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The Emotional Eating Scale: Can a self-report measure predict observed emotional eating?

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Abstract

We assessed the validity of the Emotional Eating Scale (EES) by examining whether the EES predicted food intake following two negative mood inductions. Participants underwent mood inductions for anxiety, anger and neutral mood, then received snack foods in a sham palatability test. EES anxiety, but not anger, predicted intake. Participants high on EES anxiety consumed more snacks during the anxiety mood induction, whereas participants low on EES anxiety consumed less snacks. Results suggest that EES anxiety is a predictor of anxiety-driven eating and may be used to assess emotional eating when direct observation of intake is not possible.

Keywords

Emotional eating; food intake; obesity

Introduction

Emotional eating occurs when negative emotions trigger food intake (Lowe & Maycock, 1988; Willner et al., 1998). Emotional eating is a topic of increasing concern as it has been associated with elevated consumption of high-calorie and high-fat foods (Oliver, Wardle, and Gibson, 2000), increased risk of obesity (Sung, Lee & Song, 2010) and poor weight loss outcomes (Elfhag & Rossner, 2005).

Laboratory studies often assess emotional eating by examining ad libitum food intake in response to negative mood inductions. Self-report scales were developed to more conveniently measure emotional eating. However, controversy exists regarding the accuracy of self-report scales to predict observed emotional eating in a laboratory. While some studies found that the Dutch Eating Behavior Questionnaire emotional eating subscale (DEBQ; van Strien et. al 1986) predicted observed emotional eating following a negative mood induction

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(Oliver, Wardle, and Gibson, 2000; Wallis & Hetherington, 2009; van Stien, Herman, Anschutz, Engels & de Weerth, 2011), others have failed to find an association between this measure and observed emotional eating (Evers, de Ridder & Adriaanse, 2009).

One unexplored issue is whether emotional eaters are triggered by all negative emotions or if specific emotions increase vulnerability. Laboratory studies typically focus on negative emotion generally, rather than on specific negative emotions, in spite of research suggesting that there are differences in the experience of emotions like anxiety and anger, beyond what is explained by the experience of these emotions as positive or negative (Barret et al., 2007). The DEBQ emotional eating scale contains two subscales assessing clearly labeled (e.g., frightened, worried) and diffuse (e.g., bored, lonely) negative emotions, which does not capture differences in emotional eating between mood states. Conversely, the Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995) contains 3 subscales that assess emotional eating in response to anger, anxiety and depression. The disconnect between questionnaire and laboratory measures may result from negative emotion being considered a single unified phenomenon. The present study examined whether the EES subscales predict laboratory emotional eating in response to induced anxiety and anger.

Determining the validity of emotional eating questionnaires is vital given that these measures are more feasible for settings that do not allow observation of food intake. The present study assessed whether the EES anxiety and anger subscales predict caloric consumption in response to anxiety and anger mood inductions, respectively. We hypothesized that individuals categorized as high in emotional eating by the EES on the anxiety and anger subscales would consume more snacks following the anxiety and anger mood inductions, compared to individuals low on these subscales. This study was a secondary data analysis from a parent study investigating the relationship between emotional eating and obesity. The EES depression subscale was not examined because the parent study focused on anxiety and anger and did not include a depression mood induction.

Methods

Participants

Lean (BMI: 19–25) and obese (BMI >30) adults were recruited through advertisements posted in the community. The parent study was interested in whether obese individuals engaged in greater emotional eating; thus, overweight individuals were excluded to clearly delineate the obese group from the control group of lean individuals. Individuals were ineligible if they: (1) had any uncontrolled health condition; (2) met DSM-IV criteria for anorexia nervosa, bulimia nervosa, bipolar disorder, psychotic disorder or substance abuse or dependence (3) expressed suicidal ideation/behavior; (4) were illiterate; (5) were pregnant, lactating or had a history of severe premenstrual distress; (6) smoked >3 cigarettes/day; (7) were using appetite suppressants; or (8) had obesity surgery. Individuals with binge eating disorder were eligible. Participants were excluded if they were not responsive to a negative mood induction that occurred during the screening session described below (excluded: n=49; 28 females, 21 males). Of the 67 participants who met eligibility criteria, five declined to participate and one did not complete any experimental sessions. Of the 61 participants who completed all sessions, one did not complete the EES and was excluded from analyses, leaving a sample of 60.

Screening Session

Individuals responding to advertisements received an explanation of the study and were screened via telephone. Those passing the telephone screening were scheduled for a screening visit that lasted 2–3 hours to determine eligibility. Written consent was obtained

and height and weight were assessed. Participants were administered the Structured Clinical Interview for DSM-IV, nonpatient version (SCID-NP) to rule out exclusionary disorders and to assess for the presence of mood and anxiety disorders and binge eating disorder. Participants completed three additional procedures during the screening session: 1) memory interview; 2) mood induction and 3) food palatability ratings.

Memory interview—Participants were interviewed to solicit memories for the mood inductions. To prevent participants from guessing the nature of the experiment, they were told that the study evaluates whether different experiences affect one's enjoyment of various foods. Based on a procedure developed by Litt and colleagues (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). Other memories were queried that had nothing to do with negative moods to distract the participant from the interview's real purpose. Participants described each incident, indicating what led up to the situation, what occurred and how they felt about it. The experimenter recorded a description of the incident. Participants rated each incident on 1–10 point Likert scales to indicate the degree to which it made them feel anxious, angry, happy or sad.

Mood induction—Participants were next told that they would be asked to recall two randomly chosen memories they provided. In actuality, the memories were not randomly chosen, rather the researcher used the memories rated highest on the anxiety and anger Likert scales. The experimenter read a description of the memory and participants received verbal instructions to vividly focus on the memory as described in Schneider et al., (2010). The mood induction lasted 7 minutes. Participants' mood ratings were collected using the Profile of Mood States (POMS) prior to and immediately following the mood induction. Those who did not demonstrate an increase of at least 4 points during the anger and anxiety mood inductions were ineligible.

Food palatability ratings—Participants rated the palatability of 38 snack foods representing a variety of tastes 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'.

Experimental sessions

Participants were scheduled for three experimental sessions between 1 and 6 days apart. Participants completed the sessions, neutral, anxiety and anger, in counterbalanced order. First, participants completed a dietary recall interview to ensure that they followed instructions to not consume any food or caloric beverages in the past 2 hours. Participants then completed the POMS and rated their hunger. Participants were reminded that the study examines how situations affect the enjoyment of various foods. The experimenter then conducted the same mood induction from the screening session using different anxiety, anger or neutral memories. After participants completed another mood rating using the POMS, 6 foods rated as highly palatable (score ≥ 6 on the 1–10 likert scale) by the participant were presented in 400 kcal portions (total 2400 kcal). The participant was instructed to sample each food and to eat as much as they would like to rate palatability. They were told that leftover food would be discarded and that they do not have the option of taking any home. Participants were left alone for 20 minutes. Procedures were approved by the University of Illinois-Chicago, Hines VA Medical Center and the University of Massachusetts Medical School's Institutional Review Boards.

Measures

Emotional eating scale (EES)—The EES (Arnow et al., 1995) is a 25-item scale with three factor analytically derived subscales: anger, anxiety and depression. Participants rate the extent to which certain feelings lead to the urge to eat using a 5-point likert scale ranging from “no desire to eat” to “an overwhelming urge to eat.” The EES demonstrates adequate reliability and validity (Arnow et al., 1995) and coefficient alphas for this study were .89 and .85 for the anger and anxiety subscales. No cutoffs exist for classifying emotional eating; thus we used the mean cutoffs from Arnow’s (1995) article, which examined the EES in a sample of individuals who reported binge eating, to categorize emotional eating. Scores range from 0 to 44 on EES anger and 0 to 36 on EES anxiety; EES means were 25.4 for the anger subscale and 15.9 for the anxiety subscale. Participants were classified as high in EES anger if their score was > 25.4, and classified as high in EES anxiety if they score was > 15.9. Participants completed the EES after the final laboratory session, which ensured that completion of the measure did not impact consumption.

Body mass index (BMI)—Participants had their height and weight measured without shoes using a stadiometer and digital scale. BMI was calculated using the formula (weight in kilograms/height in meters²). Cutoffs were used to define lean (18.5–24.9) and obese (≥ 30.0) groups.

Axis I disorders—Axis I disorders were assessed using the modules for mood, substance use, anxiety and eating disorders of the SCID-NP (Spitzer, Williams, Gibbon & First, 1992).

Anxiety and anger—The 65-item POMS (McNair, Lorr, & Droppleman, 1971) was used to measure mood change. The tension-anxiety and anger subscales were used. Post-mood induction scores were subtracted from the baseline scores to assess anxiety and anger reactivity to the mood induction.

Hunger—Hunger was assessed prior to each mood induction via a 0–10 rating with 0 as ‘not hungry at all’ and 10 as ‘extremely hungry’.

Three-factor eating questionnaire (TFEQ)—Participants completed the TFEQ (Strunkard & Messick, 1985) at the screening session to assess disinhibition and restraint.

Food intake—Food was weighed in grams before and after the food presentation. The difference between the pre-session and post-session food weight was calculated and converted from grams to kilocalories. To calculate consumption resulting from a negative mood condition, food intake consumed during the neutral mood induction condition was subtracted from food intake consumed during the anxiety and anger mood inductions.

Analytic plan

Two analyses of covariance were conducted, one for each negative mood induction condition. Food intake was the dependent variable and EES anxiety or anger category was the independent variable. Correlational analyses were conducted to examine whether potential covariates (hunger during the neutral mood induction condition and the respective mood induction condition, age, BMI category, gender, mood induction sequence, restraint and disinhibition) predicted food intake, for inclusion in the model.

Results

Preliminary analyses

Characteristics for the sample by BMI category are described in Table 1. Change in targeted and non-targeted mood state between the two negative mood conditions was compared using paired samples t-tests to ensure that the mood induction was successful. For the anger mood induction, anger increased significantly more than anxiety ($t=8.33$, $p<.001$). For the anxiety mood induction, anxiety increased significantly more than anger ($t=5.18$, $p<.001$). Additionally, the neutral mood induction did not significantly increase anger ($t=0.34$, $p=.78$) or anxiety ($t=-1.78$, $p=.08$). Correlational analyses revealed that hunger was the only variable significantly associated with food intake for the anxiety condition ($r=.28$, $p=.03$) and thus was included as a covariate.

Given the unequal sample sizes observed between low and high EES subscales ($n=47$ and $n=13$ for low and high EES anxiety; $n=55$ and $n=5$ for low and high EES anger), the variances in the dependent variables were compared to ensure that the homogeneity of variance assumption was met using Levene's test of equality of error variances. Levene's test was not significant for variance in food intake between low and high EES anxiety groups [$F(1, 58) = 1.45$, $p=.23$] and between low and high EES anger groups, [$F(1, 58) = 1.54$, $p=.22$], indicating that the assumption was met.

Main analyses

Analyses revealed a significant main effect of the EES anxiety subscale on food intake, [$F(1,57)=4.13$, $p=.04$, $\eta^2=.07$], but not for the EES anger subscale [$F(1,57)=1.49$, $p=.23$]. Participants high on EES anxiety consumed an average of 128.39 ($SD=317.22$) more calories during the anxiety mood induction compared to the neutral mood induction, whereas participants low on EES anxiety consumed an average of 70.16 ($SD=222.28$) fewer calories during the anxiety mood induction. Although not significant, the means for the EES anger subscale were in the expected direction; participants high on the EES anger subscale consumed an average of 96.49 ($SD=66.68$) more calories following the anger mood induction compared to the neutral mood induction, whereas participants low on EES anger consumed an average of 7.52 ($SD=305.07$) fewer calories following the anger mood induction.

Not all participants responded equally to the negative mood inductions, which has implications for whether the emotional eating scale predicts observed food intake following a negative mood induction. Thus, we repeated the analyses with a subset of participants who reported at least a 4-point increase in the targeted mood state. Analyses revealed a significant main effect of the EES anxiety subscale on food intake, [$F(1,42)=5.22$, $p=.03$, $\eta^2=.11$], but not for the EES anger subscale [$F(1,51)=1.06$, $p=.31$]. Participants high on EES anxiety consumed an average of 192.52 ($SD=296.77$) more calories during the anxiety mood induction compared to the neutral mood induction, whereas participants low on EES anxiety consumed an average of 48.78 ($SD=232.73$) fewer calories during the anxiety mood induction.

Since individuals with binge eating disorder may be vulnerable to consuming more food, we also reanalyzed the data removing 3 participants with binge eating disorder ($n=2$ classified as high on EES anxiety and anger). Though not significant, analyses with the subsample resulted in a similar effect size for the effect of the EES anxiety subscale on food intake, [$F(1,39)=2.79$, $p=.10$, $\eta^2=.07$]. Participants high on EES anxiety consumed an average of 136.35 ($SD=243.52$) more calories during the anxiety mood induction compared to the neutral mood induction, whereas participants low on EES anxiety consumed an average of

51.56 (SD=238.22) fewer calories during the anxiety mood induction. The EES anger subscale did not predict food intake [$F(1,48)=1.69, p=.20$].

Exploratory analyses

We examined whether the continuous scores for EES subscales predicted food intake. Correlations between the EES anxiety and anger continuous subscales and food intake indicated that EES anxiety was not correlated with food intake for the full sample ($r=.21, p=.11$) and marginally correlated with food intake for the subsample showing 4-point mood responses to the induction ($r=.27, p=.07$). EES anger was not correlated with food intake in the full sample ($r=.08, p=.53$) or subsample ($r=.20, p=.18$).

Discussion

This study demonstrated that the EES anxiety mean cutoff from the standardization sample (Arnow, 1995) was a moderately-strong predictor of anxiety-driven consumption, while the EES anger cutoff was a nonsignificant predictor of anger-driven consumption. That EES anger did not predict emotional eating may have been due to the small percentage of the sample (8%) who endorsed emotional eating on the EES anger subscale, which would have limited power to detect associations. Despite the lack of a significant difference, the means for the two groups demonstrated the same pattern observed for the EES anxiety categories as individuals high on EES anger consumed more snacks following the anger mood induction compared to the neutral mood induction, whereas those categorized as low in EES anger consumed fewer snacks following the anger mood induction. Little is known about the effects of anger on eating behavior. Research describing individual differences and mechanisms that predict eating following anger could help validate the relationship between self-reported eating following anger and eating behavior.

The present study used the mean EES scores from a sample of binge eaters to categorize low and high emotional eating. Because not all individuals who engage in emotional eating are binge eaters, it is possible that the EES cutoffs used are conservative. One study of obese bariatric surgery patients reported lower means for the EES subscales (Anger: $M=15.91$; Anxiety: $M=11.92$) (Fisher et al., 2007). Using these means to categorize emotional eating we found a similar, but non-significant pattern for the EES anxiety category such that high EES anxiety participants consumed 41.47 (282.89) more calories, whereas low EES anxiety participants consumed an average of 76.15 (SD=227.48) fewer calories during the anxiety mood induction. Research on the sensitivity and specificity of cutoffs may improve the predictability of the EES for capturing emotional eating.

A limitation of this study is that it was a secondary data analysis and was not designed to address this study's aims. We had sufficient power to detect medium to large effects of the EES on eating behavior and we observed a medium-sized effect of EES anxiety on consumption. The small effect of EES anger on intake may have reached significance in a larger sample. Additionally, the EES depression subscale was not examined. Depression is commonly associated with emotional eating, and thus whether this subscale predicts observed emotional eating is critical to establishing the EES as a valid measure of emotional eating. Whether subscales for other mood states such as boredom should be developed deserves further study given that patients often report eating in the context of boredom. The study sample was primarily female and Caucasian and excluded overweight individuals, which limits generalizability. Lastly, this study excluded individuals who were non-responsive to the negative mood inductions. Literature suggests that emotional eating may be associated with alexithymia, the inability to identify and describe emotions (Pinaquy et al., 2003; van Strien, 2007), which could have resulted with them being excluded from the present study. Studies in more naturalistic settings or possibly with a different type of

negative mood induction, are needed to examine emotional eating to capture these non-responders. Strengths of the study include the provision of a variety of highly palatable foods during the bogus taste test, the use of specific negative mood inductions and use of a community sample.

The present study demonstrated differences in concurrent validity of the EES based on target negative mood state. Results resonate with van Strien's (2010) assertion that it is premature to characterize an individual's ability to self-report emotional eating as "impossible," particularly as all scales may not be created equal. Many overweight and obese individuals describe themselves as emotional eaters. Having tools that quickly and accurately identify these individuals and the specific type of negative mood they are vulnerable to can assist in understanding emotional eating.

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Table 1

Characteristics for the sample split by body mass index category (n=60).

	Lean (n=37)	Obese (n=23)
	Mean (SD)	Mean (SD)
Age (years)	31.78 (10.59)	38.35 (11.20)
EES anxiety subscale	9.19 (6.69)	12.00 (6.61)
EES anger subscale	9.11 (7.31)	13.57 (9.05)
Food intake (kcal)		
Neutral mood condition	995.67 (410.80)	995.32 (284.83)
Anxiety mood condition	966.32 (423.05)	971.72 (365.10)
Anger mood condition	1008.14 (342.10)	978.23 (287.66)
	N (%)	N (%)
Sex: Female	24 (64.9)	20 (87.0)
Binge eating disorder	1 (2.7)	2 (8.7)
Major depressive disorder	1 (2.7)	1 (4.3)
Anxiety disorder	5 (13.5)	1 (4.3)
Ethnicity:		
Caucasian	29 (78.4)	20 (87.0)
African-American	4 (10.8)	2 (8.7)
Asian, Pacific Islander	3 (8.1)	1 (4.3)
Multi-ethnic	1 (2.7)	0 (0)