Eating Behaviors 12 (2011) 9–14

Contents lists available at ScienceDirect

Eating Behaviors

Response style and vulnerability to anger-induced eating in obese adults

Bradley M. Appelhans [a,*], Matthew C. Whited [b], Kristin L. Schneider [b], Jessica Oleski [b], Sherry L. Pagoto [b]

[a] Department of Preventive Medicine, Rush University Medical Center, 1700 W Van Buren St, Ste 470, Chicago, IL 60612, USA
[b] Department of Medicine, Division of Preventive and Behavioral Medicine, University of Massachusetts Medical School, 55 Lake Avenue North, Worcester, MA 01655, USA

ARTICLE INFO

Article history:
Received 24 May 2010
Received in revised form 12 August 2010
Accepted 24 August 2010

Keywords:
Obesity
Emotional eating
Anger
Distraction
Rumination

ABSTRACT

Emotional eating appears to contribute to weight gain, but the characteristics that make one vulnerable to emotional eating remain unclear. The present study examined whether two negative affect response styles, rumination and distraction, influenced palatable food intake following an anger mood induction in normal weight and obese adults. We hypothesized that higher rumination and lower distraction would be associated with greater vulnerability to anger-induced eating, particularly among obese individuals. Sixty-one participants (74% female, mean age = 34.6) underwent neutral and anger mood inductions in counter-balanced order. Directly following each mood induction, participants were provided with 2400 kcal of highly palatable snack foods in the context of a laboratory taste test. Results revealed that distraction influenced energy intake following the mood induction for obese but not normal weight individuals. Obese participants who reported greater use of distraction strategies consumed fewer calories than those reporting less use of distraction strategies. These findings were independent of subjective hunger levels, individual differences in mood responses and trait anger, and other factors. Rumination did not account for changes in energy intake among obese or normal weight participants. Among obese individuals, the tendency to utilize fewer negative affect distraction strategies appears to be associated with vulnerability to eating in response to anger. Future research should determine whether coping skills training can reduce emotional eating tendencies.

1. Introduction

The prevalence of obesity has increased dramatically during the past 25 years as the environment has become increasingly obesogenic (Ogden et al., 2006; Ogden, Carroll, & Flegal, 2008). The identification of individual difference factors associated with overeating and risk for obesity is essential to the development of prevention and treatment approaches (Davis, 2009). Emotional eating, defined as food intake triggered by negative emotional states, is associated with weight gain over the lifespan (Hays & Roberts, 2008). Prior studies have shown that emotional experiences can influence eating behavior in the laboratory (Greeno & Wing, 1994; Torres & Nowson, 2007) and in naturalistic settings (O'Connor, Jones, Conner, McMillan, & Ferguson, 2008), but these effects may vary substantially according to the type and intensity of the emotional experience (Macht, 1999; O'Connor et al., 2008). Anger, an emotion state with negative valence, high arousal, and specific cognitive and behavioral tendencies (Cox & Harrison, 2008), has been linked to increased motivation to eat among men (Macht, 1999) and women (Macht & Simons, 2000) and is frequently reported as a trigger of eating on self-report measures (Arnow, Kenardy, & Agras, 1995). However, to our knowledge, no published studies have examined the effects of anger on objectively measured food intake, and the individual difference factors that confer vulnerability to anger-induced eating are unknown.

Several functional associations between emotions and eating have been proposed (Macht, 2008), including the use of palatable food to regulate negative affect (Macht, 2008; Spring et al., 2008; Wallis & Hetherington, 2004). It has been hypothesized that emotional eating may depend on whether more adaptive response strategies are available to an individual (Spoor, Bekker, Van Strien, & van Heck, 2007), with those lacking effective strategies for responding to emotional distress being most vulnerable to emotional eating. The notion that emotional eating may be viewed as a strategy employed to compensate for maladaptive response strategies is consistent with "escape theory" and affect regulatory explanations of emotional eating (Wallis & Hetherington, 2004). In support of this notion, greater reported use of maladaptive or ineffective coping strategies is associated with emotional eating and binge eating among both healthy adults and binge eaters (Evers et al., 2010; Spoor et al., 2007; Whiteside et al., 2007).

Nolen-Hoeksema and colleagues have described two general classes of responses to distressing situations, each of which may confer vulnerability to anger-induced eating. Rumination is a maladaptive strategy that refers to repetitive thinking about the source and consequences of negative affect (Nolen-Hoeksema, 1991; Smith & Alloy, 2009). Rumination is linked to increased experience of negative affect and is thought to contribute to risk for depression (Mor & Winquist, 2002; Thomsen, 2006). In contrast, distraction is the

* Corresponding author. Tel.: +1 312 942 3477; fax: +1 312 942 8119.
E-mail address: brad_appelhans@rush.edu (B.M. Appelhans).

1471-0153/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.eatbeh.2010.08.009

adaptive strategy of turning attention away from the source or experience of negative affect (Nolen-Hoeksema, 1991). For example, one might exercise, listen to music, or engage in a hobby to divert attention away from negative affect. The effectiveness of distraction in regulating emotions was supported in a recent meta-analysis (Augustine & Hemenover, 2009).

Studies have demonstrated that response styles modify the intensity of an angry mood, with rumination associated with increased, and distraction with decreased experience of anger during laboratory mood-induction protocols (Rusting & Nolen-Hoeksema, 1998). Distraction and rumination may directly influence vulnerability to emotional eating following anger by either tempering, in the case of distraction, or heightening, in the case of rumination, one's response to an emotionally provocative situation. In one prior study, higher rumination was associated with greater desire to eat following stressful events in naturalistic settings (Kubiak, Vögele, Siering, Schiel, & Weber, 2008).

The present study extended prior research linking anger to the subjective motivation to eat by testing the impact of anger on objectively measured palatable food intake among normal weight and obese adults. We also examined whether distraction and rumination response styles are associated with vulnerability to anger-induced eating. Given prior research suggesting that associations between affective traits and emotional eating are specific to overweight or obese individuals (Jansen et al., 2008), we hypothesized that obese individuals with lower self-reported use of distraction and higher reported rumination would demonstrate an increase in palatable food intake following an anger mood induction, whereas the associations between response styles and anger-induced eating would be attenuated or absent among normal weight individuals.

2. Methods

2.1. Participants

Healthy men and women with a BMI in the normal weight (BMI: 18.5–25) or class I/class II obese (BMI: 30–40) range were recruited through printed advertisements for a study of "memory and food preferences" posted in the community and on a medical center campus. Eligibility criteria were assessed through an initial telephone interview and a subsequent laboratory screening visit. Participants were excluded if they endorsed any of the following: (1) any uncontrolled health condition (e.g., recent myocardial infarction, uncontrolled hypertension, diabetes); (2) DSM-IV criteria for a psychotic disorder, substance abuse or dependence, bipolar disorder, anorexia nervosa, or bulimia nervosa; (3) use of medications known to affect appetite or mood or to suppress menstruation; (4) active suicidal ideation or behavior; (5) illiteracy; (6) pregnancy, intention to become pregnant, lactation, or history of severe premenstrual distress; (7) smoking >3 cigarettes/day or daily use of any nicotine product; (8) use of appetite suppressants; (9) history of obesity surgery; (10) food allergy or sensitivity. Additionally, participants were excluded if they failed to respond to a test negative mood induction (described below) during the laboratory screening visit. The Institutional Review Boards of University of Illinois-Chicago and University of Massachusetts Medical School Human approved study procedures.

2.2. Procedure

2.2.1. Screening visit

Written consent was obtained upon arrival to the laboratory. BMI [weight (kg)/height^2(m)] was derived from measurements taken in light clothing on a balance beam scale to ensure that participants were in an eligible BMI category (i.e., 18.5–25, 30–40). The Structured Clinical Interview for DSM-IV, nonpatient version (SCID-NP; Spitzer, Williams, Gibbon, & First, 1992) was administered to rule out the presence of exclusionary Axis I disorders.

Participants who remained eligible following the SCID-NP completed a test mood induction to ensure that they could be induced into a negative mood. To reduce demand characteristics, the mood inductions were described as methods to help the researchers determine whether memories of everyday experiences affect enjoyment of food. Based on Litt, Cooney, Kadden, and Gaupp (1990), participants were asked to describe a number of emotionally positive, negative, and neutral events in the past year, including situations that currently made them very angry. For the neutral mood induction, participants were asked to recall engaging in a routine household task (e.g., washing dishes) that did not evoke a negative emotion. Participants rated each memory's vividness and ability to provoke various emotions on 10-point Likert scales ranging from 1 = "not at all" to 10 = "very much." Among those rated 5 or more on both 'angry' and 'vividness', the memory with the highest 'angry' rating was selected as imagery for the mood induction. Participants were then asked to recall and re-experience the most intense anger memory provided (specific instructions described below). Mood ratings were collected on a 10-point Likert scale from 1 = "not at all" to 10 = "extremely" prior to and immediately following the test mood induction. Of the 116 individuals who completed the mood induction during the screening visit, 49 did not demonstrate an increase of at least 4 points in anger ratings following the anger induction and were deemed ineligible due to nonresponsiveness. These participants did not differ from enrolled participants on BMI ($F_{(1,108)} = .16$, $p = .69$) or sex (43% vs. 26% male; $\chi^2_{(1,\ n=110)} = 3.36$, $p = .07$). Six additional participants lost interest in participating after the screening visit and did not complete any of the experimental sessions. The final sample was composed of 61 normal weight (n = 37) and obese (n = 24) men and women who completed all study sessions.

At the conclusion of the screening visit, participants rated the palatability of 38 snack foods 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.' Examples of study foods include peanut butter cups, potato chips, chocolate chip cookies, brownies, and ice cream. Participants were informed of brand names when possible and were not asked to attempt to rate foods they were not familiar with. Six foods that received a palatability rating higher than 6 out of 10 during the screening visit were offered to participants during study sessions.

2.2.2. Experimental sessions

Participants completed 2 experimental sessions occurring 1 to 6 days apart. Sessions involved either the neutral or anger mood induction. Participants also completed a session with an anxious mood induction as part of a separate study. The order of the three sessions was counterbalanced. A brief dietary recall interview was administered at the beginning of each session, and participants who had not complied with instructions to fast for 2 h prior to experimental sessions were rescheduled (n = 1). Participants completed baseline mood and hunger ratings following the dietary recall. The experimenter then introduced the mood-induction task, again under the false pretense that the study examined how memories of everyday situations affect preferences for various foods. Participants were told that the specific memory selected for the mood induction was chosen at random. The participant was read the brief description of the memory they provided during their screening visit, and were then given the following instructions (Rusting & Nolen-Hoeksema, 1998; Wright & Mischel, 1982).

> "During the next 7 minutes, try to re-experience the memory you've retrieved as vividly as you can. Picture the event happening to you all over again. Picture in your 'mind's eye' the surroundings as clearly as possible. See the people or objects; hear