



Diet outcomes of a pilot school-based randomised controlled obesity prevention study with 9–10 year olds in England

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ABSTRACT

Objectives. To assess the effect of a US obesity prevention intervention on dietary outcomes in English 9–10 year old children in 2006.

Methods. A pilot cluster randomised controlled trial in 19 schools with children aged 9 to 10 with lessons taught by teachers. Diet was assessed at baseline and 5 months later using questionnaires. Full intention-to-treat analysis ($n = 506$) and analyses using only those with complete baseline and follow-up data ($n = 393$).

Results. 8.5% of children ate 5 or more portions of fruit and vegetables per day. The odds of eating healthy amounts of fruit and vegetables (OR 1.39 (95%CI: 0.69, 2.80)) and snacks (OR 1.22 (95%CI: 0.68, 2.21)) were greater in children from the intervention compared to control schools. Point estimates were less than one for consumption of no portions of high fat food and one or zero high energy drinks. A full-scale trial would require 2640 children (106 schools) with 80% power to detect an odds ratio of at least 1.30 for healthy levels of consumption for the four dietary outcomes, with an alpha level of 0.01.

Conclusions. The US intervention can be transferred to England and it might be effective in increasing fruit and vegetable consumption and decreasing snacks.

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Introduction

In response to the increasing levels of childhood obesity in developed countries efforts to prevent obesity have been developed which focus on changes in diet, physical activity and sedentary behaviours (Kipping et al., 2008a). Dietary fat, carbohydrate, and sweetened drinks are risk factors for obesity (Gazzaniga et al., 1993; Malik et al., 2006; Vartanian et al., 2007). Reducing the consumption of these types of foods whilst increasing the consumption of low energy, nutrient rich foods such as fruit and vegetables has been recommended as an obesity prevention approach (Foresight, 2007; WCRF/AICR Expert Report, 2007).

Many children in high-income countries, including the USA and many European countries, do not meet the recommended standard of 5 fruit and vegetable portions per day (Janssen et al., 2005; Rasmussen et al., 2006). Data from the 2006 Health Survey for England showed low levels of fruit and vegetable consumption, with boys aged 9 consuming an average of 3.3 portions of fruit and vegetables per day and girls an average of 3.5 portions (The Information Centre, 2008a,b). Only 19% of 9 year old boys and 25% of girls in England consumed at least 5 portions per day in 2006.

Many obesity prevention policy and research interventions have been based in schools (Kipping et al., 2008b). A systematic review of diet and physical activity school-based interventions found that diet and physical activity school-based interventions may help prevent children becoming overweight in the longer term (Brown and Summerbell, 2009).

The aim of this study was to present differences in dietary patterns by randomised arms of a pilot school-based obesity prevention intervention called 'Active for life year 5', which combined lessons on healthy eating, increasing physical activity and reducing TV viewing, with a short-term follow-up (5 months) in 9–10 years olds in England (Kipping et al., 2008c). The intervention was adapted from an effective school-based obesity prevention intervention designed in America: Planet Health (Gortmaker et al., 1999b) and Eat Well Keep Moving (Gortmaker et al., 1999a). The primary aim of our pilot randomised controlled trial was to test the feasibility of introducing the intervention to the UK, determine the intraclass correlation coefficient for key outcomes and hence be able to calculate the required sample size for a full-scale trial and to determine appropriate methods of recruiting schools and children to methods of data collection to evaluate the intervention's effect on diet, physical activity, sedentary behaviour and obesity within a randomised controlled trial design. Results other than the dietary data have been previously reported (Kipping et al., 2008c). Here we present the findings for the dietary outcomes.

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Methods

Study design

The 'Active for life year 5' study was conducted in 2006 as a pilot cluster randomised controlled trial (RCT), in year 5 classes (9–10 year old) in 19 primary schools in England. Twenty-seven schools in urban areas of South Gloucestershire were invited to take part in the study. South Gloucestershire is on the outskirts of the city of Bristol, in the South West of England. The ethnicity of this area is predominantly White and the socioeconomic position is higher than average for England (Office of the Deputy Prime Minister, 2004). All state junior and primary schools with year 5 classes in an urban area of South Gloucestershire were invited to take part. Private schools and special schools (e.g. learning disabilities) were excluded. The schools were informed they would be randomly allocated to 'intervention' or 'control', with the intervention schools being provided with teacher training and teaching materials and the control schools being provided with these after the completion of the study. It was not possible to blind the school to the group assignment. Nineteen schools (70%) agreed to be in the study. The timescales for recruiting the schools were short which deterred some of the schools from taking part.

Random allocation to intervention or control school was concealed and done by one of the authors (DAL) using a random-number generator to establish the group allocation of the next school. Ethical approval was sought from the National Health Service but the chairman of the local research committee said that since this was research that did not involve NHS patients staff ethical approval was not required. The schools sent letters from the local director of public health and director of children's services to parents, inviting them to give written consent for each of the outcome measures.

The US study was evaluated over a 2 year period. However, it was not possible for us to undertake a long-term trial before completing the initial feasibility/pilot work presented here. The programme was implemented over two terms with teacher training taking place in January 2006, the intervention taking place between February and June 2006 and the final outcome assessment in July 2006. Thus, we evaluated the effect of the programme over a 5-month period from February to June.

Intervention

The project was an adapted and abbreviated form of the 'Eat Well Keep Moving' programme developed by a team at the Harvard University School of Public Health (Gortmaker et al., 1999a,b; Kipping et al., 2008c). The intervention was based on social cognitive theory and behavioural choice theory of individual change (Gortmaker et al., 1999b). Social cognitive theory is a common model in nutrition education interventions, whereby the primary concept for behaviour change is self-control using behavioural change goals, monitoring, reward and problem solving and decision-making when goals are not attained (Baranowski et al., 2003). Behavioural choice theory is focused on decision-making and how time and responses are allocated on the basis of options available (Epstein, 1998).

Sixteen lessons on healthy eating, increasing physical activity and reducing TV viewing were adapted by two primary school teachers for the English school setting. The main changes were to shorten the lesson plans, change American phrasing or references and change the US-based pyramid structure of food groups to the UK 'balance of good health' plate (Food Standards Agency, 2001). The pilot did not include two staff wellness meetings, but otherwise was similar to the US intervention. Two teachers provided a training session to the 10 teachers who were teaching the lessons in the intervention schools and all teaching materials were provided. Materials included lesson plans and resources (e.g. worksheets, two journals per child, photographs of food and a CD with the lesson plans) for 9 physical activity lessons, 6 nutrition lessons and 1 lesson about screen viewing (see Table 1). The nutrition lessons focused on learning the content of the food groups, as outlined in the balance of good health, the importance of eating at least five fruit and vegetables a day and the importance of eating breakfast (Food Standards Agency, 2001). In the physical activity lessons the children played games based on the food groups using photographs of food, which reinforced the theory taught in the nutrition lessons. In addition, the children were given two journals. In the Fit Check journal the children kept a record of their time spent being physically active or sedentary and set goals to an hour of physical activity and no more than 2 hours of sedentary time per day. In the Freeze My TV

journal the children identified TV programmes to stop watching and replace with physical activity and a reflective diary on how it felt to freeze their TV. The lesson could be integrated in the Qualifications and Curriculum Authority's topics for this age group (Key stage 2) on what makes a healthy lifestyle, including the benefits of exercise and healthy eating and how to make informed choices (Qualifications and Curriculum Development Agency, 2010).

Outcome measures

All measurements were taken before the lessons were taught (baseline assessments; January/February 2006) and 5 months later (follow-up; July 2006). This paper focuses on the dietary behaviours that were assessed using a questionnaire called "A Day in the Life Questionnaire" (DILQ) with the main derived dietary outcomes being consumption of fruit and vegetables, sweet and savoury snacks, high fat foods and high energy drinks. The DILQ provides information about the children's food and drink intake the previous day. To improve recall the questionnaire is structured with sequential questions in a 24 hour segmented school day. The questionnaire has been shown to be reliable for assessing the consumption of fruit and vegetables, and sweet and savoury snack amongst children (Edmunds and Ziebland, 2002; Moore et al., 2007). Teachers were asked to supervise the children completing the questionnaire and help with spellings. Completed questionnaires were returned by post.

Fruit and vegetable consumption was assessed using an established scoring scheme which is shown in Table 2. The DILQ data were also used to create categories of snacks, high fat food and high energy drink. These categories were similar to those used in a study of 9–11 year olds in Wales (UK) which used an adapted version of the same questionnaire {101} and were also informed by the categories used in a food frequency questionnaire with 12–13 year olds in Australia (Campbell et al., 2007).

Questionnaire responses were entered into a Microsoft Access database. The responses were coded according to the number of portions consumed per day for each category. All possible spellings of words written by the children (approximately 1000) were extracted and allocated a code to indicate the food or drink category. This coding was used to generate automatic coding of the text in Access, which was followed by a manual verification of the automatic coding or changes to the coding. All manual verification was initially completed by RRK, who asked for help from the other two co-authors for items that could be allocated to more than one of the outcome categories (e.g. croissant and waffle). The final allocation of all foods is given in Table 2. Imprecise spellings were also checked and agreed by all three authors. After these discussions (regarding spelling and allocating foods to categories) and initial complete coding by RRK, a second coder (RJ and DAL 50% each) independently coded all of the foods and any differences between the initial (RRK) or second coders (RJ or DAL) were agreed by discussion. Less than 3% of the original codes required changing after the second independent coding.

Other measurements

The percentage of children receiving free school meals and the English Government school deprivation indicator were used as measures of deprivation to compare schools allocated to intervention and control groups at baseline. The English Government school deprivation indicator is a measure of income deprivation using the income characteristics of the area of residence for each child attending the school. The percentage of families with children getting Child Tax Credits and/or Working Tax Credits informs the deprivation indicator (Department for Children Schools and Families, 2008). A score of 100% represents the most deprived schools in England.

Statistical methods

Since this was a pilot study we aimed to recruit as many schools and their pupils as possible and use the results, including the intraclass correlation coefficients, to calculate the necessary sample size for a full-scale study.

Binary outcomes that reflected healthy consumption were derived for each dietary outcome using the following to define healthy: fruit and vegetables (≥ 5 portions per day); snacks (0 or 1 portion per day); high fat food (0 portion per day); and high energy drink (0 or 1 portion per day). These thresholds were defined after an initial inspection of the data and were based on both established knowledge of a healthy diet and recommendations for this (for example 5 portions of fruit and vegetables per day), together with distribution in our study sample (for example consumption of high fat food

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