Enjoyment of Tactile Play Is Associated with Lower Food Neophobia in Preschool Children

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ABSTRACT
Previous research has shown that parental reports of food neophobia and tactile sensitivity are associated with lower fruit and vegetable (F/V) intake in children. This study aimed to pilot a behavioral observation measure of tactile play in young children. The primary aim of the study was to see whether children's enjoyment of tactile play was associated with higher F/V consumption, as well as lower food neophobia. Seventy 2- to 5-year-old children (37 males and 33 females) and their parents were recruited through children's centers in the Leicester region of the United Kingdom during July to October 2012. Children's engagement in two tactile play tasks using sticky foods (mashed potatoes and vegetarian gelatin) was observed and rated by both the researcher and parent. Parents were asked to complete a series of questionnaires measuring F/V consumption, food neophobia, and sensory processing. It was found that lower child food neophobia was significantly related to enjoyment of tactile play, whereas child F/V consumption was associated with parental F/V consumption, but not enjoyment of tactile play. The findings strengthen the idea that tactile processing may be associated with the acceptance of food variety, but not the total amount of F/V consumed. Additional research is indicated to determine whether tactile play tasks can be used to lower child food neophobia.
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FRUIT AND VEGETABLE (F/V) CONSUMPTION IS A preventive health behavior that is known to reduce the incidence of long-term health problems, such as cancer and chronic heart disease.[1,2] It is well accepted that young children do not readily accept new F/V after the age of 18 months,[3] and the majority of children do not eat the portions of F/V recommended by in the "5 A DAY" National Health Service scheme in the United Kingdom,[4] or the 2 to 3 cups/day recommended by the US Departments of Agriculture and Health and Human Services.[5] Previous research has identified various techniques for successfully widening the range and amount of F/V accepted by children. These have included repeated taste exposure,[6,7] associative learning,[8] modeling[9] and rewards/incentives,[10] as well as combinations of these techniques.[11] Although these techniques are known to increase food acceptance, little attention is placed on how the individual characteristics of the children involved can influence intervention outcomes.

One child characteristic that is known to be associated with lower consumption of F/V is the construct of food neophobia, defined as the reluctance to taste or try new foods.[12] The underlying rationale for individual differences in food neophobia, and its relationship with lower F/V consumption, is poorly understood. There is increasing evidence that the sensory properties of the food can influence the neophobic food response and the efficacy of F/V feeding techniques.[13-15] In particular, individuals are more likely to reject slimy, mushy foods from both animal and vegetable origins on the basis that these textures are associated with foods that are rotting or decaying.[16] In addition, more recent research has focused on characteristics of children that can influence food neophobia and F/V consumption, such as child anxiety[17] and sensory sensitivity.[18,19]

Sensory sensitivity in the tactile domain, expressed as the reluctance to have skin contact with various substances, has been associated with lower F/V consumption and higher food neophobia in preschool children,[18] suggesting that the texture of certain foods on the hands and in the mouth of the child can inhibit acceptance of those foods. One limitation in previous studies of sensory processing in children has been the failure to validate parental reports with simultaneous trained-researcher assessments. There has been a recent intervention study that has used nontaste exposure to foods across a variety of domains, such as vision, smell, and touch, that had some success in getting children to taste the exposed foods compared with a control group.[20,21] This study, however, did not look at the success of each sensory component in increasing acceptance or examine individual differences in enjoyment of sensory play at baseline. The present study aimed to focus on exposure in the tactile domain to ascertain whether simply playing with food is associated with food acceptance in children. In particular, to pilot some tactile, messy play tasks on preschool children and ascertain whether enjoyment of engaging in these tasks was associated with well-established variables of food acceptance. It was hypothesized that a high enjoyment of tactile

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play would be associated with lower food neophobia scores and a higher intake of F/V in children, even after controlling for levels of parental F/V consumption.[18,22,23]

METHODS

Participants

The participants were recruited using a convenience sampling method from three individual Sure Start Children's Centers across Leicester, UK. Inclusion criteria were that the child was between the ages of 2 and 5 years, the caregiver was the child's parent, and the child had no known allergies to foods. Ethical approval from De Montfort University Ethics Committee was obtained before participants were recruited and data collection commenced (June 2012). All parents gave written, informed consent before participation.

Measures

Demographic variables included the sex (male or female) and age of the child (continuous variable in years), parental education (continuous variable, in years), parental age (in years), parental sex (male or female), and an open-ended question about the ethnicity of the parent (later categorized as white British, South Asian, Black Caribbean, mixed heritage, and other).

Tactile Play Tasks (Mashed Potatoes Game and Gelatin [Jelly] Game). Two tactile play tasks were developed to assess the child's enjoyment of sticky, messy play. The sensory materials chosen were mushy and slimy, and would leave traces on the children's hands, as these are textures most related to food rejection.[16] Each task followed a similar narrative structure and format developed to engage and interest the child by using a small plastic toy to motivate the child. The tasks were identical in structure but comprised a different tactile substance; mashed potatoes and vegetarian gelatin (in the United Kingdom, known as "jelly").

The researcher used the following narrative for the tactile play tasks: "There is a toy soldier lost in the (mashed potatoes/jelly) and I cannot find him in there. He has been shouting for you to rescue him from the (mashed potatoes/jelly). Can you find him in the (mashed potatoes/jelly) and save him?" The child was encouraged to find a toy soldier (4×2 cm in dimension) that was hidden in the potatoes in a 17×8×4 cm bowl. The child was prompted to use his or her hands to find the toy soldier, but failure to use one's own hands was followed by the child being given the option of using a spoon. The parent was asked to watch and rate his or her child playing the game, but to remain silent and not participate, in order to not influence their child's reactions. The child's enjoyment level for each of the tactile play games was rated by both the parent and the researcher on a 5-point scale that ranged from "5, strongly agree" to "1, strongly disagree"; where a high score indicated a high level of enjoyment of tactile play. Inter-rater reliability of the evaluation of the tactile play task by the two scorers (researcher and parent) was evaluated using mean interclass correlation (ICC) analysis. The levels of absolute agreement for both the gelatin (jelly) game (ICC=0.85; $P<0.01$) and the mashed potatoes game (ICC=0.82; $P<0.01$) between the two scorers, were acceptable (ICC=0.6).[24] Therefore, the values from both the parents and the researcher's scoring of the "mashed potatoes game" and the "jelly game" were summed to create an overall score, which will be referred to as the *tactile play* score. This score ranged from 5 to 20, with a high score indicating a high level of enjoyment of tactile play.

The Child Food Neophobia Scale[22] is an adapted six-item parental response scale and was used to measure reluctance to eat new foods.[3] Each statement measures the behavioral reluctance to eat new foods; for example, "My child does not trust new foods." The four response choices for each statement ranged from "4, strongly agree" to "1, strongly disagree." Scores range from 6 to 24 with a high score on this scale indicative of higher levels of child food neophobia. The Child Food Neophobia Scale has been widely used and is known to be a reliable[22] (Cronbach's α=.84) and valid[23] measure of child food neophobia.

Portions of F/V: (Parent and Child). This scale[25] was used to measure both parental and child daily F/V portions. Parents were asked to indicate how many portions of fruit and then vegetables (excluding potato, fruit juice, dried fruit, or pulses/dried legumes) they had eaten in a typical day (or week if less than one daily portion). They then reported this for his or her child. A portion was clearly defined at the beginning of the questionnaire according to the current guidelines suggested by UK government.[4] A portion was approximately the amount a parent or child could hold in his or her hand.[4] Fruit juice, dried fruit, and pulses, although normally counted as portions, were excluded from the final score because the main focus of this study was the consumption of fresh, canned, or frozen F/V. The child F/V consumption (outcome) and the parent F/V consumption (covariate) were calculated by summing the reported daily portions of F/V. This method has been widely used[18,25] and has been validated against food diary measures.[26]

Tactile Sensitivity (Sensory Profile). The Sensory Profile is a 125-item questionnaire that is used to assess children's responses to sensory stimuli across seven sensory domains.[27] The questionnaire has good internal and external validity,[28] as well as good reliability and discriminant validity[29] in identifying children with disorders related to sensory processing difficulties, such as autistic spectrum disorders[30] and attention deficit hyperactivity disorder.[31] Eighteen items of the Sensory Profile refer to processing in the tactile domains; in the present study, we only used the 12 items identified by Dunn[27] as measuring sensitivity to tactile information. Tactile sensitivity refers to the fact that little sensory input is required to elicit detection or response by the individual. An example of a tactile sensitivity item would be, "Dislikes going barefoot on sand or grass." As this questionnaire has not been frequently used on samples in the United Kingdom, Cronbach's α was used to confirm the internal consistency of the remaining 12 items. Scores on item eight (reacts emotionally or aggressively to touch) were not strongly associated with scores on the rest of the items, resulting in a low internal consistency score (α=.56). This item was removed, with the remaining 11 items having good internal consistency (α=.75). Responses are given on a 5-point scale from "5, always"' to "1, never" with scores on the final scale ranging from 11 to 55 with a high score indicating a high level of tactile sensitivity. In addition, one item, "Avoids getting messy" was analyzed as

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