



Research report

Impact of a non-attentively perceived odour on subsequent food choices[☆]M. Gaillet-Torrent, C. Sulmont-Rossé, S. Issanchou, C. Chabanet, S. Chambaron^{*}

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ABSTRACT

Current research in psychology suggests that unconscious processes influence a significant proportion of choices and decisions. To study the impact of a non-attentively perceived odour on food choices, we used a priming paradigm. We had previously shown that non-attentively perceived fruity odours could impact food choice intentions (on a menu card), guiding participants toward items containing more fruit and/or vegetables. The present study was designed to extend these findings, in a real-life consumption setting. One hundred and fifteen participants took part in this study, and were assigned randomly to either a control or a scented condition. On arrival in the laboratory, they were seated in a waiting room. For the scented condition, they were unobtrusively exposed to a pear odour, while under the control condition the waiting room was non-odourised. Following this waiting period, all participants moved into a non-odourised test room where they were asked to choose, from dishes served buffet-style, the starter, main course and dessert that they would actually eat for lunch. The results showed that participants subjected to the scented condition chose to consume the 'fruity' dessert (compote) more frequently than those who had waited under the control condition, who chose more frequently the dessert without fruit (brownie). In line with the findings of our previous study, these results confirm the idea of priming effects 'specific to the food cue'. To conclude, a non-attentively perceived fruity odour was shown to influence actual food choices, guiding individuals towards more fruity desserts. The involvement of implicit processes in food choices should be taken into account in guidelines and strategies designed to promote healthy eating.

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Introduction

Although it was initially thought that individuals were entirely conscious of the motivations driving their behaviours and choices, current research in psychology and economics suggests that people are not as rational as they imagine (De Martino, Kumaran, Seymour, & Dolan, 2006; Friese, Hofmann, & Wanke, 2008; Friese, Waenke, & Plessner, 2006; Kahneman & Tversky, 2000). Moreover, a large number of studies in psychology have demonstrated the influence of non-conscious processes on human feelings, behaviour

and decision-making (Bargh & Chartrand, 1999; Bargh & Ferguson, 2000; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Greenwald & Banaji, 1995). Eating behaviour does not escape from this rule. In fact, this idea was echoed in three recent publications. In the first, published in 2007, Wansink and Sobal estimated that people make a large number of food-related decisions every day. It is easy to imagine that weighing up the pros and cons of all these decisions might be almost impossible. The authors thus pointed out that: "First, we are aware of only a fraction of the food decisions we make. Second, we are either unaware of how our environment influences these decisions or we are unwilling to acknowledge it." (Wansink & Sobal, 2007, pp. 106). A year later, Finlayson and collaborators stressed the fact that "it cannot be claimed that processes that control the expression of eating habits are necessarily explicit" (Finlayson, King, & Blundell, 2008, pp. 120). These biopsychologists emphasised the point that obviously, a person cannot be aware of the biological changes that operate to control eating behaviours (changes in neuropeptides, hormones or other physiological processes). Even so, from a psychological point of view, the authors assumed that both explicit and implicit processes are

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involved. Finally, Köster resumed and expanded this last idea in a comprehensive review published in 2009. According to him, “findings about intuitive reasoning and the clear demonstration of the unconscious nature of most of our decision making do not seem to have touched sensory and consumer research, although they probably play a more important role in food-related behaviour than anywhere else” (Köster, 2009, pp. 70).

Therefore, understanding the impact of non-attentively perceived food cues involved in eating behaviour appears to require the contribution of psychology and cognitive sciences, domains in which several paradigms have been developed in order to explore non-conscious influences. One of these paradigms is called ‘priming’. In the priming paradigm, subjects are exposed incidentally to a stimulus called a ‘prime’, which may belong to any sensory modality (visual, auditory, olfactory, etc.). During this exposure, mental representations related to the prime are activated. The principle is then to use indirect tests, in order to evaluate the non-conscious effects of activating these mental representations. To date, very few studies have used the priming paradigm to investigate the role of olfactory cues in the food domain (Coelho, Polivy, Herman, & Pliner, 2009; Fedoroff, Polivy, & Herman, 2003).

However, the olfactory modality is evolutionarily and functionally closely linked to food (Hoover, 2010). Several studies have demonstrated the effects of odours on physiological (e.g. salivation) or psychological (e.g. disinhibited eating) parameters related to eating behaviours (Jansen & van den Hout, 1991; Klajner, Herman, Polivy, & Chhabra, 1981; Legoff & Spigelman, 1987; Rogers & Hill, 1989). Moreover, although the olfactory modality has long been considered as a ‘secondary’ sense in humans, food odours seem to form a category of particular importance: we are indeed more efficient to identify food odours than non-food odours (Boesveldt, Frasnelli, Gordon, & Lundstrom, 2010; Fusari & Ballesteros, 2008). Olfaction presents number of unique features compared to other sensory modalities. It is the only sensory modality that plays a significant role both: (1) as a distal cue, when perceived orthonasally (ambient odour or odour released by a food before consumption); (2) as a proximal cue, when perceived retronasally (aroma of a consumed food). Moreover, olfaction is closely linked to emotions (Bensafi et al., 2002a,b; Royet et al., 2000; Zald, Lee, Fluegel, & Pardo 1998; Zald & Pardo, 1997) that play an important role in eating behaviours (Jacquier, Bonthoux, Baciú, & Ruffieux, 2012).

In our first study (Gaillet, Sulmont-Rossé, Issanchou, Chabanet, & Chambaron, 2013), we investigated the effect of an olfactory food cue on choice intentions. The participants were seated in a waiting room of the laboratory, which was odourised with a melon odour or a pear odour, or was non-odourised in the control condition. All the participants then moved to a non-odourised test room where they performed a lexical decision task. During this task, they had to decide as quickly and as accurately as possible whether a letter string shown on a computer screen corresponded to an existing word or to a ‘non-word’ (i.e. a letter string with no meaning). The task comprised non-words, non-food related words, high-energy food words and fruit or vegetable-related words. The participants were then given a menu and asked to select one item from ten for each course in a typical French meal (starter, main course and dessert). Among the ten choices per course category, five items corresponded to foods containing fruit and/or vegetables and five items without fruit or vegetable. The results showed that participants exposed to the melon odour displayed shorter reaction times in the lexical decision task for the word ‘melon’ only, and tended to choose more starters containing vegetables than participants subjected to the control condition. Moreover, participants exposed to the pear odour chose significantly more desserts containing fruit than control participants. This first study led to two main conclusions: (1) a non-attentively perceived fruity odour could activate mental representations closely related to the prime, and have an

impact on food choice intentions (on a menu card), guiding participants towards more ‘fruit and vegetable’-related items; (2) the incidental exposure to the odour of melon or pear could activate a concept of ‘fruit and vegetables’ together with the more specific concept of the context of consumption (starter for the melon, which is a fruit mainly consumed as a starter in France, and dessert for the pear). These results highlighted the non-conscious influence that olfactory cues can have on thinking and ‘intending’ and illustrated the existence of an indirect link between perception and ‘intention’. The next step was therefore to demonstrate the influence that an incidental olfactory cue could have on action and not just on intention, namely in a real-life consumption setting (i.e. during a lunch). Based on the results of our first study (Gaillet et al., 2013), we hypothesised that the incidental exposure to the pear odour would impact choices for the desserts, guiding participants toward more ‘fruity’ desserts, but would not impact choices for the other dishes (starter, main course).

Materials and methods

Participants

One hundred and fifteen participants took part in the priming experiment, and were assigned randomly to either a control (18–50 years old; mean age = 25 years; 16 males and 42 females) or scented condition (18–52 years old; mean age = 27 years; 15 males and 42 females). To participate in the study, candidates had to fulfil a recruitment questionnaire. Candidates who declared having food allergies or being on a diet were excluded, just as those who had already taken part in a memory or priming study. Moreover, candidates who explicitly reported having some trouble in odour perception (anosmia) or vision (blindness, cataract) were also excluded. In order to ensure that the participants were unaware of the real purpose of the experiment (i.e. the study of olfactory priming), they were told that the experiment was designed to study communication skills and how people interact in the environment where they eat (i.e. false pretence). They were invited for a 1-h session during lunch-time (i.e. from 12:15 to 13:15). They were asked not to wear perfume, and not to smoke during the hour preceding the session. The experimental protocol was approved by the *Comité de la Protection des Personnes Est 1* (Research Ethics Committee) for Dijon. In accordance with the procedures of this regulatory body, the participants received written and oral information about the study before signing a consent form. In return for their participation, they received a €10 voucher.

The choice of the olfactory prime and the characteristics of the dishes proposed for the *Menu task* were investigated in separate studies that are detailed in the following two sections. The participants of these preliminary experiments were different from those involved in the priming experiment, but shared similar characteristics.

Olfactory priming

The pear food aroma sold by Meilleur du Chef® was selected on the basis of our first priming study (Gaillet et al., 2013), in which participants exposed to this odour chose significantly more ‘fruity’ desserts on a menu card. In a separate experiment, 23 individuals were asked to score pleasantness and fruit typicality of this pear odour on 10 cm scales. They were also asked to identify this odour by means of a 4-alternative forced-choice identification task. According to the results, this pear odour was rated as and pleasant ($M = 7.8$; $SE = 0.43$) and being typical of the fruit category ($M = 7.1$; $SE = 0.63$). 76% of the participants of this preliminary experiment correctly identified the odour of pear.

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