Systematic review and meta-analysis of school-based interventions to reduce body mass index

Lavelle HV, Mackay DF, Pell JP

CRD summary
The review concluded that school-based interventions can reduce body mass index in pupils. Limitations in the reported review process and analyses, unknown quality of and differences between the included studies and the small effect size suggest that the authors conclusions may not be reliable.

Authors' objectives
To determine the efficacy of school-based interventions on reducing the body mass index (BMI) in children.

Searching
MEDLINE and EMBASE were searched from inception up to February 2011 for articles published in or translated into English. Search terms were reported. Reference lists of relevant papers were checked.

Study selection
Controlled studies of any intervention that aimed at reducing BMI or weight in children (18 years or younger) delivered in a school setting were eligible for inclusion. Control groups were required to include no intervention beyond usual school-based activities. Studies were required to report mean change in BMI (or sufficient data for this to be calculated).

Included studies were conducted between 1991 and 2010. Interventions included physical, behavioural, environmental and educational (physical activity, nutrition and sedentary behaviour) components alone or in combination. Most studies were carried out in primary schools and took place during school hours. Most studies included all pupils irrespective of baseline weight. Some studies targeted only overweight or obese pupils; others targeted only girls or only boys. Intervention durations ranged from one to 72 months. Most studies were in USA; three were UK studies.

The authors did not state how many reviewers selected studies.

Assessment of study quality
The authors did not state that they formally assessed the quality of the included studies.

Data extraction
Data on mean change in BMI (or data that enabled calculation of this) were extracted. Where confidence intervals or standard deviations were not reported these were imputed using figures from other studies. Where studies reported change in BMI adjusted for potential confounders the adjusted result was used.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Studies were pooled in a meta-analyses using the random-effects model and summary estimates (effect size) and 95% confidence intervals (CI) were reported; this was repeated stratified by gender and intervention type. Statistical heterogeneity was investigated using the $I^2$ statistic.

Influence of individual studies was investigated using a meta-influence plot and a cumulative meta-analysis was used to determine whether the pooled effect changed over time. Meta-regression was performed to determine the impact of specific study characteristics (overweight/obese children versus all children) on overall effect and a bubble plot was produced to explore the relationship between length of follow-up and overall effect.

Publication bias was explored using a funnel plot and Egger's test.

Results of the review
Forty-three studies (36,579 children) were included in the review: 23 cluster randomised controlled trials (RCTs), 15 RCTs, two quasi-RCTs and three non-RCTs.

The pooled estimate of BMI change was -0.17kg/m² (95% CI -0.26 to -0.08; 43 studies, 60 comparisons). Significant statistical heterogeneity was found (I²=93.4%).

When stratified by gender, a significant reduction in mean BMI change was found for girls (-0.28kg/m², 95% CI -0.50 to -0.06) but not for boys. When intervention type was considered, a significant reduction in change in BMI was found for physical activity alone (-0.13kg/m², 95% CI -0.22 to -0.04) and in combination with nutrition (-0.17kg/m², 95% CI -0.29 to -0.06). Interventions delivered to all pupils produced a change in BMI of -0.16kg/m² (95% CI -0.25 to -0.06; 54 comparisons). Interventions delivered only to overweight/obese pupils produced a change in BMI of -0.35kg/m² (95% CI -0.58 to -0.12; six comparisons). Statistical heterogeneity was not reported for these results.

None of study characteristics assessed were found to be significant predictors of overall effect and no significant relationship between length of follow-up and effect size was found. The earliest studies were found to have the greatest effect size but the pooled estimate had been stable since 2007.

The authors reported that there was no evidence of publication bias.

**Authors' conclusions**

School-based interventions can reduce BMI in pupils, particularly when a physical exercise component is included.

**CRD commentary**

The review question was supported by broad inclusion criteria. Two relevant databases were searched. The search was restricted to articles published in or translated into English so some studies may have been missed and the funnel plot seemed to suggest this was the case. The authors did not state whether they took appropriate steps to minimise the likelihood of error or bias during study selection and data extraction. The authors did not state whether they assessed the quality of the included trials and this limited interpretation of the results.

Details on interventions were limited and there was no mention of drop-out rates. Substantial statistical heterogeneity was found in the primary meta-analysis so pooling may not have been appropriate. Statistical heterogeneity was not reported for stratified or subgroup analyses. It was unclear whether or not participants were included more than once in the meta-analyses (several comparisons from the same studies were included in the model but participant numbers were not reported). The authors acknowledged that inclusion of unadjusted results may have introduced bias. The effect size was statistically significant but it was small and the authors acknowledged that it was unlikely to be clinically significant at an individual level. Very few studies were conducted in the UK.

Uncertainties in the review process and limitations of the evidence mean that the authors conclusions should be interpreted with caution as they may not be reliable.

**Implications of the review for practice and research**

**Practice:** The authors stated that the reduction in BMI was unlikely to be clinically significant at an individual level.

**Research:** The authors stated that further randomised studies were needed to determine duration of benefit and the ideal type of intervention. Studies should take not only efficacy but also cognisance and cost effectiveness into consideration.

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**Bibliographic details**


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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.