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## Original Research

# Impact of a school-based intervention to promote fruit uptake: a cluster randomised controlled trial

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## ABSTRACT

**Objective:** There is evidence that fruit consumption among school children is below the recommended levels. This study aims to examine the effects of a dietary education intervention program me, held by teachers previously trained in nutrition, on the consumption of fruit as a dessert at lunch and dinner, among children 6–12 years old.

**Study design:** This is a randomised trial with the schools as the unit of randomisation.

**Methods:** A total of 464 children (239 female, 6–12years) from seven elementary schools participated in this cluster randomised controlled trial. Three schools were allocated to the intervention and four to the control group. For the intervention schools, we delivered professional development training to school teachers (12 sessions of 3 h each). The training provided information about nutrition, healthy eating, the importance of drinking water and healthy cooking activities. After each session, teachers were encouraged to develop classroom activities focused on the learned topics. Sociodemographic was assessed at baseline and anthropometric, dietary intake and physical activity assessments were performed at baseline and at the end of the intervention. Dietary intake was evaluated by a 24-h dietary recall and fruit consumption as a dessert was gathered at lunch and dinner.

**Results:** Intervened children reported a significant higher intake in the consumption of fruit compared to the controlled children at lunch ( $P = 0.001$ ) and at dinner ( $P = 0.012$ ), after adjusting for confounders.

**Conclusions:** Our study provides further support for the success of intervention programmes aimed at improving the consumption of fruit as a dessert in children.

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## Introduction

The evidence suggests that children's consumption of fruit and vegetables is below the recommended levels.<sup>15,21</sup> It is known that human biology does not predispose children to eat the recommended amounts of fruit and vegetables and makes them especially exposed to the current food environment of foods high in refined sugars.<sup>23</sup>

Previous studies found that a western dietary pattern is characterised by the consumption of sweet desserts, which are correlated to an increase in the intake of solid fats and added sugars in children's diets.<sup>5,10,19</sup> In 2–18-year-old children, grain desserts such as cakes, cookies, doughnuts, pies, crisps, cobblers and granola bars are the top source of energy, the second major source of solid fats and third of added sugars. In addition, dairy desserts are the fourth major source of added sugars.<sup>32</sup> In Portugal, it is common to eat fruit as a dessert, at least at lunch and dinner, nevertheless total consumption of fruit is still lower than the recommended levels.<sup>20</sup> Schools in Portugal have canteens and most of the children eat there. Government recommendations provide guidelines to schools and their canteens to offer healthy food such as fruit and soup.<sup>43</sup>

There is growing evidence that childhood is an important time to establish eating behaviours. School-based intervention programmes aimed to improve students diets and reduce chronic diseases have had mixed success.<sup>2,7</sup> Some of the studies have a positive impact on fruit and vegetable consumption during the day.<sup>12,22,27,34,44</sup> However to the best of our knowledge, none of them analysed the effects of an educational programme on fruit for dessert. Until now, it is unclear the role of teachers in the delivery features of the interventions.<sup>39,41</sup> Although teachers are not able to devote as much time and energy to provide interventions as dedicated interventionists, at least theoretically, because they have responsibilities in the classroom that take precedence,<sup>41</sup> some studies consider them dedicated interventionists.<sup>39</sup> In Portugal, teachers have to attend professional development training (lifelong training) to progress in their career. There are few, if any, examples of studies that consider the programme to have impact on the progression of a teaching career. It is hypothesised that participation in this school-based intervention programme have impact on children from primary schools by increasing consumption of fruit as a dessert at lunch and dinner.

The purpose of the present study is to examine the effects of a six-month dietary education intervention programme, delivered and taught by trained teachers, on the consumption of fruit as a dessert in children aged 6–12 years.

## Methods

### Participants

During 2007/2008, seven of 80 public elementary schools from a city in the north of Portugal were selected by a simple random sample and invited to participate in this study. The number of schools involved was according to constraints of

personnel for assessment and intervention. The unit of randomization was the school, and three of them were assigned into intervention, and four into the control group (Fig. 1). Previous data collection, the written consent forms signed by parents, was gathered according to the ethical standards laid down in the Helsinki Declaration. Immediately before data collection children gave oral assent. Also, both the schools where the study was carried out, and the Portuguese Data Protection Authority (CNPD-Comissão Nacional de Proteção de Dados, process number 7613/2008) approved the study. In addition the protocol for this study was registered in the [clinicaltrials.gov](http://clinicaltrials.gov), NCT01397123.

Of the 574 children who were invited to participate, 464 (239 female), aged 6–12 years old, agreed and returned (80.8%) the written consent forms filled by their parents. From these, 233 (50.2%) were allocated to the intervention group, and 231 (49.8%) to the control group. Follow-up assessment was available for 63.4% of the children, 143 (61.9%) in the control and 151 (64.8%) in the intervention groups. Attrition rates did not differ between intervention and control group (35.2% and 38.1%, respectively). Major reasons for non-participation were school transfer (94.1%), parental refusal (4.1%) and absence from school (1.8%). A total of 257 parents of the children involved in the study provided data at baseline and 203 (79.0%) at postintervention, i.e. after the programme ended during the year 2009.

### Overview of the intervention

Fifteen teachers from intervention schools (15 classrooms) were invited to participate in the programme conducted between October 2008 and March 2009, and all of them agreed to be involved. This intervention programme was based on the Health Promotion Model<sup>28</sup> and the social cognitive theory,<sup>3</sup> and aimed to promote healthier active lifestyles by encouraging children to be more active and make a better food selection. The professional development training for the teachers was approved by the Minister of Education, Scientific-Pedagogic Council for In-service Training (Conselho Científico Pedagógico da Formação Contínua, Ministério da Educação) in the form of 'training workshop' with 72-h duration. The programme was implemented over two terms: (1) teachers' training delivered by researchers between October 2008 and March 2009; and (2) intervention delivered by the trained teachers to children between November and March 2009 and as previously described elsewhere.<sup>35,36</sup> Briefly, teachers of the intervention group had 12 sessions of three hours each with the study researchers during six months, which included contents related to health promotion and overweight and obesity prevention, concepts of food, nutrition and dietary guidelines, hydration and the importance of water, appropriate physical activity levels and strategies to reduce screen time. After each session, teachers delivered the learnt contents and developed creative and engaging classroom activities about the addressed topic. Individual meetings with teachers occurred just before the beginning of the intervention to clarify doubts and review the materials to be used in the sessions.

The implementation of the programme occurred as planned. All the children of the intervention schools had contact with trained teachers. Teachers taught the components of the

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