



## Research report

# Trait anxiety, but not trait anger, predisposes obese individuals to emotional eating<sup>☆</sup>

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## ABSTRACT

The present study examined whether trait anxiety and trait anger are associated with vulnerability to emotional eating, particularly among obese individuals. Lean ( $n = 37$ ) and obese ( $n = 24$ ) participants engaged in a laboratory study where they completed measures of trait anxiety and trait anger at screening and then completed 3 counterbalanced experimental sessions involving different mood inductions (neutral, anxiety, anger). Following each mood induction, participants were provided with snack foods in a sham taste test. Models predicting snack intake revealed a significant trait anxiety  $\times$  body mass index group interaction, such that high trait anxiety was positively associated with food intake for obese individuals, but not their lean counterparts. Contrary to the hypothesis, trait anger was not associated with food intake for obese or lean participants. Results suggest that trait anxiety may be a risk factor for emotional eating among obese individuals.

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## Introduction

The influence of negative emotions on food intake is complex and not completely understood (Macht, 2008). Research shows that negative emotions can decrease food intake in some individuals and circumstances (e.g., Baucom & Aiken, 1981; Heatherton, Herman, & Polivy, 1991) and increase food intake in others (e.g., Lowe & Maycock, 1988; Willner et al., 1998). The latter is referred to as emotional eating, and to the extent that it leads people to consume more than their daily needs, weight gain and obesity can develop (Hays & Roberts, 2008). Obesity intervention studies also show that emotional eating is associated with poorer weight loss outcomes (Elfhag & Rossner, 2005).

Emotional eating has been observed in both obese and lean individuals (Greeno & Wing, 1994) and a critical review of the literature concluded that there is no relationship between body mass index and emotional eating (Allison & Heska, 1993). Thus, vulnerability to emotional eating does not appear to be simply a function of weight. Vulnerability to emotional eating is likely influenced by multiple factors. Individual differences in affective traits may account for some of the observed variability in the effects of emotions on eating. Jansen et al. (2008) reported that obese individuals high in negative affect consumed more food than

individuals low in negative affect following a negative mood induction, relative to a neutral mood induction. In contrast, lean individuals consumed comparable amounts of calories in the negative and neutral mood induction conditions, regardless of their level of negative affect (Jansen et al., 2008). A limitation of this study is the use of state measures of negative affect, which capture transient moods, but not necessarily affective traits. Further research is needed to explore whether trait negative affect could possibly be a risk factor for emotional eating in obese individuals.

Also unknown is whether specific types of trait negative affect differentially impact emotional eating. Initial research suggests that trait anxiety and trait anger may be particularly important predictors of emotional eating. Initial evidence suggests that trait anxiety is associated with higher food consumption under stress (Pollard, Steptoe, Canaan, Davies, & Wardle, 1995). Other support for a role of trait anxiety is provided by studies showing a high prevalence of anxiety disorders (37%) among people with binge eating disorder (Grilo, White, & Masheb, 2009). Similarly, elevated trait anger has been observed in cross-sectional studies of individuals with bulimia (Fassino, Daga, Piero, Leombruni, & Rovera, 2001) and binge eating disorder (Fassino, Leombruni, Piero, Abbate-Daga, & Rovera, 2003) compared to lean and obese individuals without a diagnosed eating disorder. Although emotional eating is a hallmark of bulimia (Ouwens, van Strien, van Leeuwe, & van der Staak, 2009; Stice, Shah, & Nemeroff, 1998) and binge eating disorder (Stein et al., 2007; Wolfe, Baker, Smith, & Kelly-Weeder, 2009), most individuals who endorse emotional eating do not meet criteria for bulimia or binge eating disorder (Fischer et al., 2007; Lindeman & Stark, 2001). Thus, the extent to

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which trait anger and anxiety increase vulnerability to emotional eating in non-eating disordered populations is not well-explored.

The present study examined whether trait anxiety and trait anger are associated with vulnerability to emotional eating, particularly among obese individuals. Lean and obese participants completed measures of trait anxiety and trait anger prior to undergoing neutral, anxiety, and anger mood inductions on separate days. Following each mood induction, participants were given highly palatable foods in a sham taste test. After the sham taste test, food intake was objectively measured. Two different hypotheses were tested: (1) Whether higher trait anxiety is associated with greater food intake following an anxiety mood induction for obese, but not lean individuals and (2) whether higher trait anger is associated with a greater food intake following an anger mood induction for obese, but not lean individuals.

## Methods

### Participants

Lean (BMI: 19–25) and obese (BMI > 30) adults ( $N = 61$ ) were recruited through study advertisements posted in the community and on a medical center campus. Individuals were ineligible for the study if they: (1) had any uncontrolled health condition (e.g., uncontrolled hypertension, diabetes); (2) met DSM-IV diagnostic criteria for anorexia nervosa, bulimia nervosa, bipolar disorder, psychotic disorder or substance abuse or dependence (3) expressed active suicidal ideation or behavior; (4) were illiterate; (5) were pregnant, intending to become pregnant during the course of the study, lactating, or had a history of severe premenstrual distress; (6) smoked > 3 cigarettes/day or used any other nicotine product daily; (7) were using appetite suppressants; and (8) had a history of obesity surgery. Participants were also excluded if they were not responsive to a negative mood induction (anger and anxiety mood induction) that occurred during the screening session (less than 4 point increase in targeted negative affect states) as described below.

### Screening session

Potential participants responding to study advertisements received an explanation of the study and were initially screened via telephone. Preliminarily eligible persons were then scheduled for a screening visit that lasted no more than 3 h to determine eligibility. Written consent was obtained and height and weight were assessed on a balance beam scale with shoes removed. Participants were administered the Structured Clinical Interview for DSM-IV, nonpatient version (SCID-NP) (Spitzer, Williams, Gibbon, & First, 1992) to rule out the presence of exclusionary Axis I disorders noted above. Participants completed three additional procedures during the screening session as part of participant pre-testing: (1) memory generation; (2) mood induction and (3) food palatability ratings.

### Memory generation

Participants were then interviewed about recent experiences to generate memories for use in the mood induction protocol. To reduce demand characteristics and prevent participants from guessing the nature of the experiment, they were told that the study evaluates whether different everyday situations affect enjoyment of various foods. The focus on mood and affective traits was not mentioned. Based on a procedure developed by Litt, Cooney, Kadden, and Gaupp (1990), the interviewer asked each participant to describe events within the past year that made them anxious and others that made them angry. For the neutral mood induction, participants were asked to recall a routine household

task (e.g., washing dishes), and it was used as long as this memory did not evoke a negative emotion. Other memories were queried that had nothing to do with negative moods, such as a time when they successfully accomplished a task. Participants were encouraged to describe each event in their own words, indicating what led up to the situation, what occurred, how they felt about it and the outcome. The experimenter recorded a brief description of the incident. After generating the memories, participants rated each incident on 1–10 point Likert scales to indicate the degree to which it made them feel various emotions (including anxiety, anger, happiness and sadness) and the vividness of the memory.

### Mood induction

Participants were next told that they would be asked to recall two randomly chosen memories that they had just provided. In actuality, the memories were not randomly chosen, rather the researcher used the memory rated highest on anxiety and the memory rated highest on anger (If a memory was equally intense on anger and anxiety it was not used). Two mood inductions were conducted: one for anger and one for anxiety. Participants' mood ratings were collected on a 1–10 Likert scale prior to and immediately following the test mood induction. Participants who did not demonstrate an increase of at least 4 points during either mood induction were deemed ineligible due to being non-responsive to the mood induction (excluded:  $n = 49$ ; 28 females, 21 males). These excluded participants did not differ from enrolled participants on BMI ( $t = 0.40$ ,  $p = .69$ ) and sex ( $\chi^2(1) = 3.37$ ,  $p = .07$ ); however age was significantly different ( $t = 3.38$ ,  $p = .001$ ), such that non-responders ( $M = 42.00$ ;  $SD = 11.41$ ) were slightly older than responders ( $M = 34.61$ ;  $SD = 11.37$ ). To ensure that participants did not exit the session in a distressed state, participants whose negative affect scores had not returned to baseline by the end of the screening session underwent a positive mood induction prior to leaving the laboratory.

### Food palatability ratings

Immediately following the test mood induction, participants rated the palatability of 38 snack foods (e.g., peanut butter cups, pretzels, potato chips, chocolate chip cookies) representing a variety of tastes, textures, and macronutrient composition on a 0–10 scale, where 0 was 'do not enjoy this food at all' and 10 was 'enjoy this food extremely'. The timing of the completion of this measure was in keeping with the cover story that the study examined the influence of memories on food enjoyment. To obtain meaningful palatability ratings, participants were informed of brand names of food items when possible and were asked to avoid rating unfamiliar foods. Participants were scheduled for three experimental sessions to be between 1 and 6 days apart. Of the 67 participants who met eligibility criteria following the screening session, five declined to participate and one did not complete any experimental sessions, leaving a final sample of 61 that completed all 3 experimental sessions.

### Experimental conditions

Participants completed 3 experimental mood induction sessions, neutral, anxiety and anger, in counterbalanced order. The use of anxiety and anger mood inductions enabled the coupling of the trait measures with their comparable state induced negative emotions, which provides a particularly strong test of the hypotheses. Participants were administered a brief dietary recall interview at the beginning of the session to ensure that they followed instructions to not consume any food or energy-containing beverages in the previous 2 h. Those who had were rescheduled for a different day ( $n = 1$ ). Participants then completed a mood questionnaire (Profile of Mood States) and rated their

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