



Effectiveness of Taste Lessons with and without additional experiential learning activities on children's willingness to taste vegetables



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ABSTRACT

This study assessed the effectiveness of the Dutch school programme Taste Lessons with and without additional experiential learning activities on children's willingness to taste unfamiliar vegetables. Thirty-three primary schools (877 children in grades 6–7 with a mean age of 10.3 years) participated in Taste Lessons Vegetable Menu (TLVM, lessons and extra activities), Taste Lessons (TL, lessons), or a control group. A baseline and follow-up measurement was used to assess for each child: number of four familiar and four unfamiliar vegetables tasted, quantity tasted, choice of vegetable of which to eat more, and number of vegetables willing to taste again later. Furthermore, children filled out a questionnaire on daily vegetable intake and food neophobia. Multilevel and Cox regression analyses were conducted to compare changes in the outcome measures between the three study groups. No significant intervention effects were found on willingness to taste unfamiliar vegetables. Neither were effects found on familiar vegetables, except for number of familiar vegetables tasted ($p < 0.05$). Furthermore, no significant intervention effects were found on daily vegetable consumption and food neophobia. These results indicate that more intensive school-based nutrition education activities are needed to increase children's willingness to taste unfamiliar vegetables and increase their vegetable intake.

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1. Introduction

Vegetables are an essential part of a healthy eating pattern (Beck et al., 2015; Diet, 2003; Knai, Pomerleau, Lock, & McKee, 2006). However, many children fail to eat enough vegetables, mainly because of low vegetable preference and food neophobia (Beck et al., 2015; Birch, 1979; Blanchette & Brug, 2005; De Bourdeaudhuij et al., 2005). Several school-based programmes have tried to increase children's vegetable intake, but have shown

minimal effects (Blanchette & Brug, 2005; Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; Hersch, Perdue, Ambroz, & Boucher, 2014; Knai et al., 2006; Pérez-Rodrigo & Aranceta, 2001).

Experiential learning methods, such as cooking, gardening, and tasting, are among the most promising strategies to enhance the effectiveness of such programmes (Dudley, Cotton, & Peralta, 2015; Knai et al., 2006; Peters, Kok, Ten Dam, Buijs, & Paulussen, 2009; Pérez-Rodrigo & Aranceta, 2001). These methods may increase familiarity and create positive associations with vegetables (Heim, Stang, Ireland, 2009; van der Horst, Ferrage, & Rytz, 2014), resulting in increased vegetable preference, willingness to taste vegetables, and vegetable intake (Dazeley, Houston-Price, & Hill, 2012; sHeim et al., 2009; Hersch et al., 2014; Robinson-O'Brien, Story, & Heim, 2009).

A systematic review showed that experiential learning methods are seldom applied in school-based nutrition education (Evans

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et al., 2012). Furthermore, few studies have used objective measures to evaluate whether school-based nutrition education programmes using experiential learning methods have an effect on children's willingness to taste vegetables. The Dutch school-based nutrition education programme 'Taste Lessons' makes use of experiential learning methods. This programme includes hands-on activities in each lesson, such as tasting, conducting experiments, and cooking. A former evaluation of Taste Lessons showed small effects on the self-reported number of familiar and unfamiliar food products tasted (Battjes-Fries, Haveman-Nies, Renes, & Meester, van't Veer, 2015), but no objective measures such as taste tests were used to evaluate the programme on children's willingness to taste vegetables. Evaluation studies of sensory education in other European countries (known as the SAPERE method) used taste tests in a school setting and showed significant increases in willingness to try unfamiliar foods in France (Reverdy, Chesnel, Schlich, Köster, & Lange, 2008), but not in Finland (Mustonen, Rantanen, & Tuorila, 2009). Of three other studies that evaluated school-based nutrition education programmes including gardening and cooking activities with taste tests, two found significant increases in willingness to taste vegetables (Anderson et al., 2005; Morgan et al., 2010), and one did not (Morris & Zidenberg-Cherr, 2002). It is therefore unclear whether experiential learning methods enhance children's willingness to taste vegetables. To deepen understanding on the effectiveness of experiential learning methods in school-based nutrition education, in the current study objective and subjective measures in the school setting were used to assess the effectiveness of Taste Lessons with and without additional experiential learning activities on children's willingness to taste vegetables, vegetable consumption, and food neophobia.

2. Material and methods

2.1. Intervention design

Taste Lessons (*Smaaklessen*) is a national, school-based nutrition education programme for grades 1–8 of elementary schools (children aged 4–12 years), developed in 2006 by the Netherlands Nutrition Centre and Wageningen University. The programme consists of five lessons per grade on the themes taste development, healthy eating, food production, consumer skills, and cooking. Each lesson takes on average 45 min and includes plenary group talks and in-class hands-on activities, such as tasting, conducting simple experiments and cooking. In 2013, a format was developed that extends Taste Lessons with additional hands-on activities for the five basic food groups. For this study, the Taste Lessons Vegetable Menu for 6th and 7th graders (10–11 year-olds) was developed. The Taste Lessons Vegetable Menu consists of the five existing lessons (teaching materials for the two grades combined and tailored to the food group vegetables) and four additional hands-on activities: a vegetable quiz; an excursion to a vegetable grower; a home assignment for the children to perform with their parents in the supermarket, in which the children for example had to look up the country of origin of several vegetables; and a cooking lesson with a dietician and the parents (extended version of lesson 5 of Taste Lessons). The programme was implemented by the teachers themselves, after attending an introductory workshop in which the programme was explained. To take pressure off the teachers, the excursion and cooking lesson were arranged for the schools by the research team.

2.2. Study design and procedure

A quasi-experimental design with three arms was used to assess the effect of the Taste Lessons Vegetable Menu. The study was

conducted among 1010 children in 34 elementary schools. Of this group, 11 schools implemented the Taste Lessons Vegetable Menu (TLVM), 11 schools implemented Taste Lessons (TL), and 12 schools took part in the study as a control group. In February–April 2013, the intervention schools were visited the week before the intervention for the baseline measurement, and the week after the intervention for the follow-up measurement. The measurements in the control schools took place in the same period. Children took part in the study whose parents reported no refusal to participate. Parental reports revealed that none of the children involved in the study had a food allergy for the selected vegetables in the taste test and that all children were healthy. The measurements took place during school time, between 9:00 and 15:00. Under supervision of a research assistant, children completed a questionnaire in their classroom. Meanwhile, small groups of children were asked to leave the classroom and perform the taste test in a separate room in the school. The children were not in a fasting state, but followed their regular mealtimes. The starting time of the taste test was reported for each child, and these times were in all study groups equally spread over the school day. Prior to the intervention study, children received a questionnaire to take home for completion by one of their parents (on paper or online). Teachers completed a questionnaire before the study started. The study was granted an exemption from requiring ethics approval by the local Medical Research Ethics Committee.

2.3. Study population

The study took place in the Dutch province of Gelderland. Schools in this region were invited to participate in a randomly allocated study group. Schools were included if they were not planning to participate in any other nutrition-related education programme and the children in grades 6–7 had not been previously enrolled in Taste Lessons. Of the 219 schools approached, 34 schools were willing to participate (16%). Eleven schools (417 children in 18 classes) participated in the TLVM group, eleven schools (285 children in 13 classes) in the TL group, and twelve schools (308 children in 18 classes) in the control group. All recruited classes participated in the baseline measurement. Of the 1010 children in total, 948 children completed the baseline questionnaire (94%) and 944 children the taste tests (93%). At the follow-up measurement, all but one class in the control group completed the questionnaire (885 children, 88%), and all but one class in the TL group participated in the taste tests (912 children, 90%). In total, 877 children (87%) participated in both taste tests and 828 children (82%) filled out both questionnaires.

3. Measures

3.1. Willingness to taste vegetables

Children's willingness to taste vegetables was assessed by conducting different tasks in a taste test in which children received both four unfamiliar and four familiar vegetables. The eight vegetables were selected on the basis of consumption data from the Dutch food consumption survey (RIVM, 2013), seasonal availability, and the possibility of being eaten raw. The vegetables were grouped into two pairs of generally unfamiliar vegetables (turnip cabbage and white radish; fennel and romanesco) and two pairs of generally familiar vegetables (tomatoes and cucumber; carrots and bell pepper). Children were given one vegetable from each pair at the baseline test and the other vegetable at the follow-up test in random order. Questions posed to the children at the end of the taste test confirmed that the selected unfamiliar vegetables were indeed unfamiliar; 0–5% of the children recognised these

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