Public Health England

School Food and Attainment

Review of the literature

About Public Health England

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Introduction

There is widespread belief that nutrition and diet may have a part to play in raising attainment of children at school. There continues to be considerable activity to improve and promote school food. Much of the available evidence is confusing or contradictory. This paper presents a review of evidence investigating the effects of nutrition and diet on academic achievement of school aged children.

Methods

This paper took the review by Ells *et al*[1] as the starting point. In 2013 the same search strategy was used to identify additional papers published between 2006 and 2013. Included studies had to be primary studies reporting empirical research from controlled trials, include exposure or intervention focusing on nutrition or diet and educational performance (using validated methodology, include a nutritional or dietary exposure achievable through the normal diet), include children aged 4-18 years, undertaken in a developed country, with sufficient duration to have reasonable benefit.

The search was supplemented by personal communication to identify further studies.

Results

The updated literature search identified 39 potentially relevant publications. Seven were excluded on the basis of not including empirical research, three on the basis of not being peer reviewed 20 were excluded on the basis of topic (ie not having relevant, sufficient or validated measurements), five were excluded owing to being duplicate papers from the same authors/studies. This left four additional papers, a pilot randomised controlled trial (RCT), a cross sectional study and 2 longitudinal studies.

The Ells *et al* review[1] included 29 studies. Fifteen of these examined the effect of breakfast. Ells *et al* noted some short comings within these papers. Of the studies investigating breakfast clubs, three identified a small positive impact of participation while the remaining found no effect. Four of six studies looking at breakfast consumption vs fasting identified some improvement in problem solving, attention and episodic memory after consuming cereal-based breakfasts and complex visual display following consumption of breakfast. Two studies were unable to identify differences.

Two studies considering habitual vs standardised breakfast provision demonstrated some improvements in cognitive function after consumption of the standard breakfast.

However, one study demonstrated an increase in memory scale results accompanied by a reduction in concentration. The authors conclude the diverse range of breakfast interventions and research designs makes it difficult to the findings together. They concluded that the majority of studies (10 out of 15) were able to demonstrate that the provision of breakfast may have some small benefit to a limited selection of short-term functions and achieved low quality assurance scores for the weight of the overall evidence.

Six studies included in the Ells *et al* review were on the effect of sugar intake on learning and behavioural outcomes in school aged children. Five studies examined the effects of fish oil supplementation, while two examined the effect of multivitamin and mineral supplementation. Other studies included the effect of a supplemented diet on deprived Mexican school children.

Ells *et al* concluded that there was insufficient evidence to identify any effect of nutrition, diet and dietary change on learning, education or performance in school aged children in the developed world.

An evaluation of the Free School meals pilot in England[2] found that the universally extending provision of school lunch eligibility to all students impacted on attainment at Key Stages 1 and 2. However, the study was unable to establish if this was the result of providing free school meals or the wider package of activities associated with the pilot. The extension of eligibility below the level of universality did not demonstrate an improvement in achievement.

A cross-sectional study in Australia[3] assessed a range of health-related behaviours in relation to literacy and numeracy of 824 children (grade 3-7; covering primary and secondary school age). This study assessed influences of physical activity, sleep and nutritional quality of breakfast (using a previously validated self-reporting methodology). The authors reported that greater school socioeconomic status was the most significant predictor of literacy followed by greater mother's education, being female, higher nutritional quality of breakfast score and more time spent in sedentary behaviour before school. No effect of breakfast quality score was seen for numeracy in boys or girls. The authors conclude that nutritional quality of breakfast is small compared to the child's socioeconomic status and parental education. Overall the study had a high proportion of breakfast consumers, did not assess the rest of the day's dietary intake and includes no assessment of other school-related issues.

The evaluation of the free school breakfast program in St Joseph, Missouri[4] collected participation and attendance data for all students before and after implementation of

free breakfast club in six schools. Maths and science scores form 345 matched students were assessed to investigate academic performance and breakfast consumption obtained form a random sample of 450 students. Location of the programme influenced participation and attendance increased during the intervention period. While the authors reported that the free breakfast programme was beneficial and benefited all students, especially those from low-income families no influence on academic performance was observed.

Evidence from the Avon Longitudinal Study of Parents and Children[5] reported that a "junk food" dietary pattern at age three had a negative association with level of school attainment. A weak association remained after controlling for other confounders, including dietary patterns at ages four and seven years. This study, however, does not provide any confirmatory data in relation to food consumption in school and suggests that the dietary pattern pre-school appear to persist over time.

Summary

Although three studies have been identified which have promising associations between diet and academic attainment a fourth study was unable to identify a benefit of a free breakfast club on academic performance at one year. Many studies in this area include confounders associated with wider concomitant activity within the school environment on going and none of the three studies here assessed, or when considered, were unable to determine any effect of nutritional intake separately from these wider factors.

Many of the excluded studies related to breakfast consumption vs skipping breakfast and short-term assessments of cognition. This literature confirms current advice that breakfast is an important meal and should be encouraged. The literature does not, however, provide evidence for the nutritional content of the meal rather simply confirms the current advice that we should all eat breakfast.

It is also noteworthy that school level attainment data may be impacted by the improved attendance and punctuality associated with the provision of breakfast clubs, and in some cases a switch form consuming breakfast at home to consuming at school. Such findings also support a useful role for intervention.

While the studies identified in this literature review add value to the previous systematic review, taken together there remains insufficient evidence to identify an effect of nutrition and diet and dietary change on learning and education in school aged children.

We do know, however, that the diet of children, particularly teenagers, is less than ideal with many eating too much salt, saturated fat, and sugars[6] and with between one in

three and one and six being overweight or obese[6]. These patterns of dietary intake and overweight are associated with poor health now and in the future.

Helping children achieve and maintain a healthy diet as visually shown in the eatwell plate will have lasting health benefit regardless of any potential impact on attainment and should remain our key rationale for promoting a better diet.

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