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Research report

Food neophobia and its relation with olfactory ability in common odour identification ☆

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ABSTRACT

Food neophobia is strictly connected with many different aspects of human feeding, ranging from food preferences to food choice, from active chemosensory exploration of the world (sniffing and tasting) to physiological responses associated with alertness. Therefore in this study, we tested the ability of 167 participants (54 women and 113 men, aged between 20 and 59 years old) to correctly identify 36 common odours, and we verified whether such ability could be related to their level of neophobia toward food and to demographic parameters (i.e., age, gender, and smoking habits). In the analyses, an advantage in odour identification abilities for non-neophobic people over more-neophobic participants was observed. As for participants' demographic information, a smaller reluctance to try new food in older than younger people was highlighted. The results of the present study suggest a connection between the attitude toward the exploration of the chemosensory environment and the ability to identify odours.

Introduction

In the last two decades, food neophobia, that is the reluctance to try unknown foods, has been extensively investigated by taking into account a number of different personal factors going from personality traits to perceptual sensitivity (for a recent review, see Dovey, Staples, Gibson, & Halford, 2008). What appears to be consistently proven so far is that the richer a person' alimentary world is, the higher will be her/his willingness to consume new food (Birch, Gunder, & Grimm-Thomas, 1998; Pliner, Pelchat, & Grabski, 1993).

In adults, diet variety plays a significant impact, as demonstrated by the negative correlation observed in groups of young adults between the levels of food neophobia and the levels of both education and socio-economical status (Flight, Leppard, & Cox, 2003; Meiselman, King, & Gillette, 2010). This effect appears to be directly related to the frequency with which one person experiences different kinds of foods during everyday life (Knaapila et al., 2011). In particular, an increase in the exposure to new food has been proven to reduce general food neophobia levels (Birch et al., 1998; Pliner et al., 1993).

In addition to the role of frequency of food exposure in the development of food neophobia, a reduction in the hedonic value of food has been revealed to be tightly associated with high reluctance to try new foods (Frank & van der Klaauw, 1994; Tuorila & Mustonen, 2010). The decreased pleasantness produced by the experience with food, described by Frank and van der Klaauw (1994), turns into a reduction of the exploratory behaviour of the olfactory environment, as reported by Raudenbush, Schroth, Reilley, and Frank (1998). More specifically, neophobic people reveal to use a smaller sniff magnitude than non-neophobics, and this is interpreted as an index of an attempt made by neophobics to avoid any possible bad odour-related experiences (Prescott, Burns, & Frank, 2010).

In the literature about human chemosensory abilities, it is well established that active exploration of the olfactory world through sniffing is a key factor for odour detection. Frasnelli and colleagues for instance, observed that the ability to localise a pure odourant (that is an odour that does not stimulate the trigeminal system, such as the rose-like odour of phenyl ethyl alcohol) by discriminating the stimulated nostril (right vs. left) varies as a function of the stimulus being actively sniffed or passively perceived (i.e., mechanically delivered into the nostrils; Frasnelli, Charbonneau, Collignon, & Lepore, 2009). Tourbier and Doty (2007), instead, demonstrated that sniff magnitude correlates with human

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olfactory abilities as measured by the University of Pennsylvania Smell Identification Test (UPSIT; Doty, Shaman, & Dann, 1984), with participants with a sense of smell in the normal range showing smaller magnitude sniffs than anosmic participants. In addition interestingly, these authors highlighted that sniff magnitude ratio is strongly modulated by the hedonic value of the perceived odour (i.e., it decreases when malodour rather than a pleasant odour is used; see also Djordjevic et al., 2008), suggesting a possible important role of expectancy in olfactory behaviour that would be mediated by the hedonic dimension of odours.

Odour identification is another olfactory ability known to be positively linked to the degree of experience one person has of the olfactory world (Lehrner & Walla, 2002; see also Cain et al., 1995; de Wick & Cain, 1994; Lehrner, Glück, & Laska, 1999). Therefore, it is possible to hypothesise that the scant exploratory behaviour described in food neophobics could also affect the ability of finding the right name for an odour. Given the great importance of the exploratory behaviour highlighted so far in different aspects of human chemosensation and feeding behaviour (i.e., olfactory perception, food preferences, etc.), we sought to establish whether a connection does indeed exist between the personal attitude toward unknown food (i.e., neophobia) and the ability to name common odours. This would represent an important point in the field of sensory sciences, which always try and pinpoint more effective ways both to identify valuable candidates to be involved in the panel groups for food tasting activities, and to discriminate between people in order to forecast as much as possible consumers' behaviour and preferences.

Unlike what is usually done to test olfactory abilities (i.e., the use of diagnostic tests like for instance the UPSIT; Doty et al., 1984), we decided to use a commercially-available set of familiar odours related to the food world. In particular, we asked a number of participants to sniff and then try and indentify 36 odours, and their performances were then analysed as a function of their neophobic profile. Additionally, results were also analysed as a function of a number of different demographic parameters (e.g., age, gender, etc.) as previous research demonstrated their relation with chemosensory awareness and performance (Demattè et al., 2011).

Methods

Participants

One-hundred and seventy-one adults (117 men and 54 women), aged between 20 and 59 years old, took part in this study. Sixty-eight participants were recruited among Fondazione Edmund Mach (FEM, Italy) employees, which is a non-profit organisation involved in education, research, services, and technology transfer in the fields of environment, agriculture, and nutrition. The remainders were students of the Viticulture and Oenology degree course of the University of Trento who were attending the Sensory Analysis class over three different academic years. Demographic data were collected through a general questionnaire consisting of questions about the participants' age, gender, and smoking habits.

Food Neophobia Scale

Information about their willingness to try unfamiliar foods was gathered by using the Food Neophobia Scale questionnaire (FNS; see Pliner & Hobden, 1992; see also Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001), conveniently translated in Italian. In the questionnaire, participants express on a response scale the degree of agreement with a series of positive and negative statements about their general attitude toward novel food. In the present study a nine-point scale (ranging from 1 = totally disagree to 9 = totally agree) rather than the original seven-point scale was used, in order to be consistent with other questionnaires usually used in the laboratory (see Demattè et al., 2011; cf. Meiselman et al., 2010; see also Cook & Beckman, 2009). Therefore, the theoretical range of the translated scale was between 10 and 90.

Odour Identification Test

As for the evaluation of olfactory identification ability, 36 familiar odours taken from the "Nez du Vin" master kit (a commercially available set of 54 stimuli frequently used for wine-experts training; see McMahon & Scadding, 1996) were presented to the participants. The stimuli were selected as a function of previous experience made in our laboratory where they are routinely and successfully used during training of oenology students. The selected odours have a link with food and beverages and are characterised by different levels of familiarity. The odour stimuli were prepared by dropping three drops of odourant (about 0.15 ml) on cotton wool put into 40 ml amber glass vials closed by a screw cap. Odours belonged to the categories of fruit (banana, lemon, strawberry, orange, pineapple, melon, almond, raspberry, peach, pear, apple, blackberry, apricot, cherry, and blueberry), vegetables (mushroom, cut hay, and green pepper), flowers (honey, violet, rose, linden, hawthorn, and acacia), spices (liquorice, cinnamon, clove, pepper, vanilla, thyme, and saffron), roasted odours (smoke, caramel, roasted hazelnut, and toast), and animals (butter). Glass vials were labelled with a random three-digit code.

Procedure

On the first experimental day, the participants were presented with the socio-demographic questionnaire and the FNS questionnaire appearing on a computer screen placed inside one of twelve individual testing booths of the Sensory Analysis Laboratory. Participants were instructed to carefully read the instructions and to answer to each question by using the mouse.

The odour identification task started immediately after the FNS questionnaire was completed and it was organised in different sessions with a frequency of one test per week. In 2008 and 2009, students performed a nine-odour identification per session (resulting in a total of four testing sessions), whilst 2010 students and FEM employees made 12 identifications per session (resulting in three testing sessions in total). Each odour target was presented once and a total of 36 responses were collected for each participant. Order of odour presentation within each session varied across years with the constraint of keeping constant targets identification probability for each session, in order to avoid having particularly difficult or easy testing days. This was achieved by organising the target odours to be identified in every session by taking into account each odours identification average over the years. Each test lasted for about 20 min. Instructions presentation and data collection were entirely computerised and managed by FIZZ software (Biosystèmes, Couternon, France). The glass vials were arranged in plastic racks that kept them standing in the correct order (for further details, see Demattè et al., 2011) and were presented in a balanced order to each participant.

On each trial, the participant was instructed to pick from the rack the target stimulus as indicated by a code appearing on the screen. Then, he/she unscrewed the lid, smelt the content of the vial for 2–3 s, and closed the lid again. This operation could be repeated for as many times as the participant wanted. The task consisted in sniffing and then trying and identifying each odour presented in the vial by either selecting a name from a 90-label list (arranged in categories, such as "fruit", "vegetables", etc.) presented on the screen or by manually entering a different label by means of a virtual keyboard. The list also included responses such