A systematic review of the effect of dietary exposure that could be achieved through normal dietary intake on learning and performance of school-aged children of relevance to UK schools
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CRD summary
This review concluded that there was insufficient evidence to identify any effect of diet, nutrition and dietary change on learning, education or performance of school-aged children from developed countries. The conclusions should be considered as relatively reliable, but the potential influences of language or publication biases and reviewer error such be borne in mind.

Authors' objectives
To review the effects of nutrition, diet and dietary change on learning, education and performance in school-aged children from UK and other developed countries.

Searching
MEDLINE, CINAHL, PsycINFO, British Education Index, ERIC, Australian ERIC, SSCI, ASSIA, IBSS, Sociological Abstracts, SPECTRE and ZETOC were searched from inception to December 2005 (search terms were reported). Only published peer-reviewed English-language papers were considered for inclusion.

Study selection
Controlled trials that compared an exposure or dietary intervention that focused on nutrition, diet or dietary change (that could be achieved through normal dietary exposure) in children aged four to 18 years were considered for inclusion. Trials were required to report at least one of the following outcomes: educational performance or behaviour and motivation. Minimum study duration was more than five days (or over two hours for high carbohydrate studies). Study setting was defined as developed countries according to World Bank human development index score.

Randomised and non-randomised controlled trials (RCTs and CCTs) were included in this review from USA (most studies), UK, France, Chile, Israel, Canada, Japan, Mexico and Sweden. All studies reported either educational attainment or some measure of behavioural outcomes (varied across studies). Two-thirds of studies were carried out with children of primary age. More than half of the studies had less than one month duration. Populations varied across the study groupings from generally healthy in the breakfast interventions, children with attention deficit and hyperactivity disorder (ADHD) in sugar intake studies and symptoms of neurodevelopmental disorders (dyspraxia and ADHD) in fatty acid studies. Interventions were grouped as breakfast interventions, sugar intake, fatty acid supplementation, vitamin and mineral supplementation or other.

The authors did not report how many reviewers performed the study selection.

Assessment of study quality
Included studies were assessed in terms of validity and quality based on the SIGN guidelines for assessing RCTs (with items on randomisation, blinding, concealment and intention-to-treat analysis). A quality-assurance template produced by the EPPI-Reviewer software was also used, which weighted evidence into low, medium and high categories. No further details on how many reviewers performed the validity assessment were reported.

Data extraction
Quantitative and qualitative data were extracted independently using EPPI-Reviewer templates by two reviewers. Any discrepancies were resolved by discussion with the review group.

Methods of synthesis
A narrative synthesis was carried out with included studies grouped according to intervention type (breakfast, sugars, fish oils, mineral and vitamin supplementation, other).
Results of the review
A total of 29 RCTs and CCTs were included in the review. The quality of the studies was variable and many failed to account for important confounding variables. Statistical power was calculated in five studies with concealment/compliance being poorly reported in some studies. Overall it was difficult to compare across studies and draw conclusions.

Breakfast was examined by 15 studies. Ten studies identified an association between breakfast provision and some small cognitive and behavioural improvements, but the questionable quality of the research made it difficult to draw definite conclusions.

Six studies explored short-term exposures to sugar in children (mostly primary school age) with ADHD. Collectively there was no evidence that sugar intake adversely affected learning or behavioural outcomes.

Five studies looked at fish oil supplementation in children with symptoms of neurodevelopmental disorders. Findings were mixed and results inconclusive.

Two studies explored vitamin/mineral supplementation. One trial in Hispanic children reported a significant improvement in IQ scores in a small sample and the second trial found no effect. Overall these results were deemed inconclusive.

One study that evaluated the impact of a supplemented diet showed significant improvements in exam results and behaviour, but the study was poorly reported and not considered reliable.

Authors’ conclusions
There was insufficient evidence to identify any effect of diet, nutrition and dietary change on learning, education or performance of school-aged children from developed countries. There was emerging evidence for the effects of some fatty acids and further high-quality research relevant to UK was required.

CRD commentary
This review addressed a wide-ranging question with appropriate inclusion criteria. A range of sources were searched, but language and publication biases seemed likely given the exclusion of non-English and unpublished research. Only the data extraction procedures were described, thus it was difficult to rule out that reviewer error/bias being introduced at the study selection and validity assessment stages. A narrative synthesis appeared appropriate given the heterogeneity within study groups and study quality issues incorporated into this synthesis. Overall the authors conclusions are likely to be reliable, but the potential influences of language and publication biases and reviewer error should be borne in mind.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further well-conducted research in all areas was required in settings relevant to UK. Such research should be of high quality, representative of all populations, adjust for confounders, use biochemical monitoring, be undertaken for longer durations and use standardised outcome measures particularly in relation to educational attainment. Studies were needed particularly in older (teenage) and special needs populations.

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Bibliographic details
Record Status
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.