Heart healthy eating behaviors of children following a school-based intervention: a meta-analysis
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Authors' objectives
To evaluate the magnitude of change in the heart healthy eating behaviours of elementary school children who participate in school-based cardiovascular health promotion programme.

Searching
Several retrieval methods identified in Cooper and Hedges, 1994 (see Other Publications of Related Interest) were used, which included the following: Ancestry method using footnotes from selected articles and health behaviour texts; Consultation and informal discussion at conferences (e.g., National Assembly on School-Based Health, Society of Behavioural Medicine, annual meeting of the American Heart Association Schoolsite Programs); Facsimile and electronic mail messages sent to experts in the field (e.g., nurse-researchers, epidemiologist, social psychologist); Searches in subject indexes including MEDLINE 1980 to present using the keywords of cardiovascular health promotion, school, and children; Browsing through journals, including Journal of School Health, and Health Education Quarterly. The Internet was also searched for school-based health promotion programmes and cardiovascular health in children within the USA. The director of the school of nursing school-based programmes was contacted and volunteered to explore the topic in school-based health care networks, especially the location of unpublished studies.

Study selection
Study designs of evaluations included in the review
Randomised experimental, within-subjects design, non-equivalent control group designs with pre-test, and time series. Studies were required to have contrasted two groups, as well as include the individual as the unit of analysis.

Specific interventions included in the review
An elementary school-based cardiovascular health promotion programmes with nutrition (heart healthy eating) as a component.

Participants included in the review
Children ages 9-11 (fourth and fifth grades) in the United States.

Outcomes assessed in the review
A quantifiable measure of eating behaviour. The measures used by individual studies included in the review varied. They included self-reports, physiological measures (serum cholesterol), observation of food intake, and anthropometric measures. The majority of studies used self-reports; most used multiple measures. Quantification techniques included calculation the number or percent of heart healthy foods in the diet, percentage of saturated food in diet, food frequencies, number of vegetables and fruit servings, and description of usual food choices.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The validity tool included seven items which gave a total of 18 points. Individual items included: the presence of a theoretical framework; the study design; sampling method; description of the intervention; type of outcome measures; reliability of measures; and validity of measures. Higher total scores represented higher quality of the individual study. The investigator and a cohort coded each individual variable which was then allocated a corresponding score. Any disagreement was resolved by discussion.
Data extraction
Data from individual studies were coded using coding sheets that included 64 variables (including validity assessment). The investigator and a cohort coded each variable and any disagreement was resolved by discussion. Several decision rules were used: If more than one measure of eating behaviour was used in a study, a single measure would be randomly selected; The first measure of eating behaviour post-intervention would be used; If the results were non-significant and no P value was given or could be extracted, a p=0.2 was used.

Effect size (d) was computed for each study.

Methods of synthesis
How were the studies combined?
Descriptive statistics of the sample were calculated. Effect sizes were weighted based on variance and combined for the overall effect of intervention. The 95% Confidence interval (CI) was calculated using the expected parameters of the population.

How were differences between studies investigated?
Homogeneity of the effect size was calculated using the Q statistic.

Results of the review
Twelve studies were included in the review, with a total of 3,828 participants.

The test for homogeneity was significant with Q =75.42 exceeding the critical value of 24.72 at the 0.05 level of significance. Two outliers, defined as a study having an effect larger than 1, were identified. Both studies were reported in the same article and had a quality score of 9. Both studies were six months to a year in duration, multicentred and included samples of 161-133 subjects. The effect sizes of the studies were 1.69 and 1.05, respectively.

The weighted average effect size for the sample of 12 studies was 0.24 (95% CI 0.174 to 0.301), showing that school-based cardiovascular health promotion programmes had a significant effect on heart healthy eating behaviour of student participants. The quality score ranged from 9-16.

Authors’ conclusions
Limitations of this meta-analysis include the dearth of studies that limits the ability to generalise the results. The measurements of heart healthy eating behaviours were varied and generally lacked reported reliability. Although the overall effect size was small, the results do support school-based programs that include eating behaviours as a component of the intervention.

CRD commentary
The author presents a clearly stated objective, uses a specific inclusion/exclusion criteria, and assess the validity of the included studies. Although the author uses several methods to identify relevant articles and attempts to identify unpublished studies, the only electronic database that was used was MEDLINE. This may therefore, have resulted in some important information being missed. In addition, very little information is presented about individual studies and despite finding significant heterogeneity between included studies the results were pooled. This was not appropriate and the results should therefore be considered with great caution.

Implications of the review for practice and research
The author recommends that future research in school-based cardiovascular health programmes identify and implement reliable measures. Increasing the representativeness of culturally diverse populations is also warranted.

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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.