Physiology & Behavior 136 (2014) 128–134

Contents lists available at ScienceDirect

Physiology & Behavior

journal homepage: www.elsevier.com/locate/phb

Psychobiological examination of liking and wanting for fat and sweet taste in trait binge eating females

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HIGHLIGHTS

- Evidence examining the role of liking and wanting as features of 'trait binge eating'
- Trait binge eating is associated with adiposity and risk of weight gain in females.
- Wanting predicts choice and intake of snack food in lab and free-living settings.
- Wanting sweet/fat food is enhanced in fasted and fed states in trait binge eating women.

ARTICLE INFO

Article history:
Received 22 December 2013
Received in revised form 3 March 2014
Accepted 16 March 2014
Available online 22 March 2014

Keywords:
Liking
Wanting
Binge eating
Sweet-fat food
Reward
Psychology

ABSTRACT

The hedonic value of food has been conceptualised as a combination of how much a food is liked and how much a food is wanted in a given moment. These psychobiological constructs help to explain choices about which foods to eat and have a primary role in how much energy is consumed. Moreover the processes of liking and wanting for food are not always equivalent and may differ by degree according to the food in question, state of satiety, body composition and individual differences in dispositional eating behaviour traits. Here we report progress on the behavioural quantification of food hedonics in the laboratory setting through assessment of 'explicit liking' and 'implicit wanting' according to perceived fat content and/or sweet taste of common foods. We review recent experimental evidence examining the role of liking and wanting as features of 'trait binge eating' (assessed using the Binge Eating Scale)—a non-clinical psychometric marker for susceptibility to overeating and increased risk of weight gain. Our data show that trait binge eating can be viewed as an ecologically valid, behavioural phenotype of obesity, characterised by reliable psychological and anthropometric characteristics. Enhanced implicit wanting for sweet foods with high fat content is a psychobiological feature of susceptibility to overeating and offers a potential target for improving appetite control.

1. Introduction

In the current obesogenic environment becoming overweight has been described as a 'normative response', in which the homeostatic regulation of energy is challenged by environmental pressures to overeat, coupled with a permissive psychobiological system of appetite control [1]. The quantitative aspects of eating behaviour (how much to eat) reflect a general motivational drive and inhibition of drive to eat conceptualised by the strength and duration of satiation and satiety [2,3]. The qualitative aspects of eating behaviour (what to eat) largely depend on the direction of food preferences, driven by the motivation and experience of pleasure obtained from food (wanting and liking for food). This distinction between drive and direction is often framed in terms of homeostatic and hedonic systems for the control of appetite and food intake [4]. In recent years, hedonic influences on appetite control have increasingly been the focus in eating behaviour research compared to homeostatic mechanisms. Hedonic-driven eating may be characterised by instances where liking and wanting components of food reward become enhanced, attenuated or even dissociated to contribute to certain phenotypes of obesity and eating pathology [5]. While all instances of overeating cannot be explained by dysregulated food reward, by examining hedonic risk factors we are able to explore subtypes that exist within both lean and overweight or obese populations with implications for improved appetite control and prevention and treatment of obesity. The aims of this paper are to report progress on the experimental study and quantification of food hedonics in the laboratory setting through assessment of 'explicit liking' and 'implicit wanting' according to perceived fat content and sweet taste; and secondly to review recent experimental evidence from our laboratory linking these liking and wanting components to 'trait binge eating' a psychometric risk factor for overeating and weight gain.

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http://dx.doi.org/10.1016/j.physbeh.2014.03.019
0031-9384/

1.1. Liking and wanting as psychological components of reward

Recently progress has been achieved in conceptualising the hedonic response to food and how separate psychological components of liking and wanting could feature in the susceptibility to overeating [5,6]. To this end, the terms 'explicit liking' and 'explicit wanting' can be discussed in relation to subjective states and cognitions that correspond to the everyday understanding of these terms. Similar to the neural substrates of reward identified in behavioural neuroscience [7], liking and wanting as psychological constructs are logically distinct from one another. However, it is important to make a further distinction between the neural correlates of reward, and liking and wanting as psychological constructs, as one cannot infer that the latter are an interpretative readout of the former. The link between subjective and behavioural forms of liking and wanting, and their neural underpinnings are not well understood and will certainly involve the recruitment of additional brain areas that are related to cognitive evaluations and conscious experience [8,9]. Therefore the conceptualisation of liking and wanting as psychological constructs differs from their conceptualisation in behavioural neuroscience.

Specifically, liking is typically understood as the perceived or expected pleasure-giving value of a food, the appreciation of its sensory properties or a judgement of the degree of pleasure it elicits. In this context, liking for food appears to be a relatively enduring trait in an individual, that varies only slightly under specific circumstances. For instance, research has demonstrated that liking for food is greater when individuals are in a fasted compared to a fed state [10] and liking for a recently eaten food has been shown to decrease in a manner consistent with sensory specific satiation [11]. To this end, liking is thought to be more important in determining the range of foods eaten [12] and in establishing the motivational value of food [10,13]. Conversely, wanting refers to the attraction that is triggered by the perception of a food or a food-related cue in the environment. Importantly, rather than being a constant motivational drive, like hunger, the wanting component of reward implies a target with a direction that may vary depending on a number of factors, including appetitive state, time of day and the degree of attentional resources available. Therefore, the level of wanting for food is created new on each encounter with it or its associated cues. Further to this, research suggests that the target of wanting can vary from being relatively broad to becoming more focussed. For example, previous research has demonstrated, independent of BMI, that in a fasted state individuals have increased wanting for food in general [14–17]. Furthermore, there is some evidence that suggests that wanting may become focussed (and at times dissociated from liking) under certain conditions in which one food is wanted to a greater extent over available alternatives, such as when individuals are in a state of macronutrient imbalance [18] or in those who exhibit certain disordered eating patterns [19,20].

The subjective sensations of liking and wanting often overlap and are therefore subject to interference or misinterpretation. For this reason, their relationship with behaviour is often difficult to discern [9,21,22]. However, not all behaviour is under conscious control and liking and wanting responses to food are thought to have both an explicit and an implicit element. For example, while people tend to be very good at estimating how much they like a food, they often find it more difficult to introspect on their wanting for food (i.e. why they are drawn to one food over another). Therefore, the psychological components of reward have been proposed to operate at implicit (automatic, unconscious) and explicit (subjective, conscious) levels and may bear some relation to dual process models of motivation [23–25].

It is logical that the overall reward experience involves a combination of liking and wanting and that both processes contribute to eating behaviour. For this reason we would hypothesise that subjective and behavioural measures of liking and wanting will frequently be interrelated. Therefore, by measuring these components separately it is possible to learn under which circumstances they may differ by degree, or even become dissociated, which helps to elucidate their role in susceptibility to overeating and weight gain. For measures of liking and wanting to be plausible, they should incorporate the ability to not only reflect distinct components of reward, but also prevent confounding of one component with another in order to allow for the detection of dissociations. The Leeds Food Preference Questionnaire (LFPQ) has been developed and refined over a number of years and is our preferred procedure to simultaneously measure explicit liking and implicit wanting components of reward according to pre-determined dimensions of food [19,23].

1.2. The Leeds food preference questionnaire

The LFPQ provides measures of different components of food preference and food reward. Participants are presented with an array of pictures of individual food items common in the diet. Foods in the array are chosen by the experimenter from a pre-validated database to be either predominantly high (>50% energy) or low (<20% energy) in fat but similar in familiarity, protein content, sweet or non-sweet taste and palatability. Each food category is represented by four photographs of familiar, ready-to-eat foods. Typical foods used in the task are listed in Table 1. The LFPQ has been deployed in a wide range of published research [11,18,26,27]. Responses are recorded and used to compute mean scores for high fat, low fat, sweet or savoury food types (and different fat-taste combinations). Alternatively mean low fat scores can be subtracted from the mean for high fat scores to provide an 'Appeal Bias' for high fat versus low fat food for each outcome [28]. In instances where participants report low acceptance of the foods in the array (determined during screening) there are additional images with similar nutritional and sensory properties for each category that can be substituted.

1.3. Implicit wanting and food preference

Implicit Wanting and Food Preference are assessed using a forced choice methodology in which the food images are paired so that every image from each of the four food types is compared to every other type over 96 trials (food pairs). Participants are instructed to respond as quickly and accurately as they can to indicate the food they want to eat the most at that time (*Which food do you most want to eat now?*). The parameters are set as 96 randomised food pair trials presented in three blocks, with each stimulus appearing 8 times. Stimuli are presented until a valid response is detected up to a maximum of 4000 ms with a variable 500–2000 ms washout between presentations in which a central fixation cross is displayed. To measure 'implicit wanting' (see Fig. 1), reaction times for all responses are covertly recorded and used to compute mean response times for each food type [10,26]. Since these early studies, the psychometric properties of the implicit wanting measure have been improved with the 'D-score' algorithm adapted from Greenwald et al. [29] to adjust for overall variability in reaction time (**Formula 1**) e.g. [11,18], and most recently with the 'Frequency-weighted' algorithm developed with colleagues at the National Institute of Diabetes and Digestive and Kidney Disorders (NIDDK) to account for both the speed and frequency with which a food category is both

Table 1
Typical photographic food stimuli used in the Leeds Food Preference Questionnaire to assess explicit liking, explicit wanting and implicit wanting.

Savoury		Sweet	
High fat	Low fat	High fat	Low fat
Garlic bread	Salad	Jam biscuits	Apples
Chips	Bread roll	Doughnuts	Strawberries
Fries	Vegetable rice	Chocolate biscuits	Candies
Peanuts	Boiled potatoes	Chocolate	Marshmallows