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Autistic traits associated with food neophobia but not olfactory sensitivity

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ABSTRACT

Food neophobia has been shown to be associated with a range of personality traits (including anxiety, lower sensation seeking) and additionally sensory aspects of food such as taste and texture. Running parallel to that work, research has demonstrated higher incidences of food neophobia in autistic populations and separately evidence of hypersensitivity in some sensory domains. The aim of the current study was to extend our understanding by exploring whether the broader aspects of autistic traits can predict food neophobia in a non-autistic population and whether this is mediated by differences in olfactory sensitivity. In the present study, student participants (N = 50) completed questionnaires measuring their food neophobia (FNS) and preferences for foreign cuisine, autistic traits (Autistic Quotient, AQ), and then completed an olfactory threshold test for a food related odour. The findings demonstrated a positive association between food neophobia and the magnitude of autistic traits and interestingly, an inverse relation between preference for foreign cuisine and olfactory sensitivity; those individuals less inclined toward foreign cuisine had poorer sensitivity to a food related odour. Since AQ was not related to olfactory sensitivity, these findings suggest the relation between autistic traits and food neophobia is unlikely to be mediated by olfactory sensitivity. More broadly however, our sense of smell is associated with experiencing a wider diet.

1. Introduction

The reluctance to try new foods is commonly referred to as food neophobia (Birch, McPhee, Shoba, Pirok, & Steinberg, 1987) and is thought to reflect the tension in all humans of, on the one the hand, avoiding novel foods that may harm us and on the other, approaching novel foods that confer advantages of a wider diet (Pliner & Hobden, 1992). Food neophobia can be measured using instruments such as the Food Neophobia Scale (FNS, Pliner & Hobden, 1992), where individuals respond to questions on their propensity to try novel foods in different situations. Research has shown that younger children tend to be more food neophobic (Birch, 1999) and generally appears to reduce with age (Otis, 1984). Work has also found that in young children, those with psychological and behavioural problems are less likely to try novel foods (Pelchat & Pliner, 1986). Of particular interest to the present study is the influence of behavioural ridgity in restricted eating habits, which can be manifested by rituals in preparation and presentation (Jacobi, Schmitz, & Agras, 2008). These factors are also indicative to those on the Autistic spectrum, and research has shown that childhood food neophobia is higher in those populations (Bandini et al., 2010; Barnhill, Gutierrez, Marti, & Hewitson, 2015). However, what remains unclear is to what extent these sorts of traits (i.e. behavioural ridgity) relate to food neophobia in non-clinical adult populations. This is important since personality traits such as low sensation seeking (that also relate to autistic traits, Romero-Martínez, Moya-Albiol, Vinkhuyzen, & Polderman, 2015) can predict lower preference for trying new foods (Frank & van der Klaauw, 1994), hence it could be that those sorts of traits are part of a wider personality constellation of autistic related tendencies.

Food neophobia is also driven by sensory factors such as the smell, taste and texture of the food (Wildes, Zucker, & Marcus, 2012). For instance, research in adults has shown that those individuals less willing to try new foods, rated a selection of odours as less pleasant and less intense and in a measure of 'ideal' taste intensities, preferred lower levels of intensity (Frank & van der Klaauw, 1994). This suggests that there are differences in odour hedonics and sensitivity in food neophobics. Separately and apart

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from food research, olfactory abilities in autistic versus non-autistic populations have shown either impairments (Suzuki, Critchley, Rowe, Howlin, & Murphy, 2003), or no differences (Tavassoli & Baron-Cohen, 2012). Those findings are surprising as one might reason that given the evidence for hypersensitivity in other modalities (e.g. Vision: Simmons et al., 2009; Audition: Jones et al., 2009) that oversensitivity to odours would be a characteristic of autistic populations and by extension offer some evidence as to their role in the wider possible relationship between autistic traits and food neophobia. However, in both of the autistic/non-autistic lines of research, there is a mismatch between the types of olfactory tests employed and whether food related odours were utilized. For this reason, the present study used a reliable and widely used test of olfactory sensitivity (Threshold detection test) together with a test of hedonics (pleasantness) and intensity; and importantly, we used a food related odour.

In the current study, individuals completed questionnaires measuring their food neophobia (FNS) and preferences for foreign cuisine, with both measures found to correlate strongly in the original study (Pliner & Hobden, 1992). We included the latter as we are interested in differences in the sense of smell and how this relates to behavioural aspects (Autistic traits) and attitudes toward food. In contrast to the FNS, attitudes toward different types of food cuisine offers a more tangible measure of food neophobia, particularly relevant to these other characteristics.

Individuals then completed a measure on the degree to which they present autistic traits (Autistic Quotient, AQ); followed by a test of olfactory sensitivity for a food related odour. It was expected that Food neophobia and rejection (i.e. less preference) for foreign cuisine would be positively associated with AQ and we tentatively predicted that both of these would relate to increases in olfactory sensitivity.

2. Method

2.1. Participants

Fifty University students, aged between 18 and 24 (40 females) participated in the study (M = 20.4 years, SD = 4.2 years). Participants were recruited using an online system where the study was advertised as examining factors that influence our sense of smell. Participants with respiratory conditions (i.e. asthma) were advised not to take part due to possible adverse effects. All participants reported good health and free from any colds that may have affected their ability to smell. Participants gave written informed consent and the study protocol was given ethical approval from the department's ethics committee (British Psychology Society guidelines, consistent with the declaration of Helsinki).

2.2. Design

The study used a regression design exploring the following variables: Autistic Quotient (AQ), Food Neophobia Scale (FNS), Preference for Foreign Cuisine (PFC) and olfactory measures (threshold/intensity/pleasantness).

3. Materials

3.1. Food Neophobia Scale (FNS)

The FNS consisted of ten items (Pliner & Hobden, 1992). This measured the likelihood of avoiding new foods in different situations. Responses were made on a Likert scale of 1 (Strongly disagree) to 7 (Strongly agree) for all items. Half of the items were positive statements towards food such as "I am constantly sampling new and different foods." The other half consisted of negative statements towards food such as "I am afraid to eat things I have never had before." Ratings from the positive items (1, 4, 6, 9 and 10) were reversed and the sum was calculated to form FNS score. Scores can range from 10 to 70, with higher scores indicating higher food neophobia.

3.2. Preference for Foreign Cuisine (PFC)

Following the FNS were three additional questions that asked how often they ate foods from different countries (Chinese, Italian and Indian food). The questions were adapted from Pliner and Hobden (1992) and were found by those authors to correlate strongly with the FNS. The three cuisines were chosen as they are the most common foreign cuisine consumed in the UK. The question was "How often do you eat 'nnn' food?", where 'nnn' was replaced with the relevant cuisine (Chinese/Italian/Indian, fixed order). Responses were made on a scale of 1 (never) to 7 (frequently). All ratings were reversed individually before summing the score, so that a high score showed that they consumed food from those cuisines less often; This scoring facilitated the comparison with other factors and in particular with the FNS. The scores on this scale can range from 3 to 21.

3.3. Autistic Quotient (AQ)

The AQ used was the original version for aged 16 + devised by Baron-Cohen, Wheelwright, Skinner, Martin, and Clubley (2001) which is used to measure the level of autistic tendencies. It consisted of 50 questions made up of 10 questions covering 5 different areas: social skill (e.g. "I find social skills easy" – reversal scored), attention switching (for example "I frequently get so strongly absorbed in one thing that I lose sight of other things"), attention to detail (e.g. "I tend to notice things that others do not"), communication (e.g. "I enjoy social chit chat" – reversal scored) and imagination (for example "I find making up stories easy" – reversal item). The responses for all questions were: definitely agree, slightly agree, slightly disagree and definitely disagree, 1 point was scored when the response was either definitely/slightly in the autistic behaviour items. Any other responses were scored 0. The sum of this score was the final AQ score. The scores can range from 0 to 50. A high score represents a high number of autistic tendencies.

3.4. Olfactory threshold test

The odour used for the threshold test was a sweet smelling chocolate odourant (Code 0679, Anglo brands, UK) used in previous work (Stafford & Whittle, 2015) which was diluted in propylene glycol (Fisher Scientific, UK). The odourant was prepared using sixteen 250 ml squeeze bottles, in 16 dilution steps, starting at 0.125% (Step 1) with each successive step diluted by a factor of two using serial dilution to the lowest (Step 16) dilution. In addition to the odour containing bottles, for each dilution step, two 'blank' squeeze bottles (containing dilutant only) were used in the threshold test. Testing commenced by asking participants to smell the bottle with the highest concentration to familiarise themselves with the target odour. They were then presented with the triplet containing the weakest concentration. Following presentation of the last bottle of the triplet (counterbalanced), participants were asked which bottle contained the odour (1, 2 or 3). If the participant answered correctly (and it was the lowest concentration), they were presented with the same triplet again (in a different order) and the task repeated until they made a mistake, which resulted in the triplet containing the next concentration step being presented. Using a single up-down staircase system, this was then repeated