Appetite 113 (2017) 84–90

Contents lists available at ScienceDirect

Appetite

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

Play with your food! Sensory play is associated with tasting of fruits and vegetables in preschool children

Helen Coulthard*, Annemarie Sealy

De Montfort University, UK

ARTICLE INFO

Article history:
Received 16 September 2016
Received in revised form
6 January 2017
Accepted 3 February 2017
Available online 12 February 2017

Keywords:
Fruit and vegetable
Sensory
Exposure
Child
Games

ABSTRACT

The objective of the current study was to ascertain whether taking part in a sensory play activity with real fruits and vegetables (FV) can encourage tasting in preschool children, compared to a non-food activity or visual exposure to the activity. Three to four year old pre-school children (N = 62) were recruited from three preschool nursery classes from a school in Northamptonshire, UK. A between participants experimental study was conducted with each class assigned to one of three conditions; sensory FV play, sensory non-food play and visual FV exposure. Parental report of several baseline variables were taken; child baseline liking of the foods used in the study, parental and child FV consumption (portions/day), child neophobia and child tactile sensitivity. Outcome measures were the number of fruits and vegetables tasted in a post experiment taste test which featured (n = 5) or did not feature (n = 3) in the task. Analyses of covariance controlling for food neophobia and baseline liking of foods, showed that after the activity children in the sensory FV play condition tried more FV than both children in the non-food sensory play task ($p < 0.001$) and children in the visual FV exposure task ($p < 0.001$). This was true not only for five foods used in the activity ($p < 0.001$), but also three foods that were not used in the activity ($p < 0.05$). Sensory play activities using fruits and vegetables may encourage FV tasting in preschool children more than non food play or visual exposure alone. Long term intervention studies need to be carried out to see if these effects can be sustained over time.

1. Introduction

Many children do not consume the recommended daily intake of fruit and vegetables (FV) which are a good source of vitamins and minerals (World Health Organisation, 2003) and have been found in multiple epidemiological studies to be associated with a lower risk of chronic health conditions (Dauchet, Amouyel, Hercberg et al., 2006). It is estimated that only 16% of pre-school children in the UK eat the recommended daily allowance of five portions of FV, (Health Survey for England, 2008) and fruits and vegetables are the most commonly rejected food groups in this age group (Cooke, Wardle, & Gibson, 2003; Russell & Worsely, 2008). Research has found that both pre-school and home environments can improve young children's FV consumption through repeated and frequent tasting known as taste exposure (Caton et al., 2012; Parmer, Salisbury-Glennon, Shannon et al., 2009; Holley, Haycraft, & Farrow, 2015). It has long been believed that tasting is the most important means to establishing FV preference, and children have to taste foods in order to make the unfamiliar familiar (Birch et al., 1987).

There is a developmental trajectory of the number of tasting occasions (exposures) needed to establish preference (Sullivan & Birch, 1994), with young infants showing a preference after fewer exposures in comparison to older children from 2 years onwards (Howard et al., 2012; Maier, Chabanet, Schaal et al., 2007; Sullivan & Birch, 1990). Child refusal of new foods however is often translated by caregivers as a genuine dislike for the foods which prevents them from carrying out the requisite number of exposures (Campbell & Crawford, 2001; Skinner et al., 2002). In addition actually getting children to taste, and therefore be exposed to, novel foods can be challenging, as young children will reject on sight rather than taste (Dovey et al., 2012). As most healthy eating interventions rely on taste exposure, coupled with other proven strategies such as modelling and rewards (Holley et al., 2015; Horne et al., 2011), it is important to strike a balance between

* Corresponding author. Division of Psychology, School of Applied Social Sciences, Faculty of Health & Life Sciences, Hawthorn Building, De Montfort University, Leicester, LE1 9BH UK.
E-mail address: hcoulthard@dmu.ac.uk (H. Coulthard).

http://dx.doi.org/10.1016/j.appet.2017.02.003
0195-6663/

encouragement to taste and prompting/pressure to eat, which can have a detrimental effect on tasting (Osborne & Forestell, 2012).

Recently it has been suggested that interventions should add an element of non-taste sensory exposure, to encourage familiarisation with the sensory properties of fruits and vegetables (Dazeley, Houston-Price, & Hill, 2012). Some intervention studies have looked at activities, that can be carried out prior to tasting, to examine whether these can encourage children to overcome their natural neophobic reaction (e.g. Witt & Dunn, 2012). Some studies have focussed on sensory education, in 'Classes de Gout' where children are educated about evaluating the sensory taste properties of food (Mustonen & Tuorila, 2010; Reverdy et al., 2008). These studies, whilst successful, have been aimed at older children who can understand the terminology and format of sensory education sessions. Recent interventions, looking at multisensory educational tasks in preschool children, such as exploring the insides of fruits, have found some increases in fruit and vegetable acceptance (Dazeley & Houston-Price, 2015; Hoppu et al., 2015). Other interventions, such as 'Color me Healthy' which have used imaginative physical games (for example pretending to climb a mountain, make a camp and then making a vegetable stew), and have been more successful in increasing consumption, perhaps because they have a greater element of fun and reward built into the intervention (Witt & Dunn, 2012). Although these intervention studies have been successful in increasing tasting and preference for foods, it is unclear what aspects of these multifaceted interventions are responsible for the observed improvements.

Some recent behavioural studies have attempted to isolate aspects of sensory exposure, and have found that children's enjoyment ratings of the feel of non-food substances (jelly and mashed potatoes; Coulthard & Thakker, 2015) and a range of food andnon-food substances (e.g. Hair gel, cookie dough, shrimp crackers, sand paper; Nederkoorn, Jansen & Havermans, 2015) is associated with lower food neophobia. Although these studies were correlational, they suggest that there is an association between enjoyment of touch and food acceptance, and both authors suggest that expected mouth-feel, the sensation of foods in the mouth, may be the reason behind this association. Some experiments looking at sensory rating of FV in school children have examined which sensory domain is the most important factor in determining food rejection and acceptance, have found developmental differences, with younger children rejecting according to visual cues and older children using olfactory cues when deciding to try or reject a novel fruit or vegetable (Dovey et al., 2012; Coulthard, Palfreyman & Morizet, 2016b). Intervention studies with visual exposure to FV using picture books, has been found to successfully increase tasting and liking of FV (Heath, Houston-Price, & Kennedy, 2011; Houston-Price, Butler, & Shiba, 2009; Osborne & Forestell, 2012).

The main purpose of the present study was to examine whether a creative multi-sensory play game using fruits and vegetables carried out prior to a tasting session, can influence tasting behaviour in young children. Children who take part in a sensory play task, where they create pictures using real FV stimuli (Sensory FV play), will be more likely to try FV afterwards, than children who take part in a sensory play task with non-food items (sensory non-food play) or watching the researcher carry out the FV play task (visual FV exposure). In addition it is expected that children in the visual exposure condition where they are exposed to real FV, will try more FV than those in a tactile non-food play condition.

2. Experimental methods

2.1. Participants

One hundred and twenty recruitment letters and questionnaire packs were distributed to all the parents of preschool children from three different classes who attended a local government-run nursery in Northamptonshire, UK. Sixty-eight parents returned the baseline questionnaires, of which six were not present on the day or were excluded as they had known food allergies. The final sample comprised sixty-two children (27 boys and 35 girls) with a mean age of 3.36 (±0.52) years. Parents' ages ranged from 22 to 45 years of age, with a mean age of 34.20 (±6.25) years. The majority of the sample (n = 61) were White-British, with the exception of one child and parent who were of Chinese origin. The study was approved by De Montfort University Ethics Committee and all parents gave their informed consent prior to data collection. A G power a priori analysis indicated that for moderate to large effect sizes, a sample of 17–40 participants in each condition was needed.

2.2. Design

The study was a cross-sectional, between-participants experimental design. The dependent variable was the number of foods tasted by the children after the experimental task. The factor was the condition the child was in (FV play task, non-food play control vs visual exposure control). Each class was randomly allocated to one condition by picking numbers from a hat. This clustered randomisation was adopted to prevent children from being exposed to the other experimental conditions. There were several covariates which were examined, including child food neophobia, parent & child FV daily portions, child tactile sensitivity and child baseline liking of experimental foods.

3. Materials and methods

3.1. Parental report measures

All parents were given a questionnaire pack, along with information about the study, a week before the experimental tasks were carried out. Children were included in the study if their parents filled in the questionnaires and gave informed consent for their child to be included.

3.1.1. Child neophobia food scale (CFNS)

The CFNS (Pliner & Hobden, 1992) adapted by Wardle, Carnell, and Cooke (2005) measures willingness to eat novel foods and is viewed as reliable and valid (Ritchey et al., 2003; Cooke et al., 2004). The scale consists of six statements, for example '*My child is afraid to try food they have never had before*' rated using a 4 point response scale from *strongly agree* (4) to *strongly disagree* (1), with overall scores ranging from 6 to 24 with a higher score indicating higher levels of food neophobia. This score was referred to as child food neophobia.

3.1.2. Tactile sensitivity (Sensory Profile)

Child's tactile sensitivity, was measured using twelve items from a subsection of Dunn's Sensory Profile (Dunn, 1997) which has been used with both non-clinical and clinical samples of children (Miller-Kuhaneck et al., 2007; Tomchek & Dunn, 2007) and in previous studies relating to food acceptance (Coulthard & Blissett, 2009). An example of a statement is, *"My child becomes irritated by shoes or socks"*. Statements were rated by parents using a 5 point Likert scale, from *always* (5) to *never* (1) with the items scored in this study so that higher scores indicated high sensitivity to tactile stimuli. Cronbach's Alpha for the scale in the current study was 0.69, which was considered acceptable.

3.1.3. Fruit & vegetable portions (child and parent)

The amount of FV consumed by parents and children was