



# A laboratory-based study of mood and binge eating behavior in overweight children

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## ABSTRACT

**Purpose:** Associations between negative mood and binge eating in the laboratory are well-established in adults, but such data are limited in youth. We investigated the relation between mood and binge eating in children using a laboratory feeding paradigm.

**Method:** Overweight girls, aged 6–12 years, with (BE;  $n = 23$ ) and without (control, CON;  $n = 23$ ) reported objective and/or subjective binge eating underwent both sad and neutral mood inductions, followed by multi-item buffet meals.

**Results:** The Group  $\times$  Mood Condition interaction for overall energy intake was non-significant. However, BE girls consumed more energy from fat in the sad condition as compared to the neutral condition. Baseline mood predicted BE girls' likelihood of reporting loss of control during the sad condition test meal.

**Conclusions:** Results suggest that emotional eating episodes in children reporting aberrant eating may be characterized by the experience of loss of control, rather than the consumption of objectively large amounts of food. Interventions focused on affect regulation may minimize the adverse consequences of pediatric binge eating.

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## 1. Introduction

The prevalence of pediatric obesity has dramatically increased in the past several decades, with recent estimates suggesting that up to 17% of children and adolescents in the United States are overweight or obese (Ogden et al., 2006). In addition to its myriad physical health sequelae (Dietz, 1998), pediatric obesity is associated with a host of psychosocial problems (Strauss & Pollack, 2003), including eating pathology (Goldschmidt, Passi Aspen, Sinton, Tanofsky-Kraff, & Wilfley, 2008). In particular, binge eating is a prevalent behavior among overweight youth that is marked by physical and psychosocial impairment (Goldschmidt & Wilfley, 2009; Tanofsky-Kraff, 2008; Tanofsky-Kraff, Yanovski, et al., 2009). Binge eating may complicate or exacerbate childhood obesity, and thus may represent a potential target of interventions for preventing the long-term negative consequences associated with chronic obesity and disordered eating (Jones et al., 2008; Tanofsky-Kraff, Wilfley, et al., 2007; Tanofsky-Kraff et al., 2010). In accordance with affect regulation theories of binge eating (Heatherton & Baumeister, 1991; Kenardy, Arnow, & Agras,

1996), negative mood has been identified as a proximal trigger to binge eating in adults and children (Hilbert, Rief, Tuschen-Caffier, de Zwaan, & Czaja, 2009; Stein et al., 2006; Tanofsky-Kraff, Goossens, et al., 2007; Tanofsky-Kraff, Theim, et al., 2007; Wolfe, Baker, Smith, & Kelly-Weeder, 2009); however, most research in children is limited by self-reports of eating behavior. The purpose of the current study was to examine the relation between binge eating and negative affect in children using a laboratory feeding paradigm.

Binge eating is characterized primarily by the experience of loss of control while eating (i.e., the sense that one cannot control what or how much one is eating). Both objective (i.e., consumption of an unambiguously large amount of food accompanied by loss of control while eating) and subjective binge eating (i.e., consumption of an amount of food consumed that is *not* unambiguously large, but is perceived as large by the respondent, accompanied by loss of control while eating) in children are associated with increased eating-related and general psychopathology, including emotional eating, shape and weight concerns, depression symptoms, and anxiety (Goldschmidt, Jones, et al., 2008; Tanofsky-Kraff, Goossens, et al., 2007; Tanofsky-Kraff, Theim, et al., 2007; Tanofsky-Kraff et al., 2004). Moreover, pediatric binge eating predicts weight gain and the onset of obesity (Field et al., 2003; Tanofsky-Kraff, Yanovski, et al., 2009; Tanofsky-Kraff et al., 2006), marking it as a problem with significant public health implications.

Although negative affect has been identified as a robust correlate and predictor of binge eating in children (Stice, Killen, Hayward, & Taylor, 1998; Tanofsky-Kraff, Faden, Yanovski, Wilfley, & Yanovski, 2005), little research to date has documented a causal link between

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the experience of negative emotions and binge eating in the laboratory (Hilbert, Tuschen-Caffier, & Czaja, 2010). While existing studies do indeed suggest that negative emotions may be a trigger for binge eating episodes in youth (Hilbert et al., 2009; Tanofsky-Kraff, Goossens, et al., 2007; Tanofsky-Kraff, Theim, et al., 2007), such work has relied primarily upon self-report methodology, which is often biased in children. The feeding laboratory paradigm offers a method for avoiding many of the confounding factors inherent in self-report. Feeding laboratory paradigms have long been utilized to directly observe eating behavior in a range of samples, including children (Hilbert et al., 2010; Tanofsky-Kraff, Haynos, Kotler, Yanovski, & Yanovski, 2007) and individuals with eating disorders (Mitchell, Crow, Peterson, Wonderlich, & Crosby, 1998). Feeding laboratory data suggest that eating episodes of children with binge eating problems differ from those of their peers in quantity and/or quality (Hilbert et al., 2010; Mirch et al., 2006; Tanofsky-Kraff, McDuffie, et al., 2009). Moreover, feeding laboratory studies have been essential in demonstrating links between mood and binge eating behavior in adults and children (Agras & Telch, 1998; Chua, Touyz, & Hill, 2004; Tanofsky-Kraff, McDuffie, et al., 2009; Telch & Agras, 1996). The laboratory is thus an ideal setting for examining the relation between negative affect and binge eating in children as it enables direct observation of eating behavior and allows for experimental manipulation of mood.<sup>2</sup>

The current study utilized a feeding laboratory paradigm to investigate the impact of two distinct affect manipulations, sad and neutral, on subsequent eating behavior among overweight girls with binge eating problems, as compared to overweight controls without binge eating problems. The primary aim was to examine whether induction of a sad mood is related to aberrant eating (i.e., greater overall energy intake and/or the experience of loss of control while eating) among overweight girls reporting binge eating problems. Because the previous literature suggests that binge eating in children is related to the experience of negative emotions (Hilbert et al., 2009; Tanofsky-Kraff, Goossens, et al., 2007; Tanofsky-Kraff, Theim, et al., 2007) and that binge eating episodes are associated with greater overall energy intake than normal meals (Hilbert & Tuschen-Caffier, 2007; Tanofsky-Kraff, McDuffie, et al., 2009), it was expected that children reporting binge eating episodes would consume more kilocalories and be more likely to report a sense of loss of control while eating following a sad mood induction relative to a neutral mood induction. The first secondary aim was to explore whether eating in response to aversive emotional states is a phenomenon specific to overweight youth experiencing binge eating, as opposed to a general function of overweight status. Given limited evidence of emotional eating behavior in the general population of overweight youth (Caccialanza et al., 2004; Jansen et al., 2003; Nguyen-Rodriguez, Chou, Unger, & Spruijt-Metz, 2008; Shapiro et al., 2007; Snoek, van Strien, Janssens, & Engels, 2007; Tanofsky-Kraff, Theim, et al., 2007), an interaction between binge eating status and mood condition was predicted whereby children with binge eating problems would consume more kilocalories following a sad versus neutral mood induction, and overweight controls without binge eating problems would consume a similar quantity of food regardless of mood condition. The next secondary aim was to investigate whether the level of negative affect after the sad mood induction was related to the presence of loss of control while eating during the test meal among girls reporting binge eating problems. Based on the findings from the adult literature (Engelberg, Steiger, Gauvin, & Wonderlich, 2007; Smyth et al., 2007), it was predicted that higher negative mood following the sad

mood induction would be related to a stronger likelihood of losing control during the subsequent test meal. The final secondary aim was to examine differences in macronutrient intake during the sad versus neutral mood inductions among girls reporting binge eating problems and overweight controls. It was expected that binge eating participants would consume a greater percentage of energy intake from carbohydrates and fat in the sad condition relative to the neutral condition, as compared to non-binge eating participants, given that carbohydrate and fat consumption is associated with both binge eating (e.g., Hilbert et al., 2010; Tanofsky-Kraff, McDuffie, et al., 2009) and mood improvements (Gibson, 2006).

## 2. Methods

### 2.1. Participants

Participants were 46 overweight or obese females (body mass index [BMI; kg/m<sup>2</sup>] ≥ 85th percentile for age and sex), aged 6–12 years. Of these, 23 participants endorsed at least one episode of objective or subjective binge eating within the past 3 months (BE), while the remaining 23 participants reported no history of binge eating and thus served as a comparison control group (CON). The BE group inclusion criterion was selected based on evidence that pediatric binge eating is associated with obesity, weight gain, and psychosocial impairment, independent of episode size or frequency (Goldschmidt, Jones, et al., 2008; Tanofsky-Kraff, Yanovski, et al., 2009; Tanofsky-Kraff et al., 2004). The sample size provided 80% power to detect a 500 kilocalorie difference between sad and neutral mood conditions (UCLA Department of Statistics, 2004), assuming equal variances and using mean and standard deviation estimates for eating episodes reported in prior studies (Agras & Telch, 1998; Mirch et al., 2006).

Participants were recruited through local schools, children's hospitals, pediatrician referrals, community organizations (e.g., health clubs), and Volunteer for Health, a university-based research referral network. Exclusion criteria included medications or medical conditions affecting appetite, body weight, or ability to sustain attention; food restrictions or preferences precluding consumption of greater than 50% of food items presented during the laboratory test meals; current psychosis or suicidality; and a current diagnosis of bulimia nervosa. A total of 137 participants were screened for participation in the study, of whom 86 were excluded before the baseline assessment (e.g., due to ineligible BMI), and an additional 5 of whom were excluded after randomization (e.g., due to attrition, failure to comply with study procedures).

After receiving a complete description of the study, participants and their parents provided written informed consent. For ethical reasons, participants were informed that the study purpose was to examine the relation between mood and eating behavior; however, this was the extent of their knowledge about the study aims. They were not aware of the specific mood states under investigation, the content of films used for the mood inductions, or study hypotheses. The study was approved by the Washington University School of Medicine Institutional Review Board.

### 2.2. Procedure

After a baseline assessment visit to determine study eligibility, participants completed two separate experimental study visits, which were scheduled approximately 1 week apart. Participants were provided a Kellogg's Nutri-grain<sup>®</sup> bar (140 kcal, 3 g fat) and a Nestle Juicy Juice<sup>®</sup> apple juice box (100 kcal, 0 g fat) to consume 3 h prior to each experimental session. At each experimental session, all participants viewed a brief (4 min 20 s) segment from either a sad ("The Champ," 1979) or neutral film ("Winged Migration," 2003). Both films are rated by the Motion Picture Association of America as appropriate for audiences of all ages. Film clips were selected as the method of

<sup>2</sup> Both naturalistic and laboratory feeding studies have suggested interactional effects of dietary restraint and negative affect on binge eating and overeating in adults (e.g., Cools, Schotte, & McNally, 1992; Schotte, Cools, & McNally, 1990; Sheppard-Sawyer, McNally, & Fischer, 2000; Stice, Akutagawa, Gaggan, & Agras, 2000); however, given that the literature is inconsistent regarding associations between binge eating and dietary restraint in children (Claas, Braet, & Decaluwe, 2006; Decaluwe & Braet, 2004; Decaluwe, Braet, & Fairburn, 2003; Tanofsky-Kraff et al., 2004), dietary restraint was not a focus of the current study.

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