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Research report

Attentional biases towards familiar and unfamiliar foods in children. The role of food neophobia ☆

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ABSTRACT

Familiarity of food stimuli is one factor that has been proposed to explain food preferences and food neophobia in children, with some research suggesting that food neophobia (and familiarity) is at first a predominant of the visual domain. Considering visual attentional biases are a key factor implicated in a majority of fear-related phobias/anxieties, the purpose of this research was to investigate attentional biases to familiar and unfamiliar fruit and vegetables in 8 to 11 year old children with differing levels of food neophobia. To this end, 70 primary aged children completed a visual-probe task measuring attentional biases towards familiar and unfamiliar fruit/vegetables, as well as the food neophobia, general neophobia and willingness to try self-report measures. Results revealed that as an undifferentiated population all children appeared to demonstrate an attentional bias towards the unfamiliar fruit and vegetable stimuli. However, when considering food neophobia, this bias was significantly exaggerated for children self-reporting high food neophobia and negligible for children self-reporting low food neophobia. In addition, willingness to try the food stimuli was inversely correlated with attentional bias towards the unfamiliar fruits/vegetables. Our results demonstrate that visual aspects of food stimuli (e.g. familiarity) play an important role in childhood food neophobia. This study provides the first empirical test of recent theory/models of food neophobia (e.g. Brown & Harris, 2012). Findings are discussed in light of these models and related anxiety models, along with implications concerning the treatment of childhood food neophobia.

Introduction

The benefits of eating a diet rich in fruit and vegetables is well-documented (Wengreen, Madden, Aguilar, Smits, & Jones, 2013). Containing a range of vitamins, minerals, electrolytes, antioxidants etc., fruits and vegetables are nutrient dense as well as a recommended source of dietary fibre. Given this it is no wonder that across a range of countries (e.g. Canada, the UK, the United States) the recommended daily guide is to consume four to six portions of fruits and vegetables per day (Slavin & Lloyd, 2012). However, increasingly, low energy density foods such as fresh fruit and vegetables are being replaced by high fat, high sugar, snack, drink and meal products, which may lead to increased obesity and its related disorders (Kaufman, 2002). In the USA alone, it is suggested that the number of obese 6–11 year old children has increased from 7% in 1980 to nearly 18% in 2010 (Ogden, Carroll, Kit, & Flegal, 2012); and that fewer than one in five children between the ages of 4 and 13 are consuming the recommended five or more daily portions suggested (Guenther, Dodd, Reedy, & Krebs-Smith, 2006). In the UK, the Department of Health (2013) reports that almost 30% of children between the age of 2 and 15 are now obese. In a bid to understand food preferences in children a wide variety of factors have been investigated. These include, but are not limited to: i) the social–affective context the food is presented in (Birch, Zimmerman, & Hind, 1980); ii) the interaction between preference and genetic predisposition; iii) food availability and child-feeding practices (see Birch, 1999 for review); iv) the educational level of the mother (Cooke, Wardle, & Gibson, 2003); and, more recently, v) the familiarity of the food (e.g. Dovey, Staples, Gibson, & Halford, 2008; Dovey et al., 2012; Mustonen, Oerlemans, & Tuorila, 2012).

The influence of familiarity on food preference is commonly investigated through studies of 'neophobia', with Dovey et al. (2008) proposing that this factor is one of, if not the main, predictor of childhood eating behaviours. Food neophobia is defined as a personality characteristic in which foods that are uncommon or unknown to the individual are rejected or avoided on sight, i.e. before tasting (Cooke et al., 2003). Namely, those who have higher food neophobia are likely to persistently reject food items, before tasting them, as compared to others. It is suggested that food neophobia is a predominant of the visual domain, and necessarily developed to evoke rejection of a food prior to tasting it, as the latter behaviour could

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lead to poisoning (e.g. Cashdan, 1998). Thus adults and children demonstrating increased neophobia are more likely to reject food items before tasting them based on 'what they look like'. Consistent with this, Mustonen et al. (2012) have demonstrated that in 8 to 11 year old children, food neophobia predicts the number of foods tried, with children scoring low on the Food Neophobia Scale (FNS) familiar with a larger number of foods than those scoring high on this scale. Despite this, the cognitive mechanisms underlying food neophobia are not well understood. Correlations between food neophobia and a child's actual 'willingness to try' a novel food are weak (Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001) or inconsistent (Dovey et al., 2008). For instance, Dovey and Shuttleworth (2006) found that whilst food neophobia in rural children was higher than in urban children, these children were *more* willing to try unfamiliar vegetables than urban children. This perplexing paradox indicates that yet further factors are involved in food preferences and the acceptance or rejection of novel foods in their first instance.

One such factor that has received limited investigation in child food preference research is the role of visual attentional biases. Yet visual attentional biases have been observed to be related to stimulus familiarity, stimulus saliency/threat (i.e. phobias) *and* eating behaviours. For example, there is now a body of literature demonstrating that individuals with eating disorders such as anorexia and bulimia, or a proneness to obesity, show a bias towards food, body shape and weight stimuli (see Faunce, 2002 for a review; see also Castellanos et al., 2009). This is consistent with the idea that visual attentional biases are linked to motivational systems (Mogg, Bradley, Miles, & Dixon, 2004). Indeed, phobias have been linked with patterns of 'vigilance' and 'avoidance' towards threat-related stimuli (see Cisler & Koster, 2010 for review), and in adult populations research has consistently found strong associations between biases towards threatening visual stimuli (i.e. vigilance) and levels of anxiety (MacLeod, Mathews, & Tata, 1986; Mogg, Holmes, Garner, & Bradley, 2008), levels of attachment insecurity (Dewitte & De Houwer, 2008) and low self-esteem (Dandeneau, Baldwin, Baccus, Sakellaropoulo, & Pruessner, 2007). Moreover, Waters, Lipp, and Spence (2004) have found that whilst a bias to fear or phobic related stimuli is common to both adults and children in general, in anxious children this bias (or vigilance) is exaggerated. Thus there appears to be a natural bias to prioritise attention and processing resources towards threatening rather than positive or rewarding stimuli (e.g. LeDoux, 2003; Maratos, 2011; Öhman, Lundqvist, & Esteves, 2001; Simione et al., 2014).

Comparatively, Johnston, Hawley, Plewe, Elliott, and DeWitt (1990) have demonstrated that novel stimuli capture attention more readily than familiar stimuli. They suggest that vigilance to such stimuli enables rapid detection and identification of environmental change, which is of benefit to the individual. Perhaps of most relevance, however, Brown and Harris (2012) have recently proposed a model of food neophobia in early childhood in which it is the *perceptual* attributes of food stimuli that drive early food neophobic responses. They argue that these perceptual biases are innate and have developed to ensure that non-recognisable food stimuli (e.g. novel foods) are rejected to avoid unknown ingestion consequences (e.g. poisoning) prior to full cognitive understanding of disgust/contagion; the latter occurring in later childhood.

Considering the above research it is perhaps surprising that the role of perceptual attentional biases in food preferences has received limited investigation. Certainly, if food preferences are related to familiarity and neophobia, and neophobia is not only a predominant of the visual system but also a substantial predictor of childhood eating behaviours, then it seems logical that perceptual attentional biases may be implicated in childhood food preferences. In other words, high neophobic children may demonstrate a visual attentional bias, or 'vigilance', towards unfamiliar foods. Thus the aim of the present study was to explore attentional biases to familiar and unfamiliar fruits and vegetables in a child population. To do so, we used a computerised visual probe task in which participants' reaction times to probes replacing familiar or unfamiliar photographs of fruits and/or vegetables were measured. Consistent with Johnston et al. (1990) we predicted that all children would demonstrate an attentional bias towards 'novel' food stimuli i.e., the unfamiliar fruits and vegetables. However, consistent with phobic/anxiety literature (both in adults and children), we further predicted that this bias would be exaggerated in children who reported high food neophobia.

Methods

Participants

Participants were 70 children between the ages of 8 to 11 years (35 boys) recruited from two primary schools in the East Midlands of England. All participants had normal or corrected-to-normal vision and informed written consent was obtained via parental consent.

Materials

Food and general neophobia scale

The food neophobia scale (FNS) (Pliner & Hobden, 1992) is a 10-item questionnaire that measures a person's willingness to 'try' novel foods. Responses to the questions were recorded on a five-point scale.

The general neophobia scale (GNS) (Pliner & Hobden, 1992) is an 8-item questionnaire that measures a person's willingness to 'approach' novel situations. Responses to the questions were recorded on a five-point scale.

Both measures are reliable ($\alpha = 0.8$ to 0.91 for the FNS; $\alpha = 0.76$ to 0.86 for the GNS) and have been used in children as young as seven years (Koivisto & Sjoden, 1997). Although originally designed for use with adults, it has been shown that children can complete both scales if given in the form of an interview and if they are given clarification on aspects that they do not understand (Koivisto & Sjoden, 1997). On the whole, the children understood all of the questions and utilised all five points for each scale.

Fruit and vegetable stimuli

Fruit and vegetable stimuli were adapted from a stimulus set by Dovey and Shuttleworth (2006). For this study, the stimulus set was developed by showing 40 primary aged children pictures of a range of fruits/vegetables and asking them whether they knew what the fruit or vegetable was (by name). Fruit and vegetable stimuli identified by more than 80% of the children and eaten at least once were characterised as familiar and those identified by fewer than 20% were characterised as unfamiliar. In the current study this resulted in photographs of ten familiar and ten unfamiliar fruits and vegetables serving as the experimental stimuli. These were *Apple–Mango; Strawberry–Dragonfruit; Grapes–Starfruit; Grapefruit–Passion fruit; Pear–Kiwifruit; Turnip–Chowchow; Runnerbean–Okra; Courgette–Bittermelon; Carrot–Sweet Potato; Redpepper–Butternutsquash* (where the first in the pair indicates the familiar). The photographs of the stimuli were displayed as JPEG images. Jasc Paint Shop Pro 7 was used to equate the luminance, contrast and background grey (mean luminance = 14 cd/m^2) of all stimuli. All pairings were designated based on the visual similarity of the different fruit/vegetables i.e. colour and shape.

'Willingness to try' scale

'Willingness to try' the fruit and vegetable stimuli was measured on a computerised five point Likert type scale with a happy and sad face positioned at the extremities. The faces were used to signify 'I would like to try it a lot' to 'I do not want to try it at all',