on BMI in Latino-American preschool-aged children |
| **Methods** | Design: RCT<br>Selection: bilingual research assistant approached individuals in the waiting area of community agencies (e.g., pediatric clinics, community centers); study advertised via: flyers, community organizations; Spanish radio, Spanish newspapers, word-of-mouth<br>Inclusion criteria: parents >18 years; self-defined as Hispanic/Latino; child aged 2-6; not currently enrolled in another healthy lifestyle program; valid telephone number; planning on remaining in the city for the next 6 months<br>Unit of allocation: dyads<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 106<br>Intervention n=54; Control n=52<br>Age mean (SD) (years): Intervention: 4.2 (0.9); Control: 4.1 (0.9)<br>Gender [Female n (%)]: Intervention n=16 (45.7%); Control n=22 (55%)<br>Loss to follow-up: Intervention n=19; Control n=12 |
| **Intervention** | Description of intervention: Salud Con La Familia (Heart with the family); 12 weekly 90-minute skills-building sessions for parents and preschool-aged children to improve nutritional habits, increase physical activity, and decrease sedentary activity<br>Description of control: brief school readiness program conducted as alternative to active intervention; met 3 times for 60 minutes over the 12-week study period<br>Duration of intervention: 12 weeks<br>Length of follow-up: immediate post |
| **Study/Location** | Beech 2003 [5] United States; Companion paper: Story [93] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |

| Study/Location | Bellows 2013 [6] United States |
|---|---|
| **Objective** | To assess the efficacy of an intervention on gross motor skill performance, physical activity, and weight status of preschoolers |
| **Methods** | Design: RCT<br>Selection: NR<br>Unit of allocation: child<br>Unit of analysis: child<br>Intention to treat analysis: no |
| **Participants** | Sample: 263<br>Intervention n=132; Control n=131<br>Age mean (SD) (months): Intervention: 53.0 (6.8); Control: 51.5 (6.6)<br>Gender (Female): 45%<br>Race/Ethnicity: 59% Hispanic<br>SES: all participants considered to have low SES<br>Loss to follow-up: Intervention n=34; Control n=28 |
| **Intervention** | Description of intervention: "The Food Friends: Get Movin' With Mighty Moves": 18 weeks classroom based intervention 4 days/week for 15–20 min/day; 72 lessons that comprised multiple activities (143 total activities) focused on gross motor skill and healthy eating; led by classroom teacher<br>Description of control: NR<br>Duration of intervention: 18 weeks<br>Length of follow-up: immediate post |
| **Study/Location** | Black 2010 [7] United States |
| **Objective** | To evaluate a 12-session home/community-based health promotion/obesity prevention program (Challenge!) on changes in BMI, body composition, physical activity, and diet |
| **Methods** | Design: RCT<br>Selection: one group participated in investigation of growth and development; other group recruited from middle schools; researchers visited classes and described the project and the possibility of receiving a health program with a "personal trainer"<br>Inclusion criteria: aged 11-16 years; reside in nearby low-income communities<br>Unit of allocation: individuals<br>Unit of analysis: individuals<br>Intention to treat: No |
| **Participants** | Sample: 235<br>Intervention n=121; Control n=114<br>Age mean (SD) (years): Intervention: 13.3 (1.0); Control: 13.3 (1.0) |

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|---|---|
| | Gender [Female n (%)]: Intervention n=62 (51.2%); Control n=54 (47.4%)<br>Race/Ethnicity: Non-Hispanic blacks: Intervention: 118 (97.5%); Control: 110 (96.5%)<br>Loss to follow-up: Intervention n=30; Control n=21 |
| **Intervention** | Description of intervention: 12 sessions that included a challenge (e.g., persuade someone to drink water instead of soda), setting a personal goal related to diet or PA (e.g., eat 2 vegetables/day, walk 30 min/day), make and taste healthy snacks and engage in PA with mentors; taste tests (e.g., regular/diet soda), recipes for healthy snacks (e.g., breakfast sundae with yogurt, granola and fruit), and recommendations for PA; parents welcome to participate; mentors left recipes and information for the family<br>Description of control: no mentor, no contact between baseline and follow-up<br>Duration of intervention: 11 months<br>Length of follow-up: 24 months |
| **Study/Location** | Bonsergent 2013 [8] France; Companion paper: Briancon [94] |
| **Objective** | To evaluate the 2-year effectiveness of three strategies aimed at preventing overweight and obesity among adolescents in a high school setting |
| **Methods** | Design: RCT<br>Selection: 24 high schools randomly selected after stratification on department and type of education (general and technological or vocational)<br>Inclusion criteria: high school must be a state administrated establishment<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 5,354<br>Intervention n=2,641; Control n=2,713 (baseline and follow-up data only presented by completers and non-completers)<br>Age mean (SD) (years): Completers: 15.6 (0.7)<br>Gender (Female): completers 57.6%<br>Loss to follow-up: 33.9% overall |
| **Intervention** | Description of intervention: dietary and physical activity lectures for 5 hours in Grade 10, 6 hours in Grade 11 and group work to exchange, find and present answers to problems related to eating habits, physical activity and the environment<br>Description of control: non-education strategy<br>Duration of intervention: 24 months<br>Length of follow-up: immediate post |
| **Study/Location** | Brandsetter 2012 [9] Germany |
| **Objective** | To describe the effects of a school-based intervention for overweight prevention on children's BMI and other measures of fat mass |

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| **Methods** | Design: RCT<br>Selection: all principals were informed in writing about the study and were asked to invite first-grade teachers to participate<br>Inclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 1,119<br>Intervention n=540; Control n=579<br>Age mean (SD) (years): Intervention: 7.61 (0.42); Control: 7.53 (0.42)<br>Gender (Female): Intervention 44.9%; Control 47.9%<br>Loss to follow-up: Intervention n=51; Control n=42 |
| **Intervention** | Description of intervention: school-based, within existing curriculum focused on health promoting behaviour change with action alternatives in three areas: drinking sugar-sweetened beverages (drinking water, discovering hidden sugar in drinks), spending time with screen media (leisure activities without TV), and being physically active (learning about local sport and leisure facilities); 1 school year of materials covering: 29 30-60 minute teaching units; 2 short (5-7 minute) blocks of PA exercises a day, 6 family homework lessons; teacher training and parent information materials<br>Description of control: no intervention<br>Duration of intervention: 1 school year<br>Length of follow-up: immediate post |
| **Study/Location** | Brown 2013 [10] United States |
| **Objective** | To develop a lifestyle change program for Native American youth by modifying the Diabetes Prevention Program (DPP) and to assess implementation indicators and short term behavioural and physiological outcomes of the intervention among a pilot sample |
| **Methods** | Design: RCT<br>Selection: Northern Plains Indian youth 10-14 years old living on 2 American Indian reservations in north-central and southwestern Montana<br>Unit of allocation: child<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 76<br>Intervention n=38; Control n=38<br>Age mean (SD) (years): Overall: 11.4 (1.1)<br>Gender (Female): 50%<br>Race/Ethnicity: Native American<br>Loss to follow-up: Intervention n=6; Control n=6 |

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| **Intervention** | Description of intervention: general content and behavioural were based on the original DPP lifestyle change model; strategies targeted healthy weight maintenance, lowering fat intake, increasing physical activity; 9 sessions over 3 months; weight goal to slow or reduce BMI growth; emphasis on traditional activities (e.g., berry picking, horseback riding, dancing, hunting, hiking, and camping), use of storytelling and native language to convey information, and participation of elders; hands-on interactive activities<br>Description of control: addressed risks for alcohol and drug use<br>Duration of intervention: 3 months<br>Length of follow-up: immediate post |
| **Study/Location** | Burgi 2012 [11] Switzerland; Companion papers: Puder [95], Niederer [96] |
| **Objective** | To examine whether a multidimensional lifestyle intervention is equally effective in children of migrant and/or low educational level parents |
| **Methods** | Design: RCT<br>Selection: public preschool classes randomly selected in areas with a high migrant population from two different socio-cultural and linguistic regions in Switzerland<br>Inclusion criteria: for preschool classes a >40% prevalence of migrant children and no participation in any other prevention project<br>Unit of allocation: class<br>Unit of analysis: children<br>Intention to treat: yes |
| **Participants** | Sample: 652<br>Intervention n=342; Control n=310<br>Age mean (SD) (years): Intervention: 5.2 (0.6); Control: 5.2 (0.6)<br>Gender [Female n (%)]: Intervention n=167 (49%); Control n=159 (51%)<br>Loss to follow-up: Intervention n=18; Control n=9 |
| **Intervention** | Description of intervention: children participated in a PA program consisting of four 45 min sessions per week; teachers participated in two 3 hour workshops to learn the content and practical aspects of the intervention and in one informal meeting to exchange experiences; parents participated in three interactive information and discussion evenings about promotion of PA, healthy food, limiting TV use and the importance of sufficient sleep<br>Description of control: Regular school curriculum<br>Duration of intervention: 10 months<br>Length of follow-up: immediate post |
| **Study/Location** | Caballero 2003 [12] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |

| Study/Location | Campbell 2013 [13] Australia; Companion paper: Campbell [97] |
|---|---|
| **Objective** | To assess the effectiveness of a parent-focused intervention on infants' obesity-risk behaviours and BMI |
| **Methods** | Design: RCT<br>Selection: 14 local government areas randomly selected from 28 eligible; fifty percent of eligible first-time parents' groups in each area randomly selected (62/103 groups) and approached by research staff during a standard nurse-facilitated group session<br>Inclusion criteria: parent groups eligible if ≥8 parents enrolled or ≥6 parents enrolled in areas of low SES<br>Unit of allocation: parent group<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 542<br>Intervention n=271; Control n=271<br>Age mean (SD) (months): Overall: 3.9 (1.6)<br>Gender (Female): 47.4%<br>Loss to follow-up: Intervention n=30; Control n=32 |
| **Intervention** | Description of intervention: dietitian-delivered intervention comprised six 2-hour sessions delivered quarterly during the first-time parents' group regular meeting<br>Description of control: 6 newsletters on non obesity-focused themes; parents received usual care from their MCH nurse, who may have provided lifestyle advice.<br>Duration of intervention: 15 months<br>Length of follow-up: immediate post |
| **Study/Location** | Crespo 2012 [14] United States; Companion paper: Elder [98] |
| **Objective** | To evaluate the impact of a community health advisor intervention to promote healthy eating and physical activity and prevent excess weight gain among Latino children |
| **Methods** | Design: RCT<br>Selection: elementary schools within 3 school districts in south San Diego County<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 808<br>Intervention 1 n=198; Intervention 2 n=165; Intervention 3 n=218; Control n=227<br>Age mean (SD) (years): Overall: 5.9 (0.9)<br>Gender (Female): 50%<br>Loss to follow-up: Intervention 1 n=31; Intervention 2 n=20; Intervention 3 n=22; Control n=22 |

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| **Intervention** | Description of intervention 1: home/family environmental change – activities delivered by eight promotoras (community health advisors) consisted of home visits, newsletters, recipe cards, goal setting, booster phone calls<br>Description of intervention 2: community-only environmental change – school playground improvements and implementation of salad bars/improvements to salad bars, improvements to community parks, change in classroom practices, physical education equipment, children's menus at restaurants<br>Description of intervention 3: family-plus-community-environmental change – combination of interventions 1 and 2<br>Description of control: no intervention<br>Duration of intervention: 3 years<br>Length of follow-up: immediate post |
| **Study/Location** | Cunha 2013 [15] Brazil |
| **Objective** | To evaluate the effectiveness of a school-based intervention involving families and teachers to promote healthy eating habits in adolescents and reduce increase in BMI |
| **Methods** | Design: RCT<br>Selection: selected 20 schools with fifth grade classes out of 35 municipal schools; all located in areas not considered high risk for violence<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 574<br>Intervention n=293; Control n=281<br>Age mean (SD) (years): Intervention: 11.2 (1.3): Control: 11.2 (1.3)<br>Gender (Female): 48.6%<br>Loss to follow-up: Intervention n=45; Control n=30 |
| **Intervention** | Description of intervention: trained nutritionists gave monthly 1hour sessions in the classrooms, which included games, theater sketches, movies and puppet shows, writing and drawing contests, to encourage changes in eating habits and food consumption<br>Description of control: one-hour section of orientation on general health and advice on healthy eating, at the end of the study<br>Duration of intervention: 9 months<br>Length of follow-up: immediate post |
| **Study/Location** | Daniels 2012 [16] Australia |
| **Objective** | To evaluate a universal obesity prevention intervention for infants |
| **Methods** | Design: RCT<br>Selection: recruitment 4 hospitals in Adelaide and 3 in Brisbane; consecutive sample of |

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| | first-time mothers (≥18 years old) who delivered a healthy term infant approached while still in hospital by hospital employed midwives, study-employed staff, or doctoral students; mothers who gave consent re-contacted when infant was 4-6 months<br>Inclusion criteria: no documented history of domestic violence or intravenous drug use; no self-reported eating or psychiatric disorder; written and spoken English; ability to attend sessions; no serious infant health problems; score on the Kessler Psychological Distress Scale (K10) below 30 (not high maternal psychological distress).<br>Unit of allocation: child<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 698<br>Intervention n=352; Control n=346<br>Age mean (SD) (months): Intervention: 4.3 (1.0): Control: 4.3 (1.0)<br>Gender (Female): Intervention 51%; Control 50%<br>Loss to follow-up: Intervention n=92; Control n=65 |
| **Intervention** | Description of intervention: comprehensive skills-based program that used a cognitive behavioural approach and focused on feeding and parenting practices; 2 modules of 6 fortnightly group sessions (10–15 mothers per group), each 1 to 1.5 hours; Module 1 delivered by 9 dietitians and 10 psychologists who worked in pairs<br>Description of control: self-directed access to usual community child health services, which were similar in both states and largely targeted at high-risk families<br>Duration of intervention: 3 months<br>Length of follow-up: 15 months |
| **Study/Location** | DeBar 2011 [17] United States; Companion paper: The HEALTHY Study Group [99] |
| **Objective** | To examine whether student's "public commitment" - voluntary participation as a peer communicator or in student-generated media opportunities - in a school-based intervention to prevent diabetes and reduce obesity predicted improved study outcomes |
| **Methods** | Design: RCT<br>Selection: schools where at least 50% of children ineligible for federally subsidized, free, or reduced-priced meals and/or at least 50% of students' ethnicity was Black or Hispanic. Students enrolled in 6th grade in Fall 2006 who had no conditions that would preclude active participation in physical education classes<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 3,131<br>Intervention n=835; Control n=2,296<br>Age mean (SD) (years): Intervention: 11.3 (0.5); Control: 11.3 (0.5) |

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| | Gender (Female): Intervention 58.6%; Control 69.6%<br>Race/Ethnicity: Intervention 51% Hispanic; Control 53.5% Hispanic<br>Loss to follow-up: 0 |
| **Intervention** | Description of intervention: HEALTHY intervention, delivered over five semesters (Spring 2007, Fall 2007, Spring 2008, Fall 2008, Spring 2009) comprised four components: nutrition, physical education, behaviour and communications<br>Description of control: no intervention<br>Duration of intervention: 3 years<br>Length of follow-up: immediate post |
| **Study/Location** | de Heer 2011 [19] United States |
| **Objective** | To evaluate the effectiveness and spillover of an after-school health education and physical activity program among Hispanic elementary school children |
| **Methods** | Design: RCT<br>Selection: students recruited in third, fourth, and fifth grades by making announcements and passing out consent forms during PE classes<br>Exclusion criteria: children were excluded if they were not in the target grades and/or if they had a condition that would endanger their own or others' safety<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 646<br>Intervention n=292; Control n=354<br>Age mean (SD) (years): Intervention: 9.24 (0.87); Control: 9.10 (1.08)<br>Gender (Female): 47.0%<br>Loss to follow-up: Intervention n=50; Control n=28 |
| **Intervention** | Description of intervention: after-school program ran twice weekly for 12 weeks for a total of 24 sessions at each school; each session took place in the schoolyard or in the multipurpose room and comprised a 20 to 30 minute health education component followed by 45 to 60 minutes of physical activity.<br>Description of control: no treatment<br>Duration of intervention: 3 months<br>Length of follow-up: immediate post |
| **Study/Location** | De Coen 2012 [18] Belgium |
| **Objective** | To evaluate the effects of a school-based, 2-year, multi-component intervention on BMI, eating and physical activity behaviour |
| **Methods** | Design: RCT<br>Selection: six communities selected from research regions in Flanders based on five |

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| | socio-economic characteristics: (i) number of births in underprivileged families; (ii) proportion of pupils in primary school with a school delay; (iii) rate of unemployment; (iv) number of persons on welfare support; and (v) number of underprivileged foreigners; recruitment in schools; all pre-primary and primary schools invited<br>Unit of allocation: community<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 3,242<br>Intervention n=2,034; Control n=1,208<br>Age mean (SD) (years): Intervention: 4.86 (1.25); Control: 5.04 (1.29)<br>Gender (Female): 50%<br>Loss to follow-up: Intervention n=1,364; Control n=766 |
| **Intervention** | Description of intervention: based on the 'Nutrition and Physical Activity Health Targets': (i) increasing daily consumption of water and decreasing soft drinks consumption; (ii) increasing daily milk consumption; (iii) increasing daily consumption of vegetables and fruit; (iv) decreasing daily consumption of sweets and savoury snacks; and (v) increasing daily PA and decreasing screen-time behaviour<br>Description of control: no intervention<br>Duration of intervention: 24 months<br>Length of follow-up: immediate post |
| **Study/Location** | de Ruyter 2012 [20] Netherlands; Companion paper: de Ruyter [100] |
| **Objective** | To examine the effect on weight gain of masked replacement of sugar-sweetened beverages with non-caloric, artificially sweetened beverages |
| **Methods** | Design: RCT<br>Selection: recruited children at eight urban elementary schools near Amsterdam<br>Inclusion criteria: children who commonly drank sugar-sweetened beverages<br>Exclusion criteria: children with various medical conditions<br>Unit of allocation: child<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 641<br>Intervention n=319; Control n=322<br>Age mean (SD) (years): Intervention: 8.2 (1.8); Control:8.2 (1.8)<br>Gender (Female): Intervention 46%; Control 47%<br>Loss to follow-up: Intervention n=94; Control n=50 |
| **Intervention** | Description of intervention: children received a box at school each week containing 8 cans, 1 for each day plus 1 spare in case a can was misplaced; teachers checked to see whether the children consumed their beverage during the morning break in class and |

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| | reminded them to take cans home for the weekend and any holidays. The sugar-free beverages contained 24 mg of sucralose and 12 mg of acesulfame potassium per can.<br>Description of control: control beverage contained 26 g of sucrose<br>Duration of intervention: 18 months<br>Length of follow-up: immediate post |
| **Study/Location** | Donnelly 2009 [21] United States; Companion paper: Gibson [101] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Dzewaltowski 2010 [22] United States |
| **Objective** | To evaluate the prevention of childhood obesity through building the capacity of after-school staff to increase physical activity and fruit and vegetable opportunities |
| **Methods** | Design: RCT<br>Selection: all schools participating in an after-school program alliance of the Lawrence Public School District<br>Exclusion criteria: if after-school programs were not on the elementary school grounds<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 273<br>Intervention n=148; Control n=125<br>Age mean (SD) (years): Intervention: 9.34 (0.65); Control: 9.19 (0.66)<br>Gender (Female): Intervention 53.0%; Control 46.0%<br>SES (% eligible for free/reduced lunch): Intervention 44%; Control 58%<br>Loss to follow-up: Intervention n=14; Control n=13 |
| **Intervention** | Description of intervention: the HOP'N intervention model included three levels: a community/government/human service agency (County Cooperative Extension), after-school staff training, and after-school program quality elements.<br>Description of control: standard after-school program<br>Duration of intervention: 24 months<br>Length of follow-up: immediate post |
| **Study/Location** | Ebbeling 2006 [23] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | El Ansari 2010 [24] Egypt |
| **Objective** | To assess the association between a PA intervention and three anthropometric parameters (weight, body mass index, body fat) and four physiological parameters (cholesterol level, |

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| | systolic blood pressure, diastolic blood pressure, heart rate) among adolescents |
| **Methods** | Design: RCT<br>Selection: schools with sport facilities and sport equipment<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 160<br>Intervention n=80; Control n=80<br>Age mean (SD) (years): Intervention: 15.7 (1.8); Control: 15.4 (1.6)<br>Gender [Female n (%)]: Intervention n=45 (56%); Control n=45 (56%)<br>Loss to follow-up: Intervention n=0; Control n=0 |
| **Intervention** | Description of intervention: three, 60-minute PA sessions each week for three months<br>Description of control: no intervention<br>Duration of intervention: 3 months<br>Length of follow-up: immediate post |
| **Study/Location** | Escribano 2012 [25] Germany/Spain; Companion paper: Koletzko [102] |
| **Objective** | To assess if the increases in weight gain velocity and BMI induced by protein intake early in life are related to an increase in fat or fat-free mass |
| **Methods** | Design: RCT<br>Selection: 80 infants from the EU Childhood Obesity Programme sample; 37 from Germany and 43 from Spain; selected by recruitment order from 522 eligible subjects when they were 6 months old<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: N/A |
| **Participants** | Sample: 66<br>Intervention 1 n=17; Intervention 2 n=24; Control n=25<br>Age: NR<br>Gender [Female n (%)]: Intervention 1 n=8 (47%); Intervention 2 n=14 (58%); Control n=10 (40%)<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: 41 infants randomized at birth to higher or lower protein content formula (HP=17 and LP=24); 25 breastfed infants also included; anthropometric measures assessed at baseline, 6, 12 and 24 months, and fat-free mass (FFM) and fat mass (FM) were assessed by isotope dilution at 6 months.<br>Duration of intervention: 6 months<br>Length of follow-up: 12, 24 months |

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| **Study/Location** | Fitzgibbon 2005 [26] United States; Companion paper: Fitzgibbon [27] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Fitzgibbon 2006 [27] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Fitzgibbon 2011 [28] United States |
| **Objective** | To assess the feasibility and effectiveness of a teacher-delivered weight control intervention for black preschool children |
| **Methods** | Design: RCT<br>Selection: no details regarding school recruitment<br>Inclusion criteria: intervention took place during regular class time so all children in participating classrooms received intervention and were eligible to participate<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 589<br>Intervention n=309; Control n=280<br>Age mean (years): Overall: 4.3<br>Gender (Female): Intervention 52%; Control 55%<br>Race/Ethnicity: 94% Black, 3% Latino<br>Loss to follow-up: overall n=29 |
| **Intervention** | Description of intervention: 14 week curriculum based intervention, 2 teacher delivered sessions per week each week on a specific theme/objective (one 20-minute lesson and one 20-minute physical activity component); parent involvement: weekly newsletter with parallel content, homework assignment with $ reward for completion<br>Description of control: general health intervention<br>Duration of intervention: 14 weeks<br>Length of follow-up: immediate post |
| **Study/Location** | Fitzgibbon 2013 [29] United States |
| **Objective** | To test the feasibility of Family-Based Hip-Hop to Health, a school-based obesity prevention intervention for 3-5-year-old Latino children and their parents, and estimate its effectiveness in producing smaller average changes in BMI |
| **Methods** | Design: RCT<br>Selection: principals and preschool teachers from four Chicago Public Schools agreed to allow children to participate. Two half-day classrooms from each school participated |

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| | Unit of allocation: ECE program<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 147<br>Intervention n=73; Control n=74<br>Age mean (SD) (months): Overall: 54.2 (5.0)<br>Gender (Female): 50%<br>Race/Ethnicity: 94% Hispanic<br>Loss to follow-up: Intervention n=12; Control n=7 |
| **Intervention** | Description of intervention: child component included a 14-week (three times weekly) intervention led by a bilingual/bicultural educator; each session included 20 min of nutrition instruction (included activities led by puppets) and 20 min of aerobic activity; parent component included classes and newsletters adapted for a lower-income, Hispanic population; parents encouraged to attend six weekly 90-min classes that included 60 min of interactive instruction on healthful eating and family exercise plus 30 min of moderate physical activity (e.g., salsa aerobics, walking group)<br>Description of control: control schools received a once weekly intervention for 14 weeks (20 min each week) that taught general health concepts such as dental health, seat belt safety, and calling 911; parents received parallel weekly newsletters<br>Duration of intervention: 14 weeks<br>Length of follow-up: immediate post; 12 months |
| **Study/Location** | Foster 2008 [30] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | French 2011 [32] United States; Companion papers: Foster [31], The HEALTHY study group [99] |
| **Objective** | To evaluate an intervention to prevent weight gain among households |
| **Methods** | Design: RCT<br>Selection: households recruited over 8 months; recruitment sources: community libraries, worksites, schools, daycare centers, health clinics, religious institutions, park and recreation centers, grocery stores, and food co-ops<br>Exclusion criteria: living too far from the university, household TV viewing hours below enrollment criteria, household configuration not meeting enrollment criteria<br>Unit of allocation: household<br>Unit of analysis: household/individual<br>Intention to treat: no |
| **Participants** | Sample: 90 households<br>Intervention n=45 households; Control n=45 households |

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| | Age: aged <5 years n=23, aged 5-11 years n=84, aged 12-17 years n=75<br>Gender [Female n (%)]: only reported for adults as main respondents 93%<br>Loss to follow-up: overall 4 households |
| **Intervention** | Description of intervention: 6 monthly face-to-face group sessions, monthly newsletters, and 12 home-based activities<br>Description of control: no treatment<br>Duration of intervention: 1 year<br>Length of follow-up: immediate post |
| **Study/Location** | Fung 2012 [33] Canada |
| **Objective** | To examine the effectiveness of a Comprehensive School Health program by evaluating temporal changes in diets, activity levels and body weight |
| **Methods** | Design: RCT<br>Selection: 10 schools selected from five jurisdictions in Alberta, all of which agreed to support healthy eating and active living initiatives among students<br>Exclusion criteria: schools outside selected jurisdictions<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: N/A |
| **Participants** | Sample: 3,714<br>Intervention n=293; Control n=3,421<br>Age: NR (grade 5 students)<br>Gender [Female n (%)]: Intervention n=149 (50.7%); Control n=1,762 (51.5%)<br>Loss to follow-up: <10% dropout rate by the 2010 survey |
| **Intervention** | Description of intervention: “to make the healthy choice the easy choice” School Health Facilitators implemented healthy eating and active living strategies; engaged all stakeholders, including parents, staff and community; School Health Facilitators developed cross curriculum links and taught across curriculum; facilitated professional development days for teachers and staff, organized parent information nights, nutrition programs such as cooking clubs, after school physical activity programs, weekend events and celebrations, and circulated newsletters<br>Description of control: no intervention<br>Duration of intervention: 3 years<br>Length of follow-up: -1 year |
| **Study/Location** | Gentile 2009 [34] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |

| Study/Location | Greening 2011 [35] United States |
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| **Objective** | To evaluate a healthy lifestyle school-based obesity intervention in a rural southern community |
| **Methods** | Design: RCT<br>Exclusion criteria: disabilities that precluded comprehending the questionnaires or performing the fitness tests<br>Unit of allocation: school<br>Unit of analysis: school<br>Intention to treat: no |
| **Participants** | Sample: 450<br>Intervention n=204; Control n=246<br>Age mean (SD; range) (years): Overall: 8.34 (1.30; 6 to 10)<br>Gender (Female): overall 48.0%<br>Loss to follow-up: overall 11.0% |
| **Intervention** | Description of intervention: a 45 minute nutritional information session presented once during school year by a nutritionist; 45 minute physical education classes twice a week; healthy information incorporated into weekly class lectures; deep frying equipment replaced with baking ovens<br>Description of control: standard health curriculum<br>Duration of intervention: 8 months<br>Length of follow-up: immediate post |
| **Study/Location** | Haerens 2006 [36] Belgium; Companion paper: Haerens [103] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Hakanen 2010 [37] Finland |
| **Objective** | To evaluate the impact of individualized dietary and lifestyle counselling, primarily aimed to decrease serum low-density lipoprotein cholesterol, on the clustering of overweight-related cardiometabolic risk factors in children |
| **Methods** | Design: RCT<br>Selection: recruited by nurses at well baby visit<br>Exclusion criteria: children with chronic disease (e.g. chromosomal diseases, diabetes, familial hypercholesterolaemia)<br>Unit of allocation: child<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 1,062<br>Intervention n=540; Control n=522 |

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| | Age mean (months): Intervention: 7; Control: 7<br>Gender: NR<br>Loss to follow-up: Intervention n=291; Control n=246 |
| **Intervention** | Description of intervention: individualized dietary and lifestyle counselling at 1 to 3 month intervals until child was 2 years old and twice a year thereafter; all children continued regular visits at the wellbaby clinics and school health care for vaccinations, growth and development follow-up and basic health education<br>Description of control: contacted by the counselling team twice a year until age 7 years and once a year after that; received similar basic health education as routinely given at Finnish wellbaby clinics and school health care<br>Duration of intervention: 2 years<br>Length of follow-up: every two years for 8 years |
| **Study/Location** | Harvey-Berino 2003 [38] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | HEALTHY Study Group 2010 [31] United States |
| **Objective** | To examine the effects of a multicomponent, school-based program addressing risk factors for diabetes among children whose race or ethnic group and SES placed them at high risk for obesity and type 2 diabetes |
| **Methods** | Design: RCT<br>Selection/Exclusion criteria: ≥50% of children in school eligible for federally subsidized, free or reduced-price meals or ≥50% students black or Hispanic; Black and Hispanic children of lower SES oversampled given that these children are at a high risk for obesity and type 2 diabetes; Students in 6th grade in fall 2006 eligible if no diabetes or conditions that would preclude regular participation in physical education<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 6,358<br>Intervention n=3,189; Control n=3,169<br>Age mean (SD) (years): Intervention: 11.3 (0.5); Control: 11.3 (0.6)<br>Gender (Female): Intervention 52.6%; Control 52.9%<br>Loss to follow-up: overall 27.6% |
| **Intervention** | Description of intervention: four integrated components: nutrition, physical activity, behavioural knowledge and skills, and communications and social marketing.<br>Description of control: assessment only<br>Duration of intervention: 3 years<br>Length of follow-up: immediate post |

| Study/Location | Hoffman 2011 [39] United States |
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| **Objective** | To examine the effects of a multi-component, theory-based, 2.5-year intervention on children's fruit and vegetable consumption, preferences, knowledge and BMI |
| **Methods** | Design: RCT<br>Selection: multiple approaches to recruit (e.g., teacher meetings, principal support, classroom presentations); four urban public schools from the same school district<br>Inclusion criteria: signed parental consent required for inclusion<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 297<br>Intervention n=149; Control n=148<br>Age mean (years): Overall: 6.2<br>Gender (Female): Overall 49.0%<br>Loss to follow-up: Intervention n=46, Control n=43 |
| **Intervention** | Description of intervention: school wide (daily loud speaker announcements), classroom (instructional DVD), lunchroom (daily stickers contingent on a bite of fruit or vegetable), and family (take-home activity books) components to promote F&V consumption with emphasis on F&V in school lunch; role models delivering consistent information across multiple settings.<br>Description of control: no intervention<br>Duration of intervention: 2.5 years<br>Length of follow-up: immediate post |
| **Study/Location** | Howe 2011 [40] United States |
| **Objective** | To evaluate the efficacy of a 10-month PA intervention on: (a) the prevention of excessive age-related increases in body fatness and (b) cardiovascular fitness |
| **Methods** | Design: RCT<br>Selection: Black boys (8-12 years) recruited from five elementary schools using fliers<br>Inclusion criteria: all 3rd through 5th grade Black boys eligible if: (a) weight <300 lbs (equipment limitation), (b) not taking medications known to affect metabolism, body composition, or fat distribution, and (c) no known CV, metabolic, or respiratory disease or physical impairment that would limit participation in regular PA<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 106<br>Intervention n=62; Control n=44 |

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| | Age range (years): 8 to 12<br>Gender: 100% boys<br>Race/Ethnicity: African-American<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: participants stayed at school at end of day (177+/- 8.6 days) to receive a 2-hour intervention; conducted by trained personnel with exercise-related education plus 1-2 trained classroom teachers; 30 minutes of homework time during which the boys provided with a healthy snack followed by 80 minutes of PA<br>Description of control: no intervention, instructed not to change after-school routine<br>Duration of intervention: 10 months<br>Length of follow-up: immediate post |
| **Study/Location** | James 2007 [41] England; Companion paper: James [104] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Jansen 2011 [42] Netherlands |
| **Objective** | To evaluate the effect of a school-based intervention program to reduce overweight and improve fitness in primary school children |
| **Methods** | Design: RCT<br>Selection: primary schools in inner-city areas of Rotterdam; 27 schools applied<br>Exclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 1,386<br>Intervention n=657; Control n=729<br>Age mean (SD) (years): Intervention Grades 3-5: 7.7 (1.0), Grades 6-8: 10.8 (1.0); Control: Grades 3-5: 7.8 (1.0), Grades 6-8: 10.8 (1.0)<br>Gender (Female): Grades 3-5 Intervention 50.5%; Control 51.0%; Grades 6-8 Intervention 52.8%; Control 49.0%<br>Loss to follow-up: Intervention n=91; Control n=115 |
| **Intervention** | Description of intervention: Lekker Fit! promoting healthy eating and active living; targeted individual behaviours, school policies and curriculum; 3 PA sessions/week by PA teacher for grades 3-8 (6-12 years), 3 classroom lessons on healthy nutrition, active living and healthy lifestyle choices adapted for each grade, administration of the Eurofit test, with measurements of height, weight and 9 fitness tests<br>Description of control: usual curriculum<br>Duration of intervention: 10 months<br>Length of follow-up: immediate post |

| Study/Location | Katz 2011 [43] United States |
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| **Objective** | To evaluate the effects of a nutrition education program designed to teach elementary students and their parents to distinguish between more healthful and less healthful choices in diverse food categories |
| **Methods** | Design: RCT<br>Selection: During the 2007-2008 school year, participants second to fourth grade students recruited from 5 elementary schools in Independence, Missouri<br>Exclusion criteria: Students excluded from data collection and program evaluation if parental consent not received or if the student was unwilling or unable to comply<br>Unit of allocation: school<br>Unit of analysis: school<br>Intention to treat: yes |
| **Participants** | Sample: 1,180<br>Intervention n=628; Control n=552<br>Age range (years): 7 to 9<br>Gender (Female): Total: 51.1%; Intervention: 50.3%; Control: 52.2%<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: The Nutrition Detectives program consists of 5 lessons (power point presentation plus hands on activity) presented by physical education instructors in four 20-minute sessions; a booster training session offered later in year<br>Description of control: NR<br>Duration of intervention: 1 school year<br>Length of follow-up: 1 school year |
| **Study/Location** | Klesges 2010 [44] United States |
| **Objective** | To determine the efficacy of a 2-year obesity prevention intervention in African-American girls |
| **Methods** | Design: RCT<br>Selection: recruitment in 5 waves primarily through television and radio ads and flyers and community presentations; ads described GEMS as a study of healthy growth<br>Inclusion criteria: identified as African-American or Black by parent/caregiver; aged 8-10 years; BMI ≥25th age-sex specific percentile, or at least one parent with BMI ≥25; Girls were excluded if they had BMI >35 or conditions that would affect growth or limit participation in the study.<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 303 |

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| | Intervention n=153; Control n=150<br>Age mean (SD) (years): Intervention: 9.3 (0.9); Control: 9.3 (0.9)<br>Gender: 100% female<br>Race/Ethnicity: African-American<br>Loss to follow-up: 20% |
| **Intervention** | Description of intervention: girls and caregivers participated in the obesity prevention intervention through a combination of separate and joint sessions.<br>Description of control: intervention on improving self-esteem and social efficacy<br>Duration of intervention: 2 years<br>Length of follow-up: immediate post |
| **Study/Location** | Kriemler 2010 [45] Switzerland; Companion paper: Zahner [105] |
| **Objective** | To assess the effectiveness of a school based physical activity program during one school year on physical and psychological health in young schoolchildren |
| **Methods** | Design: RCT<br>Selection: two provinces in Switzerland. Recruitment of participating schools based on willingness to be randomized either to an intervention group or a control group.<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 502<br>Intervention (grades 1 and 5 combined) n=297; Control (grades 1 and 5 combined) n=205<br>Age mean (SD) (years): Intervention (grade 1): 6.9 (0.3); Intervention (grade 5): 11 (0.5); Control (grade 1): 6.9 (0.3); Control (grade 5): 11.3 (0.6)<br>Gender [Female n (%)]: Intervention 1 n=64 (49%); Intervention 2 n=91 (55%); Control 1 n=50 (55%); Control 2 n=52 (46%)<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: children in both groups had three 45 minute PA lessons each week; intervention group had two more lessons on remaining school days; all intervention classes received same curriculum; 3-5 short activity breaks (2-5 minutes each) during academic lessons for motor skill tasks such as jumping or balancing on one leg, power games or coordinative tasks; children received daily PA homework of about 10 minutes including aerobic, strength, or motor skill tasks such as brushing their teeth while standing on one leg, hopping up and down the stairs, rope jumping.<br>Description of control: three physical education lessons each week<br>Duration of intervention: 9 months<br>Length of follow-up: immediate post |

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| **Study** | Lazaar 2001 [46] France |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Li 2010 [47] China |
| **Objective** | To determine whether a large-scale physical activity intervention could affect body composition in primary school students in Beijing, China |
| **Methods** | Design: RCT<br>Selection: two school districts randomly selected from eight in urban Beijing<br>Inclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 4,700<br>Intervention n=2,329; Control n=2,371<br>Age mean (SD) (years): Overall: 9.3 (0.7)<br>Gender [Female n (%)]: 2,242 (47.7%)<br>Loss to follow-up: Intervention n=301; Control n=279 |
| **Intervention** | Description of intervention: 20 min of daily exercise in the classroom<br>Description of control: no intervention in control schools<br>Duration of intervention: 1 year<br>Length of follow-up: immediate post |
| **Study/Location** | Llargues 2012 [48] Spain; Companion paper: Llargues [106] |
| **Objective** | To assess whether the benefits seen in nutrition, physical activity and body mass index were maintained at 2 years of completion of the educational intervention |
| **Methods** | Design: RCT<br>Selection: all children born in 2000 who attended any school in Granollers<br>Exclusion criteria: school children requiring a special diet for a metabolic or digestive disorders, physical activity incapacity, no family acceptance of attendance to school<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 464<br>Intervention n=233; Control n=231<br>Age mean (years): Intervention: 6.03; Control: 6.03<br>Gender [Female n (%)]: Intervention n=216 (48.2%); Control n=178 (47.5%)<br>Loss to follow-up: Intervention n=9; Control n=23 |

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| **Intervention** | Description of intervention: promotion of healthy dietary habits and PA using IVAC (Intervention using research, Vision, Action and Change) educational pedagogy for two consecutive school years. The IVAC method is used in health strategies because the perceptions and knowledge elaborated by schoolchildren are directed towards change, so that they make their own decisions based on their concepts of health, determination of priorities, and change. Teachers act as moderators in conversations between schoolchildren and help them develop skills to be able to change these conditions. At study start, a group of educators specializing in community projects trained teachers in the intervention group in the above methodology<br>Description of control: no intervention<br>Duration of intervention: 2 years<br>Length of follow-up: 2 years |
| **Study/Location** | Lloyd 2012 [49] United Kingdom |
| **Objective** | To assess the behavioural and weight status outcomes in English children in a feasibility study of a novel primary school-based obesity prevention program |
| **Methods** | Design: RCT<br>Selection: schools recruited via the local network of primary school head teachers<br>Inclusion criteria: all State schools in Exeter were eligible if they had at least one single age year 5 class (9-10-year-olds) (i.e., not mixed classes, 8-10- or 9-11- year-olds)<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 202<br>Intervention n=80; Control n=122<br>Age mean (SD) (years): Overall: 9.69 (0.3)<br>Gender (Female): 50%<br>Loss to follow-up: Intervention n=7; Control n=8 |
| **Intervention** | Description of intervention: HeLP is a multicomponent four-phase program delivered over three school terms; program based on the Information, Motivation and Behavioural Skills Model, which proposes adequate information, motivation and behavioural skills are essential to behaviour change; three key behaviours are emphasised: decrease in the consumption of sweetened fizzy drinks, increase in the proportion of healthy snacks to unhealthy snacks consumed and reduction in television viewing and other screen-based activities<br>Description of control: no intervention<br>Duration of intervention: 10 months<br>Length of follow-up: 8 months, 14 months |

| Study/Location | Lubans 2011 [50] Australia; Companion papers: Lubans [107], Morgan [108] |
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| **Objective** | To evaluate the efficacy and feasibility of the Physical Activity Leaders program, an obesity prevention program for low-active adolescent boys from disadvantaged schools |
| **Methods** | Design: RCT<br>Selection: 6 low SES co-educational secondary schools from the Hunter Region, NSW Australia were invited to participate and 4 consented. Schools were identified using the NSW DET Priority Schools Program (PSP) classification (identifies disadvantaged schools from communities with the highest concentrations of low SES families); physical education teachers were involved in identifying and recruiting low-active boys<br>Inclusion criteria: adolescent boys in grade 9 attending one of the four study schools; students considered by the teachers to be disengaged in PE and/or not currently participating in organized team or individual sports<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: NA |
| **Participants** | Sample: 100<br>Intervention n=50; Control n=50<br>Age mean (SD) (years): Intervention: 14.4 (0.7); Control: 14.2 (0.4)<br>Gender: 100% boys<br>SES: all schools had to be identified as disadvantaged schools (by PSP classification)<br>Loss to follow-up: no loss |
| **Intervention** | Description of intervention: a multi-component school-based intervention including school sport sessions, interactive seminars, lunch-time activities, physical activity and nutrition handbooks, leadership sessions and pedometers for self-monitoring<br>Description of control: program delivered at the wait-list control group schools at the completion of the study<br>Duration of intervention: 6 months<br>Length of follow-up: immediate post |
| **Study/Location** | Lubans 2012 [51] Australia |
| **Objective** | To evaluate the impact of a multicomponent school-based obesity prevention program, Nutrition and Enjoyable Activity for Teen Girls |
| **Methods** | Design: RCT<br>Selection: state-funded secondary schools located in New South Wales, Australia, in areas with lower SES; 18 schools invited to participate, 12 were recruited; eligible participants were adolescent girls in grade 8 (second year of secondary school)<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: yes |

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| **Participants** | Sample: 357<br>Intervention n=178; Control n=179<br>Age mean (SD) (years): Intervention: 13.15 (0.44); Control: 13.20 (0.45)<br>Gender (Female): 100%<br>Loss to follow-up: Intervention n=37; Control n=26 |
| **Intervention** | Description of intervention: enhanced school sport sessions, interactive seminars, nutrition workshops, lunch-time PA sessions, handbooks and pedometers for self-monitoring, parent newsletters, text messaging for social support; school champions (i.e., teachers responsible for program delivery) attended 1-day training workshop which focused on promoting PA, reducing sedentary behaviours, and encouraging low-cost healthy eating; delivered during 4 school terms; enhanced sport sessions (60-80 minutes) delivered by teachers involved a range of activities organized into 4-week units; three practical nutrition workshops delivered by dietitians to provide students with the confidence to select, prepare, and consume healthy low-cost foods; parents sent 4 newsletters; girls sent weekly text messages during second and third terms and biweekly during fourth term (e.g., "Sitting down for long periods of time is bad for you, but what makes it worse is that people often eat junk while sitting down in front of the TV. Try to avoid eating dinner while watching TV").<br>Description of control: no intervention<br>Duration of intervention: 12 months<br>Length of follow-up: immediate post |
| **Study/Location** | Madsen 2013 [52] United States |
| **Objective** | To evaluate the impact of a community-based after-school soccer and youth development program, America SCORES, on students' physical activity, weight status, and fitness |
| **Methods** | Design: RCT<br>Selection: the study was presented at a regularly scheduled principals' meeting<br>Inclusion criteria: all 4th and 5th grade students enrolled in the after-school program at participating schools<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 156<br>Intervention n=82; Control n=74<br>Age mean (SD) (years): Overall: 9.8 (8.6)<br>Gender (Female): 40%<br>Race/Ethnicity: 12% African American; 32% Asian and 42% Latino<br>SES (Mother's education): 56% had high school or less<br>Loss to follow-up: Intervention n=3; Control n=3 |

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| **Intervention** | Description of intervention: soccer and writing coaches trained with a standard curriculum to lead the SCORES program in the after-school setting; students spent 2 to 3 days per week in soccer drills or games for up to 2 hours each day; the 2 non-soccer days dedicated to creative writing and performance in the 12-week fall session and to community service projects in the 12-week spring session<br>Description of control: NR<br>Duration of intervention: 8-10 months (1 school year)<br>Length of follow-up: immediate post |
| **Study/Location** | Magnusson 2012 [53] Iceland |
| **Objective** | To assess the effects of a 2-year intervention program among elementary participants on body composition and cardiorespiratory fitness |
| **Methods** | Design: RCT<br>Selection: three pairs of schools in city of Reykjavik were selected and matched on size; all children attending second grade were invited to participate<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 321<br>Intervention n=128; Control n=138<br>Age mean (SD) (years): Intervention: 7.3 (0.3); Control: 7.4 (0.3)<br>Gender [Female n (%)]: Intervention n=65 (51%); Control n=83 (60%)<br>Loss to follow-up: Intervention n=23; Control n=32 |
| **Intervention** | Description of intervention: focused on increasing PA during school hours and promoting healthy dietary habits; teacher-led daily implementation of various intervention tactics, more frequent outdoor teaching, organized fieldtrips, promotion of active commute to and from school, one extra PA lesson per week (three 40-min sessions per week instead of two compulsory 40-min sessions at the control schools) and more dietary intervention aimed to have positive impact on dietary knowledge, awareness, preferences/taste, self-efficacy and parental influence; nutrition education material was implemented during the latter intervention year; main focus of the dietary intervention was on fruit and vegetable intake<br>Description of control: no intervention<br>Duration of intervention: 2 years<br>Length of follow-up: immediate post |
| **Study** | Marcus 2009 [54] Sweden |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |

| Study/Location | Mihas 2010 [56] Greece |
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| **Objective** | To assess short-term and long-term effects of a school-based health and nutrition education intervention on diet, nutrition intake and BMI |
| **Methods** | Design: RCT<br>Exclusion criteria: participants with an organic cause for high or low weight, who had received any medication that might interfere with growth or weight control, or who were on specific diets<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 213<br>Intervention n=108; Control n=105<br>Age mean (SD) (years): Intervention: 13.1 (0.8); Control: 13.3 (0.9)<br>Gender [Female n (%)]: Intervention n=50 (51.0%); Control n=43 (50.5%)<br>Loss to follow-up: Intervention n=10; Control n=12 |
| **Intervention** | Description of intervention: multi-component workbooks covering mainly dietary issues, but also dental health and consumption attitudes; health and nutrition components conducted by home economics teacher supervised by a health visitor or family doctor and incorporated 12 hours of classroom material during 12 weeks; modules designed to develop behavioural capability, expectations and self-efficacy for healthful eating and healthy foods selection; learning activities designed to influence expectancies that value achieving these behaviours; parental involvement included two meetings where they were given a file containing their child's screening results<br>Description of control: no intervention<br>Duration of intervention: 12 weeks<br>Length of follow-up: immediate post |
| **Study/Location** | Morgan 2011 [57] Australia |
| **Objective** | To evaluate the feasibility and efficacy of the Healthy Dads, Healthy Kids program, which was designed to help overweight fathers lose weight and be a role model of positive health behaviours for their children |
| **Methods** | Design: RCT<br>Selection: Overweight or obese men with a child between 5 and 12 years of age were recruited through media releases, school newsletters and paid advertisements in local newspapers in; men were screened for eligibility through telephone interviews.<br>Exclusion criteria: history of major medical problems (e.g., heart disease) in last 5 years, diabetes, orthopedic or joint problems that would be a barrier to PA, recent weight loss ≥4.5 kg, medication use that might affect body weight; a child with extreme obesity<br>Unit of allocation: individual |

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| | Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 53 dads, 71 children<br>Intervention n=27; Control n=26<br>Age mean (SD) (years): Intervention: 8.4 (2.1); Control: 7.9 (1.9)<br>Gender [Female n (%)]: Intervention 48.7%; Control: 43.7%<br>Loss to follow-up at 3 months: Intervention n=6; Control n=3<br>Loss to follow-up at 6 months: Intervention n=7, Control n=2 |
| **Intervention** | Description of intervention: fathers attended 8 face-to-face group sessions (75 min each); 5 sessions for fathers only, delivered by male researcher; 3 sessions practical and involved both fathers and children, delivered by two male researchers, both with expertise in physical education; total contact time was 600 minutes; PA sessions for fathers emphasized modeling, reinforcing and providing opportunities and removing barriers to PA; father/child PA sessions were i) fundamental movement skills ii) rough and tumble play iii) health related fitness and iv) fun and active games; dietician developed nutrition components modeled on a previous successful intervention; healthy eating focused on parental influence on children's dietary intake, incorporating Satter's 'trust' paradigm, which suggests parents should supply healthy foods and a supportive eating environment and children can decide when and how much to eat<br>Description of control: waitlist<br>Duration of intervention: 3 months<br>Length of follow-up: 3 and 6 months |
| **Study/Location** | Mo-suwan 1998 [58] Thailand |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Muckelbauer 2012 [59] Germany; Companion paper: Muckelbauer [109] |
| **Objective** | To test whether a simple overweight prevention program promoting water consumption in elementary schools is equally effective in children with an immigration background and in those without |
| **Methods** | Design: RCT<br>Selection: schools eligible if located in deprived areas, as defined by: unemployment rate ≥15% and proportion of social welfare recipients ≥5%, and proportion of non-German residents ≥5% as indicated by local public authorities<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 3,190<br>Intervention n=1,641; Control n=1,309 |

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| | Age mean (SD) (years): Intervention: 8.26 (0.73); Control: 8.34 (0.76)<br>Gender [Female n (%)]: Intervention n=817 (49.8%); Control n= 651 (49.7%)<br>Loss to follow-up: Intervention n=65; Control n=60 |
| **Intervention** | Description of intervention: in each school, 1 water fountain, or 2 for schools with >150 participants, was installed; each child received a plastic water bottle (500 mL), and teachers encouraged to organize filling of bottles each morning; four 45-minute classroom lessons dealing with the body's water needs and the water circuit in nature; teachers received curriculum and materials to implement the lessons; 3 months into the study, teachers introduced a motivation unit (booster sessions) that used a goal-setting strategy to reach a sustained increase in water consumption by giving quantitative targets and feedback; 5 months after baseline, each participant received a new water bottle with an improved handling design<br>Description of control: no intervention<br>Duration of intervention: 10 months (1 school year)<br>Length of follow-up: immediate post |
| **Study/Location** | Nemet 2011a [60] Israel |
| **Objective** | To prospectively examine the effects of a randomized school-based intervention on nutrition and physical activity knowledge and preferences, anthropometric measures, and fitness in low SES kindergarten children |
| **Methods** | Design: RCT<br>Selection: 30 kindergartens from low SES communities<br>Unit of allocation: classes<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 795<br>Intervention n=417; Control n=378<br>Age mean (SD) (years): Intervention: 5.20 (0.02); Control 5.24 (0.03)<br>Gender (Female): Intervention 46%; Control 44%<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: designed to improve nutritional knowledge, based on the nutritional program "It Fits Me" ("Tafur Alay") of the Israeli Ministry of Education; teaching topics included food groups, vitamins, healthy food choices, food preparation and cooking methods, and information on fast-food versus home cooking; topics taught through short lectures/talks, games and story reading; children participated in 45 minutes (three 15-minute sessions) per day of exercise training (6 days a week)<br>Description of control: NR<br>Duration of intervention: 1 school year<br>Length of follow-up: 1 school year |

| Study/Location | Nemet 2011b [61] Israel |
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| **Objective** | To examine the prevalence of obesity and to prospectively study the effects of a health promotion, school-based intervention on nutrition and physical activity knowledge and preferences, anthropometric measures, and fitness in Arab-Israeli kindergarten children |
| **Methods** | Design: RCT<br>Selection: kindergarten classes randomly assigned by computerized program to participate in intervention or to serve as controls (6 control, 5 intervention)<br>Exclusion criteria: students not coming from low SES communities<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 342<br>Intervention n=154; Control n=188<br>Age mean (SD) (years): Intervention: 5.36 (0.03); Control: 5.40 (0.02)<br>Gender (Female): 45%<br>Race/Ethnicity: predominantly Arab-Israeli<br>SES: schools were selected from low SES<br>Loss to follow-up: Intervention n=20; Control n=25 |
| **Intervention** | Description of intervention: preschool teachers attended an all-day training session that covered nutrition and physical activity; 2 additional days held to collect feedback on the program and introduce new materials; parents and children were invited to 2 Health Festival days that focused on the major themes of the program (introduction of healthy nutrition, prevention of childhood obesity and beneficial effects of exercise in children)<br>Description of control: no intervention<br>Duration of intervention: 1 school year<br>Length of follow-up: immediate post |
| **Study/Location** | Neumark-Sztainer 2003 [63] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Neumark-Sztainer 2010 [62] United States |
| **Objective** | To evaluate a school-based program aimed at preventing weight-related problems in adolescent girls |
| **Methods** | Design: RCT<br>Selection: girls in intervention and control schools invited to register for an all-girls physical education class as an alternative to the regular coeducational class; in participating schools, students were required to take one or two physical education classes to graduate; participation in the study class counted toward that requirement; |

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| | recruitment materials designed to appeal to inactive girls interested in healthy weight management; class description included in the school catalogue; posters and flyers about the program were displayed at schools<br>Exclusion criteria: high physical activity levels (≥1 hour/day) and eating disorder behaviours (vomiting or laxative use weekly or more)<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 356<br>Intervention n=182; Control n=174<br>Age mean (SD) (years): Intervention: 15.7 (1.13); Control: 15.8 (1.22)<br>Gender (Female): 100%<br>Loss to follow-up: Intervention n=5; Control n=15 |
| **Intervention** | Description of intervention: New Moves included (1) 16 week physical education class (Be Fit 4 days/week) which also incorporated nutrition (Be Fueled) and social support/self-empowerment (Be Fab) sessions 1 day/week; (2) individual counseling sessions using motivation interviewing techniques; (3) lunch get-togethers (lunch bunches) 1/week during maintenance period; (4) minimal parent outreach activities<br>Description of control: all girls physical education class<br>Duration of intervention: 9 months<br>Length of follow-up: immediate post |
| **Study/Location** | Ostbye 2012 [64] United States; Companion paper: Ostbye [110] |
| **Objective** | To evaluate the effects of Kids and Adults Now - Defeat Obesity! on enhancing healthy lifestyle behaviours in mother-preschooler (2-5 years old) dyads |
| **Methods** | Design: RCT<br>Selection: mothers primarily identified from state birth certificates and screened for eligibility at 2-6 months postpartum<br>Inclusion criteria: eligible mothers had a preschooler aged 2-5 years, self-reported pre-pregnancy (and measured postpartum) BMI ≥25, no medical conditions preventing daily physical activity, English literacy, regular telephone access, ≥18 years of age<br>Unit of allocation: dyads<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 400 mother-child dyads<br>Intervention n=200; Control n=200<br>Age mean (SD) (years): 3.06 (1.0)<br>Gender (Female): Intervention 43.5%; Control 45%<br>Loss to follow-up: Intervention n=50; Control n=49 |

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| **Intervention** | Description of intervention: 8 monthly mailed interactive kits, followed each month by a 20-30 minute telephone coaching session using motivational interviewing techniques; kits included child activities and incentives reinforcing the month's topic (e.g. a rewards chart, yoga mat, pedometer, portion plate)<br>Description of control: monthly newsletters emphasizing pre-reading skills; retention encouraged by monetary incentives (up to $100 for completing all assessments)<br>Duration of intervention: 12 months<br>Length of follow-up: immediate post |
| **Study/Location** | Paineau 2008 [65] France |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Papadaki 2010 [66] Netherlands, Denmark, United Kingdom, Greece, Germany, Spain, Bulgaria and Czech Republic; Companion paper: Larsen [111] |
| **Objective** | To investigate the effect of protein and glycemic index on body composition among European children in the DiOGenes (diet, obesity, and genes) family-based study |
| **Methods** | Design: RCT<br>Selection: volunteer families from 8 countries (Netherlands, Denmark, United Kingdom, Greece, Germany, Spain, Bulgaria, and Czech Republic; families attended a screening examination to determine eligibility [eligible families were generally healthy, with at least 1 parent overweight (BMI<27) and younger than 65 years, and at least 1 child between the age of 5 and 18 years]<br>Exclusion criteria (for children): special diets, food intolerances, systemic infections or chronic diseases, use of medications that might influence study outcomes, drug or alcohol abuse<br>Unit of allocation: family<br>Unit of analysis: children<br>Intention to treat: no |
| **Participants** | Sample: 465<br>Intervention 1 (LP/LGI) n=102; Intervention 2 (LP/HGI) n=87; Intervention 3 (HP/LGI) n=92; Intervention 4 (HP/HGI) n=96; Control n=88<br>Age mean (SD) (years): Overall males 11.9 (3.4); Overall females 12.4 (3.5)<br>Gender (Female): 76%<br>Loss to follow-up: 48% |
| **Intervention** | Description of intervention: trained dietician gave instructions on ad libitum diets; all diets were low in fat (25-30% of energy); target was for protein content to comprise 10-15% of energy intake in the low protein (LP) and 23-28% in the high protein (HP) groups, complying with the acceptable range (10-30%) for children aged 4 to 18 years; children in the low glycemic index (LGI) groups were advised to consume the LGI foods, and those in the high glycemic index (HGI) groups to consume the HGI foods |

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| | Description of control: diet followed national dietary guidelines, with medium protein content and no specific instructions on glycemic index<br>Duration of intervention: 6 months<br>Length of follow-up: immediate post |
| **Study/Location** | Peralta 2009 [67] Australia |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Reed 2008 [68] Canada; Companion papers: Naylor [112], Naylor [113] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Reilly 2006 [69] Scotland |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Robinson 2003 [70] United States; Companion paper: Rochon [114] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Robinson 2010 [71] United States |
| **Objective** | To test a 2-year community- and family-based obesity prevention program for low-income African American girls: Stanford GEMS |
| **Methods** | Design: RCT<br>Selection: recruited from schools, community centers, churches, and community events in low-income, predominantly African American neighbourhoods; identified as African American or black by parent/guardian; aged 8 to 10 years; to select a community-based group at higher risk, girls required to have BMI ≥25th percentile for age and/or at least 1 overweight parent/guardian (BMI ≥25)<br>Exclusion criteria: girls with BMI >35; diagnosed with medical condition or taking medications affecting growth; condition limiting participation in the interventions or assessments; unable to understand or complete the informed consent document; planned to move from the area; homeless; had no television<br>Unit of allocation: families/households<br>Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 284<br>Intervention n=134; Control n=127<br>Age mean (years): Intervention: 9.5; Control: 9.4<br>Gender (Female): 100%<br>Loss to follow-up: Intervention n=32; Control n=27 |

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| **Intervention** | Description of intervention: GEMS Jewels after-school dance intervention offered 5 days per week, 12 months per year (excluding school holidays), at community centers in selected neighborhoods; daily sessions lasted up to 2.5 hours and started with a 1-hour homework period and small snack followed by 45 to 60 minutes of learning and practicing dance routines; dance classes led by female African American college students and/or recent graduates from the local community<br>Description of control: active-placebo health education comparison intervention consisting of culturally tailored, information-based health education on nutrition, physical activity, and reducing cardiovascular and cancer risk; 24 monthly newsletters for the girls and their parents/guardians and quarterly community center health lectures<br>Duration of intervention: 2 years<br>Length of follow-up: 6 months |
| **Study/Location** | Rosario 2013 [72] Portugal; Companion paper: Rosario [115] |
| **Objective** | To examine the effects of a program run by teachers trained in nutrition, on consumption of low nutrient, energy-dense foods, by children attending elementary schools |
| **Methods** | Design: RCT<br>Selection: 7 out of 80 public elementary schools from a city from the north of Portugal randomly selected and invited to participate<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 464<br>Intervention n=233; Control n=231<br>Age mean (SD) (years): Intervention: 8.3 (1.2); Control: 8.2 (1.2)<br>Gender (Female): Intervention 50.2%; Control 52.8%<br>SES (mother's education up to 9 years): Intervention n=116 (58.6%); Control n=128 (69.9%); SES (father's education up to 9 years): Intervention n=122 (62.9%); Control n=132 (75.9%)<br>Loss to follow-up: Intervention n=82; Control n=88 |
| **Intervention** | Description of intervention: teachers attended 12 sessions on: health promotion and overweight/obesity prevention; food and nutrition and dietary guidelines (Portuguese Food Wheel); hydration and the importance of water; appropriate physical activity levels and healthy eating practices; teaching and learning strategies on healthy eating in the classroom; strategies to reduce screen time; healthy cooking and strategies to get children and families involved in healthy cooking; teachers delivered content to students and developed creative and engaging classroom activities about the topics<br>Description of control: NR<br>Duration of intervention: 24 months<br>Length of follow-up: immediate post |

| Study/Location | Rosenkranz 2010 [73] United States |
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| **Objective** | To evaluate the effectiveness of an intervention delivered through Girl Scout Junior troops designed to foster healthful troop meeting environments and increase obesity prevention behaviours at home |
| **Methods** | Design: RCT<br>Selection: registered Girl Scout Junior troops, with girls in 4th and 5th grades; troops meet at least twice/month in facilities allowing physical activity and food preparation<br>Exclusion criteria: troops not primarily composed of Girl Scout Juniors, not regularly meeting during the study period, or not having leader and parental consent for troop participation; individual girls were excluded if they could not speak or read English<br>Unit of allocation: troops<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 76<br>Intervention n=34; Control n=42<br>Age mean (SD) years: Intervention: 10.6 (1.1); Control: 10.5 (1.3)<br>Gender (Female): 100%<br>Race/Ethnicity: Intervention: Caucasian: 79.4%, Racial minority: 20.6%; Control: Caucasian: 75%, Racial minority: 25%<br>Loss to follow-up: Intervention n=1; Control n=3 |
| **Intervention** | Description of intervention: three main components: 1) an interactive educational curriculum delivered by troop leaders (8 modules, 60 to 90 minutes each, delivered over 4 months); 2) troop meeting policies implemented by troop leaders; and 3) badge assignments completed at home by girls with parental assistance<br>Description of control: standard care<br>Duration of intervention: 7 months<br>Length of follow-up: immediate post |
| **Study/Location** | Rush 2012 [74] New Zealand; Companion papers: Graham [116], Cole [117] |
| **Objective** | To compare changes in blood pressure and body composition in children who attended Energize schools with children in control schools |
| **Methods** | Design: RCT<br>Selection: NR<br>Inclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: children<br>Intention to treat: N/A |
| **Participants** | Sample: 1,352 |

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| | Intervention 1 n=492; Intervention 2 n=200; Control 1 n=434; Control 2 n=226<br>Age range (years): Intervention 1: 5-7; Intervention 2: 10-12; Control 1: 5-7; Control 2: 10-12<br>Gender (Female): Intervention 1 n=51%; Intervention 2 n=51%; Control 1 n=51%; Control 2 n=50%<br>Race/Ethnicity: Intervention 1: European: 67%, Maori: 23%, Other: 9%; Intervention 2: European: 60%, Maori: 33%, Other: 7%; Control 1: European: 67%, Maori: 26%, Other: 7%; Control 2: European: 68%, Maori: 25%, Other: 7%<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: program staff received training as a group in order to share experience, resources and skills; classes included fundamental movement skill training, ideas for 'huff and puff' fitness activities, modified games, and ball activities and sport-related games; teachers provided with ideas for managing children during physical activity sessions; program staff promoted active transport, lunchtime games, bike days and leadership training for students to be leaders of physical activities before and after school; program staff available to assist schools with healthy-eating initiatives<br>Description of control: no intervention<br>Duration of intervention: 2 years<br>Length of follow-up: immediate post |
| **Study/Location** | Salcedo 2010 [75] Spain; Companion paper: Martínez-Vizcaíno [55] |
| **Objective** | To assess the impact of a 2-year recreational physical activity program in 1,044 fourth- and fifth-grade primary schoolchildren |
| **Methods** | Design: RCT<br>Selection: 20 public schools in 20 towns in Cuenca Province<br>Exclusion criteria: schools outside of Cuenca province<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 76<br>Intervention n=13; Control n=606<br>Age mean (SD) (years): Intervention: 10.6 (1.1); Control: 10.5 (1.3)<br>Gender [Female n (%)]: Intervention n=231 (45%); Control n=289 (48%)<br>Loss to follow-up: Intervention n=138; Control n=60 |
| **Intervention** | Description of intervention: MOVI was a non-competitive and recreational physical activity program consisting of three 90-minute sessions per week, during approximately 28 weeks every year; physical activity sessions were planned by 2 qualified physical education teachers and were supervised by sports instructors; standard physical education curriculum (3 hours per week of physical activity at low to moderate intensity) was also provided in intervention schools |

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| | Description of control: standard physical education curriculum<br>Duration of intervention: 7 months<br>Length of follow-up: immediate post |
| **Study/Location** | Shamah 2012 [76] Mexico |
| **Objective** | To assess the effectiveness of a nutrition and physical activity strategy, called "Nutrition on the Go" in maintaining the BMI values of school children in Mexico |
| **Methods** | Design: RCT<br>Selection: 60 schools selected at random<br>Exclusion criteria: schools outside of the State of Mexico<br>Unit of allocation: class<br>Unit of analysis: children<br>Intention to treat: no |
| **Participants** | Sample: 1,019<br>Intervention n=509; Control n=510<br>Age mean (years): Intervention: 10; Control: 10<br>Gender [Female n (%)]: Intervention n=263 (51.6 %); Control n=253 (49.7%)<br>Loss to follow-up: Intervention n=13; Control n=12 |
| **Intervention** | Description of intervention: nutrition and physical activity workshops; sale of fruit and vegetables and water in the school store; organized physical activity twice a week; banners; recipe calendar<br>Description of control: no intervention<br>Duration of intervention: 6 months<br>Length of follow-up: immediate post |
| **Study/Location** | Sichieri 2009 [77] Brazil |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Siegrist 2013 [78] Germany |
| **Objective** | To investigate the effects of a school-based prevention program on physical activity, fitness, and obesity |
| **Methods** | Design: RCT<br>Selection: 60 primary schools in Bavaria, Germany were invited by mail or telephone<br>Inclusion criteria: attendance in 2nd or 3rd grade and written consent from parents<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |

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| **Participants** | Sample: 902<br>Intervention n=486; Control n=340<br>Age mean (SD) (years): Overall 8.4 (0.7)<br>Gender [Female n (%)]: n=350 (48.3%)<br>Loss to follow-up: Intervention n=59; Control n=43 |
| **Intervention** | Description of intervention: educating and encouraging children, teachers and parents to live active and healthy lifestyles; monthly lessons lasting 45 minutes with three parts: 10 minute warm-up of high intensity running games, 30 min of exercises to improve body awareness and self-esteem with conversation about health-related topics, and 5 min relaxation exercises; worksheets and homework assignments plus monthly newsletters to stimulate parent-child interaction and support physical activity at home and in sports clubs; school environment altered to promote more physical activity; 2 parent training sessions about health issues; teacher trainings to increase students' physical activity during lessons and breaks<br>Description of control: usual physical education curriculum<br>Duration of intervention: 12 months<br>Length of follow-up: immediate post |
| **Study/Location** | Simon 2008 [79] France; Companion papers: Simon [118,119] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Singh 2009 [80] Netherlands |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Singhal 2010 [81] India |
| **Objective** | To study the effectiveness of a multi-component intervention for nutrition and lifestyle education on behaviour, anthropometry and metabolic risk profile in urban adolescents |
| **Methods** | Design: RCT<br>Selection: NR<br>Inclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 209<br>Intervention n=101; Control n=108<br>Age mean (SD) (years): Intervention: 16.04 (0.41); Control: 16.0 (0.5)<br>Gender (Female %): Intervention 38.6%; Control 41.7%<br>Loss to follow-up: Intervention n=2; Control n=6 |

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| **Intervention** | Description of intervention: multi-component model including seven components of nutrition and lifestyle education aimed at changing knowledge, behaviour and risk profile of urban Asian Indian adolescents<br>Description of control: no intervention<br>Duration of intervention: 6 months<br>Length of follow-up: immediate post |
| **Study/Location** | Story 2003 [82] United States; Companion papers: Rochon [114], Story [93] |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Story 2012 [83] United States |
| **Objective** | To develop and test the effectiveness of a school environment intervention, supplemented with family involvement, to reduce excessive weight gain by increasing physical activity and healthy eating practices among kindergarten and first-grade American Indian children |
| **Methods** | Design: RCT<br>Selection: NR<br>Exclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 454<br>Intervention n=267; Control n=187<br>Age mean (SD) (years): Intervention: 5.87 (0.54); Control: 5.80 (0.51)<br>Gender (Female): 49%<br>Race/Ethnicity: Native American<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: at least 60 min of physical activity at school each day using school PE, class walks outdoors, in-class action breaks, and active recess; healthy eating promoted through offering 1% white milk instead of 2%, whole, chocolate or other flavoured milks, serving recommended portions, purchasing and using low-calorie/fat foods, offering low-fat portion-controlled salad dressing, providing more fruits and vegetables, offering second helpings only on fruits and vegetables, teachers trained to limit daily snacks; modify home environment to reduce excessive caloric intake, reduce television watching, and increase physical activity; 4 family events related to nutrition and physical activity held at the schools<br>Description of control: no intervention<br>Duration of intervention: 14 weeks or 31 weeks<br>Length of follow-up: immediate post |

| Study/Location | Telford 2012 [84] Australia; Companion paper: Telford [120] |
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| **Objective** | To determine whether physical education taught by specialists contributed to academic development and prevention of obesity in elementary school children |
| **Methods** | Design: RCT<br>Selection: government-funded schools in outer-city suburbs of similar average family income from an Australian education jurisdiction through invitations to principals; of 30 invited, 29 schools accepted; 13 schools (32 classes) randomly assigned to specialist-taught PE group and 16 schools (36 classes) to common-practice PE group<br>Inclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 620<br>Intervention n=312; Control n=308<br>Age: NR<br>Gender [Female n (%)]: Intervention n=154 (49%); Control n=149 (48%)<br>Race/Ethnicity: White: 86%, Asian: 8%, Australian Aboriginal or Torres Strait Islander: 3%, Polynesian: 1%, Data missing: 2%<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: students received 150 minutes per week of PE; specialist-taught PE included 90 minutes per week of PE from visiting specialists<br>Description of control: common practice (PE from generalist classroom teachers)<br>Duration of intervention: 2 years<br>Length of follow-up: immediate post |
| **Study/Location** | Thivel 2011 [85] France |
| **Objective** | To assess the effect of a 6-month physical activity program on body composition and physical fitness among primary school children |
| **Methods** | Design: RCT<br>Selection: primary school children recruited from local public schools that agreed to participate in the study<br>Inclusion criteria: attendance in 1$^{st}$ or 2$^{nd}$ grade, taking part in standard physical education classes, participating in no more than 3 hours of extracurricular sports activity per week, free of any known disease, not involved in any other study<br>Unit of allocation: school<br>Unit of analysis: individual<br>Intention to treat: N/A |
| **Participants** | Sample: 457 |

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| | Intervention n=229; Control n=228<br>Age: NR (1st and 2nd grade)<br>Gender [Female n (%)]: Intervention n=117 (51%); Control n=112 (49%)<br>Loss to follow-up: NR |
| **Intervention** | Description of intervention: 120 min (two times for 60 min) of supervised physical activity; 2 additional hours of physical education classes per week managed and taught by sports science students; sessions consisted of a 10-min warm-up followed by psychometric activities and exercises to improve coordination, flexibility, strength, speed, and endurance<br>Description of control: regular 2 hours of physical education per week<br>Duration of intervention: 6 months<br>Length of follow-up: immediate post |
| **Study/Location** | Velez 2010 [86] United States |
| **Objective** | To examine the effects of a structured resistance training program on strength, body composition, and self-concept in normal and overweight Hispanic adolescents |
| **Methods** | Design: RCT<br>Selection: recruited from a predominantly Hispanic high school in central New Jersey; Hispanic youth selected because of this population's greater propensity for obesity and their underrepresentation in resistance training research<br>Exclusion criteria: known health (i.e., bone, joint, musculoskeletal, or cardiovascular) problems that would severely limit involvement in the resistance training sessions; already participating in structured resistance or aerobic training programs<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: no |
| **Participants** | Sample: 28<br>Intervention n=13; Control n=15<br>Age mean (SD) years: Overall: 16.14 (0.19)<br>Gender [Female n (%)]: Intervention n=5 (38%); Control n=7 (47%)<br>Loss to follow-up: 3 |
| **Intervention** | Description of intervention: resistance training consisting of 35-40-minute sessions, 3 non-consecutive days/week, in lieu of PE class; workouts divided into upper body and lower body days; trainers met 3-4 students at a time at the school weight room and led them through planned workouts; instructed to maintain usual outside activities and diets<br>Description of control: typical daily physical education/health class; total activity time per day was similar to intervention participants<br>Duration of intervention: 12 weeks<br>Length of follow-up: immediate post |

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| **Study/Location** | Vizcaino 2008 [55] Spain |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Webber 2008 [87] United States |
| **Comments** | See Cochrane Review by Waters et al.[92] for details |
| **Study/Location** | Weeks 2012 [88] Australia |
| **Objective** | To determine the effect of a twice-weekly, school-based 10-minute jumping regime on muscle and fat tissue in healthy adolescent boys and girls |
| **Methods** | Design: RCT<br>Selection: adolescents in the 9th grade of a local high school were recruited<br>Inclusion criteria: sound general health, fully ambulatory and had written consent of a parent or guardian<br>Exclusion criteria: endocrine disorder, metabolic disease or chronic renal pathology, taking medication known to affect the musculoskeletal system, recovering from lower limb injury or affected by any condition not compatible with intense physical activity<br>Unit of allocation: individual<br>Unit of analysis: individual<br>Intention to treat: yes |
| **Participants** | Sample: 99<br>Intervention n=52; Control n=47<br>Age mean (SD) years: Overall boys 13.8 (0.4), Overall girls 13.7 (0.4)<br>Gender (Female):54%<br>Loss to follow-up: Intervention: 9, Control: 9 |
| **Intervention** | Description of intervention: 10 minutes of supervised jumping activity at the start of each physical education class, 2 times per week for 8 months<br>Description of control: regular PE warm-ups and stretching<br>Duration of intervention: 1 school year<br>Length of follow-up: 1 school year |
| **Study/Location** | Wen 2012 [89] Australia |
| **Objective** | To assess the effectiveness of a home based early intervention on BMI at age 2 |
| **Methods** | Design: RCT<br>Selection: research assistants gave pregnant women attending antenatal clinics a letter of invitation and information about the study<br>Inclusion criteria: women were eligible if aged ≥16, expecting first child, between weeks 24-34 of pregnancy, able to communicate in English, lived in the local area |

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| | Unit of allocation: mother<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 667<br>Intervention n=337; Control n=330<br>Age range (years): Overall 0 to 2<br>Gender: NR<br>Loss to follow-up: Intervention n=88; Control n=96 |
| **Intervention** | Description of intervention: 4 community nurses recruited and trained to make 8 home visits, once at 30-36 weeks' gestation and 7 times after the birth (at 1, 3, 5, 9, 12, 18 and 24 months); at each visit, the nurse spent about one to two hours with the mother and infant and teaching specific skills and knowledge in relation to healthy infant feeding practices and active play and discussing family physical activity, nutrition, and social support as well as any issues and concerns raised by the mother<br>Description of control: usual childhood nursing service from community health service nurses (at least one nurse visit for general support at home; some vulnerable families are offered multiple home visits)<br>Duration of intervention: 24 months<br>Length of follow-up: immediate post |
| **Study/Location** | Williamson 2012 [90] United States; Companion paper: Williamson [121] |
| **Objective** | To test the efficacy of two-school based programs for prevention of body weight/fat gain in all participants and in overweight children |
| **Methods** | Design: RCT<br>Selection: students recruited through presentations, fliers and word of mouth<br>Inclusion criteria: for schools: one of the 28 schools or elementary feeder schools in the LA GEAR UP program, located in a rural section of Louisiana, minimum of 100 students available for study; for students: in grades 4 to 6<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: no |
| **Participants** | Sample: 2,097<br>Intervention 1 n=713; Intervention 2 n=760; Control n=587<br>Age mean (SD) years: Overall 10.5 (1.2)<br>Gender (Female): 45%<br>Loss to follow-up: Intervention 1 n=224; Intervention 2 n=207, Control n=196 |
| **Intervention** | Description of intervention: Intervention 1:emphasis on modification of environmental cues, enhancement of social support, and promotion of self-efficacy for health behaviour change; goals compatible with conventional nutrition recommendations; |

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| | promotion of 60 minutes of moderate to vigorous activity per day; meeting USDA guidelines for the National School Lunch Program and legislated requirements related to advertising fast foods and contents of vending machines and concessions in schools<br>Intervention 2: emphasis on behaviour modification approaches designed to change personal factors (i.e., increased healthy eating habits, increased physical activity, and decreased sedentary behaviour); used internet-based HIPTeens program as a part of regular classroom instruction, combined with synchronous (on-line) internet counseling and asynchronous (email) communications for children and their parents; frequent prompts to promote sustained website usage<br>Description of control: none of the prevention components hypothesized to yield weight gain prevention; a nonspecific control condition<br>Duration of intervention: 28 months<br>Length of follow-up: immediate post |
| **Study/Location** | Yin 2012[91] United States |
| **Objective** | To determine the effects of a 3-year after-school physical activity program, without restriction of dietary energy intake, on cardiometabolic outcomes |
| **Methods** | Design: RCT<br>Selection: recruitment of children in 2nd and 3rd grades<br>Exclusion criteria: NR<br>Unit of allocation: school<br>Unit of analysis: child<br>Intention to treat: yes |
| **Participants** | Sample: 617<br>Intervention n=324; Control n=293<br>Age mean (SD) years: Overall 8.7 (0.5)<br>Gender (Female): 53%<br>Loss to follow-up: Intervention n=129; Control n=88 |
| **Intervention** | Description of intervention: 120 min structured after-school program consisting of 40 min snack and teacher-assisted homework; 20 min skill based PA; 40 min vigorous PA; 20 min stretching/cool down; weekly health-related lesson<br>Description of control: NR<br>Duration of intervention: 33 months<br>Length of follow-up: immediate post |

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# PRISMA 2009 Checklist

| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | 1 |
| **ABSTRACT** | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of what is already known. | 3 |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS). | 4, Box 1 |
| **METHODS** | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | 3 |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | 4 and Boxes 1&2 |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | 4 |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated. | *e*-File Table 1 |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | 4-5 |
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | 4 |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | 5, Box 1 |
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis. | 4-5 |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | 5-6 |
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$) for each meta-analysis. | 5 |

# PRISMA 2009 Checklist

| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies). | 5-6 |
| Additional analyses | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified. | 6 |
| **RESULTS** | | | |
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram. | 6, Figure 1 |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations. | *e*-File Table 3 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12). | *e*-File Table 2 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot. | Figures 2 &3; Tables 1&2 |
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency. | Figures 2 &3; Tables 1&2 |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies (see Item 15). | Table 1 |
| Additional analysis | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]). | 7, Table 2 |
| **DISCUSSION** | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers). | 10 |
| Limitations | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias). | 11 |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | 11 |
| **FUNDING** | | | |
| Funding | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | 32 |

*From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097