



## Short communication

## Visual exposure impacts on toddlers' willingness to taste fruits and vegetables

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## ABSTRACT

This study explores the effects of exposure to pictures of fruits and vegetables on young children's willingness to taste the foods. The parents of 20 toddlers aged 21–24 months were asked to read a picture book about four foods with their child every day for two weeks. In a subsequent 'taste test' children displayed a neophobic pattern of behaviour towards foods to which they had not been exposed, but not towards exposed foods. Furthermore, while exposure served to decrease children's willingness to taste familiar vegetables, it increased their willingness to taste unfamiliar fruits.

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## Introduction

A variety of factors determine infants' liking of foods, including genetic predispositions to prefer sweet tastes and avoid unfamiliar foods ('food neophobia'; Rozin, 1976). Exposure to food plays an important role in determining young children's preferences; the influence of experience begins with pre-natal exposure through amniotic fluid and continues post-natally through breast milk (Mennella, Jagnow, & Beauchamp, 2001) and via the foods provided during weaning and beyond (Birch, Gunder, Grimm-Thomas, & Laing, 1998). Exposure to food has therefore been a key feature of attempts to enhance children's liking of healthy foods.

In adults, both positive and negative relationships have been reported between exposure to foods and rated liking of the foods. For example, Pliner (1982) gave participants three unfamiliar fruit juices to taste 5, 10 or 20 times and found that the number of exposures was positively related to participants' ratings of how much they liked each juice's taste. Other work has found 'satiation effects', whereby repeated taste exposures lead to dislike of the food (Pliner, Polivy, Herman, & Zakalusny, 1980). Pliner (1982) suggests that the discrepancy is due to participants' initial levels of familiarity with exposed foods; while repeated exposure to unfamiliar foods increases liking, exposure to foods that are already familiar may lead to dislike.

Research studies involving young children support the potential for exposure to enhance liking and consumption of unfamiliar and disliked foods. For example, Birch and Marlin (1982) provided two-year olds with up to 20 exposures to 5 unfamiliar cheeses (Experiment 1) or 5 unfamiliar fruits (Experiment 2) over a four-week period and in each case found children's preferences to be predicted by the number of exposures they had received to each food. In a more recent study, Maier, Chabanet, Schaal, Issanchou, and Leathwood (2007) found that after 16 presentations of an initially disliked puréed vegetable, infants of 7 months willingly consumed as much of the vegetable as they did of an initially liked vegetable. Liking of a food's texture, as well as its taste, is affected by exposure; at 12 months, infants' intake of chopped carrots is predicted by the frequency with the child has previously been provided with chopped foods (Blossfeld, Collins, Kiely, & Delahunty, 2007).

Exposure therefore appears to be a powerful and straightforward solution to the problem of encouraging healthy eating in children. However, 10–15 exposures to a new or disliked food may be required to effect positive changes in preference (Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok, & Steinberg, 1987), a number "greater than that most parents are willing or able to provide" (Birch et al., 1987, p. 177; Carruth, Ziegler, Gordon, & Barr, 2004). As a result, researchers have sought a means of exposing foods that does not require parents to engage in multiple attempts to persuade their child to taste unwanted foods. One avenue that has been explored is visual exposure. Given that brief television commercials can successfully induce brand preferences in preschoolers (Borzekowski & Robinson, 2001), it is conceivable

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that visual exposure to different foods might impact on children's liking of them.

Very little research has directly explored this question. One exception is a study by Birch et al. (1987), who compared the effects of taste exposure and visual exposure on preschoolers' liking of a set of six unfamiliar fruits. Each fruit was exposed 5, 10 or 15 times over a 30-day period; 3 of the fruits were tasted at each exposure, while 3 were presented visually for 10 s on each occasion. A few days later, children were presented with a forced-choice paired comparison task; the six exposed foods and a further unfamiliar food were presented in pairs and children were asked to "choose the one you like the best". The question was posed both before and after the pair of foods were tasted, which Birch et al. termed 'look judgments' and 'taste judgments', respectively. The number of taste exposures provided correlated with children's look and taste judgments of the foods, confirming previous reports that taste exposure enhances food liking. Birch et al. also reported a correlation between the number of visual exposures and children's look judgments, but no relationship between the number of visual exposures and their taste judgments, leading the authors to conclude that visual exposure has no impact on food liking.

However, there are grounds for calling for further research into the impact of visual exposure on food liking. First, Birch et al.'s (1987) 'look' and 'taste' judgments may not have indexed children's liking of the look and taste of the foods, respectively, because children were, in both cases, asked to "choose the one they liked the best". When foods were first presented children's choices were thought to reflect their liking of the look of the foods, but their judgments may have been influenced by their memory of the taste of the foods they had tasted before. Similarly, the selections children made after they had tasted the two foods may have been determined by their liking of the taste of the foods, but their responses may also have been influenced by the look or smell of the food. One cannot, therefore, be certain that children's liking of the look and taste of the exposed foods were tapped into by the questions asked.

It could also be argued that visual exposure would be unlikely to directly enhance liking of a food's taste, and that one should look elsewhere for evidence of a positive influence of visual exposure, such as in a greater willingness to taste an unfamiliar food. Birch et al.'s (1987) finding that visual exposure enhanced children's 'look judgments' suggests that this type of exposure may induce more positive attitudes towards exposed foods. Recent research by Houston-Price et al. (2009) shows that repeated exposure to pictures of foods in books leads toddlers to preferentially attend to exposed over non-exposed foods in a visual preference test. By enhancing children's attitudes towards the appearance of foods and/or their willingness to explore them visually, visual exposure might also reduce children's reluctance to taste previously unfamiliar foods. The potential to enhance children's willingness to taste new foods through visual exposure is, therefore, an exciting avenue of research that deserves exploration.

This article describes a preliminary investigation into the effects of exposure to pictures of familiar and unfamiliar foods on toddlers' willingness to taste them. We hypothesised that children would be more willing to taste unfamiliar foods if they were repeatedly visually exposed to these foods before they were invited to try them.

## Method

### Participants

Twenty toddlers, 10 boys and 10 girls, with a mean age of 23.2 months (range = 21.4–24.7) were recruited from the University's Child Development Group database, a list of parents who had

expressed an interest in taking part in research with their child. Parents gave informed consent to participate with their child in this study. Participants were rewarded with travel expenses and a certificate.

### Design

This study was approved by the University's Research Ethics Committee and conformed to the standards prescribed by the 1964 Declaration of Helsinki.

Parents were sent one of two books about four foods to read with their child every day for two weeks. Each book contained pictures and information about two familiar foods (one fruit, one vegetable) and two unfamiliar foods (one fruit, one vegetable). Following the exposure period, children took part in a 'taste test' in which they were offered all eight foods shown in the two books: the four vegetables followed by the four fruits. We recorded the number of foods children tasted and the order in which they did so. Note that, in this design, each food serves as an exposed food and as a non-exposed food for different children, thus controlling for any preferences for specific foods that children may have had.

### Materials

The fruits and vegetables to be included in exposure books were selected on the basis of parents' responses to a Food Familiarity Questionnaire. This is a list of 83 commonly available fruits and vegetables, which parents are asked to rate in terms of how often their child encounters each food on a 3-point scale: rarely or never (less than once per month); sometimes (less than once per week but more than once per month); or often (at least once per week). After excluding foods that could not be eaten raw, we selected as stimuli the two fruits parents rated as most familiar (grape and strawberry) and least familiar (blueberry and lychee) and the two vegetables rated most familiar (carrot and sweetcorn) and least familiar (radish and watercress).

Two books were created, each about two fruits and two vegetables, with one of each food type likely to be familiar to children and one likely to be unfamiliar (Book A: grape, blueberry, sweetcorn and radish; Book B: strawberry, lychee, carrot and watercress). Books included a page about each food, with one large photograph and several smaller photographs showing how the food grows, what it looks like inside and what the prepared food might look like, with sentences for parents to read. Books were produced in a colourful, child-friendly A4 format, laminated and bound.

The eight foods depicted in the books served as stimuli in the taste test. Foods were washed and provided either whole (radish, blueberry, and grape), cut in half (strawberry and lychee) or in pieces (sweetcorn kernels, carrot stick, and small sprig of watercress). A video camera was used to record test sessions.

### Procedure

Children were randomly assigned to receive one of the two books; 11 children received Book A and 9 received Book B. Parents were sent the relevant book and instructions to read the book with their child for 5 min every day for two weeks.

The day after the exposure period ended, parents (in all cases, mothers) and toddlers visited the University to take part in the taste test. Mothers were asked to choose one of two vegetables (cherry tomato or cucumber stick) and one of two fruits (pineapple chunk or mandarin orange segment) to eat during the taste test, to ensure that their child felt comfortable about eating. Mothers were told that a piece of the foods they had selected would be placed in the centre of each of the child's food plates and that they should

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