Appetite 125 (2018) 182–189

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

A process and outcome evaluation of an in-class vegetable promotion program

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ARTICLE INFO

Article history:
Received 7 September 2017
Received in revised form
18 January 2018
Accepted 22 January 2018
Available online 7 February 2018

Keywords:
School
Vegetable
Nutrition
Intervention
Children
Health promotion

ABSTRACT

Objective: Nutrition interventions that target both fruits and vegetables are effective in increasing fruit consumption, but have been limited in their ability to improve vegetable intake. To address the low proportion of children meeting vegetable intake guidelines, approaches specifically targeting vegetables are needed. This paper reports on a mixed-method analysis of a 10-week vegetable promotion pilot project that aimed to increase vegetable intake as part of the existing Crunch&Sip in-class fruit and vegetable break program.

Design: The intervention was designed to promote vegetable consumption through the implementation of vegetable-focused resources, including curriculum resources and parent education materials. Teachers completed pre- and end-of-intervention surveys. Process measures related to the use of resources and teachers' perceptions of barriers to implementation. The outcome evaluation included measures of children's vegetable consumption during Crunch&Sip breaks and teachers' attitudes and confidence relating to educating students about the benefits of consuming vegetables.

Subjects: Twenty-one Western Australian primary schools already participating in the Crunch&Sip program participated in the pilot intervention and evaluation. Coverage included 35 primary school teachers representing 818 students aged 4–11 years.

Results: The proportion of children bringing vegetables for Crunch&Sip more than doubled over the 10-week intervention (21% vs 46%; $p < 0.001$). Improvements were observed in teachers' perceived knowledge about the nutritional benefits of vegetables ($p = 0.001$) and confidence to educate students about the benefits of vegetable consumption ($p = 0.028$).

Conclusions: Preferentially promoting vegetable consumption as part of an existing school-based nutrition program may be an effective strategy to increase children's vegetable intake.

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1. Introduction

In many countries, including the United Kingdom, Ireland, Canada, United States, and Australia, children are failing to meet intake recommendations for core food groups (i.e., fruits, vegetables, grains and cereals, meat and alternatives, and dairy and alternatives) and are consuming an excess of energy-dense, nutrient-poor foods (Australian Bureau of Statistics, 2014; Australian Bureau of Statistics, 2016; Banfield, Liu, Davis, Chang, & Frazier-Wood, 2016; Jessri, Nishi, & L'Abbe, 2016; National Health and Medical Research Council, 2013; Public Health England, 2014; Walton, McNulty, Nugent, Gibney, & Flynn, 2014). Poor dietary habits established in the younger years tend to persist over time (Ashcroft, Semmler, Carnell, van Jaarsveld, & Wardle, 2008; Mikkilä, Räsänen, Raitakari, & Viikari, 2005), increasing the risk of diet-related chronic diseases in adulthood (National Health and Medical Research Council, 2013). Strategies are needed to increase children's adherence to dietary recommendations to reduce the future burden of chronic disease (Clarke, Fletcher, Lancashire, Pallan, & Adab, 2013).

Schools are an ideal target for nutrition interventions due to the substantial amount of time children spend in the school environment, the potential to influence structural factors such as policy and canteen food provision, the opportunity to teach children about nutrition through the curriculum, and the leveraging of peer and

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https://doi.org/10.1016/j.appet.2018.01.023
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teacher modelling to influence children's behaviour (Clarke et al., 2013). School-based healthy eating programs focus on a range of nutritional targets including nutrition knowledge, energy intake, sugar consumption, and fruit and vegetable intake. Interventions targeting fruit and vegetable intake are frequently multi-component, combining a mixture of approaches such as curriculum-based learning (Ransley et al., 2007; te Velde et al., 2008; Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009; Wang et al., 2010), experiential learning (e.g. skill development in cooking and gardening) (Heim, Stang, & Ireland, 2009; Parmer et al., 2009; Wang et al., 2010), providing rewards for achieving desired behaviours (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004; Wardle, Herrera, Cooke, & Gibson, 2003), and parental involvement (Ransley et al., 2007; te Velde et al., 2008; Heim et al., 2009). While many interventions focus on providing children with the knowledge and skills to make healthier food choices, there are also examples of approaches that directly target the supply of fruits and vegetables at school, such as through changes to foods offered at the school canteen or the provision of a daily portion of fruits and vegetables as part of a school subscription program (Ransley et al., 2007; te Velde et al., 2008; Wang et al., 2010; Eriksen, Haraldsdóttir, Pederson, & Flyger, 2003).

The Pro Children study conducted with students in Norway, the Netherlands, and Spain was a multi-component intervention that included the provision of fruits and vegetables (for free or as part of a paid subscription service), the development of student educational materials and information for parents, and assistance to encourage community participation in the project (te Velde et al., 2008). After the first year of the program, students in the intervention group were found to be consuming 25% more fruits and vegetables than those in the control group (a difference of 55 g), however, the majority of this change was due to increases in fruit intake (te Velde et al., 2008). The 'Food Dudes' project conducted in England and Wales with children aged 4–11 years involved children watching short videos featuring peers promoting the consumption of fruits and vegetables (Lowe et al., 2004). Students in the study were also provided with merchandise such as stickers and rulers as a reward for desired behaviours relating to fruit and vegetable consumption (Lowe et al., 2004). Following the intervention, increases were observed in children's intake of fruits and vegetables at school, with improvements of 62 g/day for fruits and 36 g/day for vegetables (Lowe et al., 2004). School-based interventions focusing on fruits and vegetables can lead to increases in combined fruit and vegetable intake (Aloia, Shockey, Nahar, & Knight, 2016; Blanchette & Brug, 2005; De Sa & Lock, 2008; Dudley, Cotton, & Peralta, 2015; Evans et al., 2012; French & Stables, 2003; Howerton et al., 2007; Knai, Pomerleau, Lock, & McKee, 2006). However, when fruit and vegetable consumption are separated, it has been shown that improvements are largely driven by increases in fruit intake (Appleton et al., 2016; Blanchette & Brug, 2005; Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; French & Stables, 2003).

Consuming a diet high in vegetables has been shown to be protective against a number of chronic lifestyle conditions including coronary heart disease, stroke, and some cancers (National Health and Medical Research Council, 2013). The low energy density of vegetables may also play a role in preventing excess weight gain (Bertoia et al., 2015; Schwingshackl et al., 2015). There is a clear disparity in children's fruit compared to vegetable consumption in many developed nations, including the United States, European countries, and Australia (Australian Bureau of Statistics, 2016; Banfield et al., 2016; Yngve et al., 2005). In Western Australia, the setting for the current study, 89% of 4–11 year olds meet the guidelines for fruit intake, while only 17% meet vegetable intake recommendations (Government of Western Australia, 2015a). Given the limited effectiveness of interventions targeting both fruits and vegetables on vegetable consumption, interventions specifically targeting vegetables need to be implemented (Appleton et al., 2016; Evans et al., 2012; Glasson, Chapman, & James, 2011; Sharp et al., 2017).

Crunch&Sip is an Australian school-based program that aims to increase the fruit, vegetable, and water consumption of primary school children (aged 4–11 years) by allowing water bottles in the classroom and providing a daily in-class break to eat fruits and vegetables (Cancer Council Western Australia, 2017). To officially join the program, schools are required to have most students participating, gain support for the program from the school community, and develop a Crunch&Sip policy or pledge document. Unlike other programs where schools provide children with additional fruits or vegetables (Ransley et al., 2007; te Velde et al., 2008; Eriksen et al., 2003), parents are primarily responsible for supplying food for the Crunch&Sip break. However, schools are required to develop strategies to provide fruits and vegetables to students with limited access. Support is given to schools through the provision of parent education materials, classroom resources, and the delivery of fruit- and vegetable-focused school events. Crunch&Sip was launched as a state-wide initiative in Western Australia in 2005 and has since been implemented in other Australian states including New South Wales, Queensland, and South Australia.

Currently 382 schools are officially participating in Crunch&Sip in Western Australia, representing 43% of eligible schools (Cancer Council Western Australia, 2017). Despite fruits and vegetables being given equal prominence in the program, including in promotional materials, feedback from teachers suggests that fruit is much more commonly consumed during Crunch&Sip breaks (Sharp et al., 2017). To improve vegetable outcomes, formative research was undertaken to identify means of promoting a stronger vegetable focus for the Crunch&Sip program (Sharp et al., 2017). On the basis of the results, a pilot intervention was developed that involved the implementation of vegetable-focused resources, including curriculum resources, parent education materials, and student incentives. The materials encouraged children to develop a more positive attitude towards vegetables while also directly promoting the increased provision of vegetables for Crunch&Sip by parents, and the increased consumption of vegetables by students during Crunch&Sip breaks. Although the project sought to increase vegetable intake, fruit remained a permitted choice for the snack breaks. The aim of the project was thus to bring vegetable intake in line with fruit intake during Crunch&Sip breaks, rather than to eliminate fruit consumption altogether.

The aim of the present study was to generate process and outcome evaluation data to assess the effectiveness of the new resources in promoting vegetables. The process data related to (i) the extent to which teachers used the pilot resources and (ii) teachers' reports of barriers encountered in implementing the pilot or encouraging students to consume more vegetables. The outcome data related to changes in (i) students' vegetable intake during Crunch&Sip breaks, (ii) teachers' attitudes towards educating students about the nutritional benefits of vegetables, iii) teachers' confidence to educate students about the benefits of vegetable consumption, and iv) teachers' perceptions of student and parent attitudes towards the consumption of vegetables for Crunch&Sip.

2. Methods

2.1. Study population

Teachers of Year 1–2 children (aged 5–7 years) and Year 5–6 children (aged 9–11 years) from all Western Australian schools participating in the Crunch&Sip program (n = 382) were invited to

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