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Research report

Negative affect-induced food intake in non-dieting women is reward driven and associated with restrained–disinhibited eating subtype

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ABSTRACT

In humans the presence of negative affect is thought to promote food intake, although widespread variability surrounds this issue. Susceptibility to negative affect-induced eating may depend on trait eating behaviours, notably 'emotional eating', 'restrained eating' and 'disinhibited eating', but the evidence is not consistent. In the present study, 30 non-obese, non-dieting women were given access to palatable food while in a state of negative or neutral affect, induced by a validated autobiographical recall technique. As predicted, food intake was higher in the presence of negative affect; however, this effect was moderated by the pattern of eating behaviour traits and enhanced wanting for the test food. Specifically, high restraint and high disinhibition in combination with higher scores on emotional eating and food wanting was able to predict negative-affect intake (adjusted $R^2 = .61$), suggesting that individuals who are both restrained and vulnerable to disinhibited eating are particularly susceptible to negative-affect food intake via stimulation of food wanting. Identification of traits that predispose individuals to overconsume and a more detailed understanding of the specific behaviours driving such overconsumption may help to optimise strategies to prevent weight gain.

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Introduction

Human eating behaviour is susceptible to influence from a range of factors independent of hunger or energy need that pose a risk for overconsumption and overweight. One such factor is the acute presence of negative affect (Canetti, Bachar, & Berry, 2002; Greeno & Wing, 1994; Macht, 2008), a term which refers to the spectrum of negative emotions including anxiety, sadness, anger, guilt etc. In animals, aversive states result in decreased intake (Krebs, Macht, Weyers, Weijers, & Janke, 1996), suggesting that this may be a biologically adaptive response (Lima, 1987). However, in the context of human eating behaviour, while suppression of appetite in response to negative affect has been observed (Macht, Roth, & Ellgring, 2002), especially in free-living individuals (Tomiyama, Mann, & Comer, 2009), a more commonly reported reaction to negative affect is increased consumption, or 'emotional eating' (Epel, Lapidus, McEwen, & Brownell, 2001; Greeno & Wing, 1994). It has been observed in older adults (Cuijpers, Steunenberg, & Van Straten, 2007), adolescents (Downs, DiNallo, Savage, & Davison, 2007) and even children (van Strien & Bazelier, 2007).

Negative affect-induced eating may be a risk factor for overweight due to its potential to override satiety, or the energy-dense characteristics of the foods that tend to be chosen (Canetti et al., 2002; Macht, 1999), which are often high in sugar and fat (Anton & Miller, 2005; Cuijpers et al., 2007; Elfhag, Tynelius, & Rasmussen, 2007; Nguyen-Michel, Unger, & Spruijt-Metz, 2007). Such foods often produce a caloric surplus or 'passive overconsumption' (Viskaal-van Dongen, de Graaf, Siebelink, & Kok, 2009) that may lead to weight gain (Blundell, Burley, Cotton, & Lawton, 1993). In accordance with this, a relationship between negative affect-induced overconsumption and elevated BMI has frequently been reported (Blair, Lewis, & Booth, 1990; Chua, Touyz, & Hill, 2004; Geliebter & Aversa, 2003; Lowe & Fisher, 1983).

Consequently, the traits that lead individuals to eat during a negative affective state are of concern. However, the evidence behind particular trait eating behaviours and negative affect eating is unclear. The trait of emotional eating, identified on a subscale of the Dutch Eating Behavior Questionnaire (DEBQ) (van Strien, Frijters, Bergers, & Defares, 1986), is defined as the tendency to eat in response to feelings rather than hunger (van Strien, Frijters, Bergers, et al., 1986). Emotional eating has previously been associated with eating after experimentally induced negative affect (Goossens, Braet, Van Vlierberghe, & Mels, 2009; Wallis & Hetherington, 2009). Perhaps the most commonly investigated trait for risk of eating in response to negative affect, however, is dietary restraint (Greeno & Wing, 1994). Restraint theorists

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postulate that the food intake of restrained eaters is kept under strict cognitive control which is liable to break down when overwhelmed by strong emotion (Herman & Mack, 1975; Herman & Polivy, 1975). In this situation restrained eaters abandon control and proceed to overconsume. In line with this theory, restrained eating has been associated with negative affect-induced eating in a number of contexts (Cools, Schotte, & McNally, 1992; Peñas-Lledó, Loeb, Puerto, Hildebrandt, & Llerena, 2008; Polivy, Herman, & McFarlane, 1994; Schotte, Cools, & McNally, 1990; Shepherd & Ricciardelli, 1998; Stice, 1994), although its role has more recently been disputed (Sheppard-Sawyer, McNally, & Fischer, 2000; Wallis & Hetherington, 2009; Wolff, Crosby, Roberts, & Wittrock, 2000). Trait disinhibition, defined as a tendency to overeat in the presence of palatable food, or other disinhibiting stimuli that trigger eating (Savage, Hoffman, & Birch, 2009), has more recently been linked with eating in response to negative affect. Disinhibition has been repositioned as a psychobiological tendency towards 'opportunistic eating' (Bryant, King, & Blundell, 2008). It is commonly assessed by the Three Factor Eating Questionnaire (TFEQ-D) (Stunkard & Messick, 1985). However, opportunistic eating may be better measured by a combination of the emotional and external eating scales of the DEBQ, which appear to have higher validity than the original TFEQ (Ouwens, van Strien, & van der Staak, 2003; Soetens, Braet, Van Vlierberghe, & Roets, 2008; Strien, Cleven, & Schippers, 2000; Tapper, Pothos, Fadardi, & Ziori, 2008), although revised versions of the TFEQ have been developed (Karlsson, Perrson, Sjostrom, & Sullivan, 2000). More recently, a high restrained/high disinhibited subtype has been identified as a more reliable risk factor for food consumption after negative affect than restrained eating alone (Bryant, Kiezebrink, King, & Blundell, 2008; Haynes, Lee, & Yeomans, 2003; Savage et al., 2009; Strien et al., 2000; Yeomans & Coughlan, 2009). The subtypes of these combined traits are likely to be more sensitive than each trait alone, as they distinguish interactions between eating styles which otherwise would be left undetermined.

The differential expression that certain trait eating behaviours show in the presence of negative affect encourages an exploration of the mechanism by which these traits may act. One such mechanism may be an enhanced response to the rewarding properties of food in the form of specific 'wanting' for the food available and thus greater motivation to eat. A neuropsychological separation of the 'wanting' and 'liking' components of reward was first introduced by Berridge (Berridge, 1996; Berridge & Robinson, 2003); Finlayson has since confirmed this experimentally in humans (Finlayson, King, & Blundell, 2006; Finlayson, King, & Blundell, 2007a). Wanting for test food, rather than liking of it, has been associated with greater food intake (Finlayson, King, & Blundell, 2007b, 2008). It is possible that, in some individuals, negative affect may lead to enhanced wanting of food, regardless of how much it is liked. Evidence for an interaction of food wanting and trait eating behaviours comes from Lemmens et al. (2010), who found that restrained and unrestrained individuals showed differential wanting following consumption of 'unhealthy' foods.

Moreover, an issue encountered in some previous research on eating in response to negative affect that confounds the debate is that the form of negative affect under examination is either not specified or misattributed. For example, a common method of inducing negative affect in the laboratory is by using ego-threatening tasks or fear inducing stimuli, techniques that are designed to elicit stress with the side effect of increasing levels of negative affect. States of affect and stress-related arousal are quite separate and have been associated with opposing effects on food intake (Macht, 2008). Furthermore, individual differences in emotional reactivity to stimuli make identification and separation of influences on subsequent behaviour difficult. Indeed, it has been argued that it is the stress inherent in such procedures, rather than adjacent negative affect, that is likely to account for reported increases in food intake (Lowe & Kral, 2006). In our literature search we found surprisingly few experimental studies on negative affect and food intake that did not invoke stress, *i.e.* with fear-inducing stimuli, negative social evaluation or under-performance on difficult tasks. The present study aimed to circumvent this issue by using a task designed specifically to elicit 'sad' negative affect, in order to examine its effect on intake of palatable snack food. We hypothesised that eating in the presence of negative affect would be moderated by trait eating behaviour; in particular, higher levels of disinhibition and restraint, and by explicit wanting for the test food.

Methods

Participants

Participants were 30 non-obese females who were not following a weight-loss diet at the time of testing. The mean age of the sample was 21.7 years (*SD* 1.02). They were recruited from the undergraduate population of the University of Leeds in response to an advert for a study investigating 'food and memory'. All participants were screened for history of eating or mood disorders, current dieting, medication known to affect appetite and willingness to eat the test food via a 'General Health Questionnaire' administered prior to the first test session. Menstrual cycle phase was recorded by self reported date of last menstruation. The research was approved by the ethics committee of the Institute of Psychological Sciences, University of Leeds. Participants were not paid for their time.

Measures

Assessment of trait eating behaviours

The Dutch Eating Behavior Questionnaire (DEBQ; van Strien, Frijters, Bergers, et al., 1986) was used to measure trait eating behaviours. It is a 33-item questionnaire consisting of three subscales measuring the constructs of emotional eating (13 items), external eating (10 items) and restrained eating (10 items). Responses are made via a 5-point Likert scale ranging from 'Never' (1) to 'Very often' (5). It has good reliability and internal and discriminative validity (van Strien, Frijters, Vanstaveren, Defares, & Deurenberg, 1986). A measure of disinhibited eating was obtained by calculating the mean of emotional and external eating scores, following Ouwens et al. (2003), Soetens et al. (2008) and Tapper et al. (2008).

Mood induction procedure

A validated technique was adapted from a study by Schaefer and Philippot (2005) in which emotional responses were evoked with the recall and oral description of emotional autobiographical memories. In the present study, participants were asked to write about one or more autobiographical memories for three minutes. They were asked to describe in detail the event and their reactions to it. If they could not write for three minutes about one particular memory, they were asked to think of another in order to continue, as long as the second memory had the same emotional significance. However, all participants wrote about one memory only. The task instructions varied according to experimental condition. In the negative affect condition, participants were asked to write about a negative ('sad') memory, concentrating on their feelings at the time associated with the events. The control condition required a neutral memory; an example given was describing a daily routine. This technique approximates a naturalistic diary-writing style often associated with the recording of personal emotions, and so may encourage more naturalistic

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