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Research report

Depressive symptoms and observed eating in youth ☆

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ABSTRACT

Depressive symptoms in youth may be a risk factor for obesity, with altered eating behaviors as one possible mechanism. We tested whether depressive symptoms were associated with observed eating patterns expected to promote excessive weight gain in two separate samples. In Study 1, 228 non-treatment-seeking youth, ages 12–17 y (15.3 ± 1.4 y; 54.7% female), self-reported depressive symptoms using the Beck Depression Inventory. Energy intake was measured as consumption from a 10,934-kcal buffet meal served at 11:00 am after an overnight fast. In Study 2, 204 non-treatment-seeking youth, ages 8–17 y (13.0 ± 2.8 y; 49.5% female), self-reported depressive symptoms using the Children's Depression Inventory. Energy intake was measured as consumption from a 9835-kcal buffet meal served at 2:30 pm after a standard breakfast. In Study 1, controlling for body composition and other relevant covariates, depressive symptoms were positively related to total energy intake in girls and boys. In Study 2, adjusting for the same covariates, depressive symptoms among girls only were positively associated with total energy intake. Youth high in depressive symptoms and dietary restraint consumed the most energy from sweets. In both studies, the effects of depressive symptoms on intake were small. Nevertheless, depressive symptoms were associated with significantly greater consumption of total energy and energy from sweet snack foods, which, over time, could be anticipated to promote excess weight gain.

Introduction

A growing body of literature supports a connection between depressive symptoms and overweight (body mass index [BMI] ⩾85th percentile for age and sex) or obesity (BMI ⩾95th percentile) in youth. Overweight and obese children and adolescents generally report more depressive symptoms than their peers who are not overweight (Bell et al., 2011; BeLue, Francis, & Colaco, 2009; Erermis et al., 2004; Goldfield et al., 2010; Sjoberg, Nilsson, & Leppert, 2005). Several studies have shown that BMI and percentage body fat are positively associated with symptoms of depression in pediatric samples (Erickson, Robinson, Haydel, & Killen, 2000; Hillman, Dorn, & Bin, 2010; Katon et al., 2010). Furthermore, many, though not all (Bardone et al., 1998; Larsen, Otten, Fisher, & Engels, 2013; Pine, Cohen, Brook, & Coplan, 1997) longitudinal studies suggest that elevated depressive symptoms or major depressive disorder predict excessive increases in children's and adolescents' BMI over time (Pine, Goldstein, Wolk, & Weissman, 2001; Roberts & Duong, 2013; Rofey et al., 2009). In a meta-analysis of 16 longitudinal studies that included samples of adolescents and adults, depressive symptoms were significantly associated with an increased risk of developing obesity, even after accounting for the potential confounding factors of age, socioeconomic status, baseline BMI, health behaviors, and parental depression (Blaine, 2008). The association between depressive symptoms and obesity onset was particularly pronounced in adolescent girls, such that those with elevated depressive symptoms were 2.5 times more likely to become obese compared to girls with low symptoms (Blaine, 2008).

Findings are more mixed with regard to the reverse relationship – the role of obesity in promoting depressive symptoms – with some longitudinal studies reporting that obesity was associated

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with increases in depressive symptoms (Anderson, Cohen, Naumova, Jacques, & Must, 2007; Boutelle, Hannan, Fulkerson, Crow, & Stice, 2010) and other studies finding that initial BMI was not related to future depression (Roberts & Duong, 2013; Stice & Bearman, 2001; Stice, Hayward, Cameron, Killen, & Taylor, 2000).

Despite the consistent evidence supporting a link between depressive symptoms and obesity, the mechanisms that explain this relationship are not well understood. One possibility is that depressive symptoms alter eating behaviors that promote excessive weight gain. According to affective theories of disordered eating, eating may serve as a coping mechanism, temporarily reducing negative emotions or distracting an individual from distressing emotional states (Bruch, 1969; Heatherton & Baumeister, 1991; Kaplan & Kaplan, 1957). Among adults, individuals who report dietary restraint—cognitive intent and/or behavioral attempts to cut back on food intake for the purpose of maintaining or losing weight (regardless of effectiveness)—are especially likely to eat more in response to emotional distress. However, the opposite or no effect on eating has been observed in adults who do not endorse restraint (Heatherton, Herman, & Polivy, 1991; Polivy & Herman, 1976). According to theoretical models of restraint and hunger, cognitive and/or behavioral restriction of eating may increase vulnerability to overeating when dietary rules have been violated or through heightened responsiveness to environmental food cues (Lowe & Levine, 2005; Polivy & Herman, 1985).

In youth, emotional eating, referring to overeating in reaction to negative affect (Thayer, 2001), more frequently occurs in overweight or obese children and adolescents than normal weight youth, as measured by parent report (Braet & Van Strien, 1997; Eloranta et al., 2012; Santos et al., 2011; Webber, Hill, Saxton, Van Jaarsveld, & Wardle, 2009). Similarly, adolescent boys and girls who are distressed by frequent overeating episodes accompanied by feelings of loss of control report higher depressive mood than those without overeating or frequent overeating (Ackard, Neumark-Sztainer, Story, & Perry, 2003). Females may be especially likely to turn to food in an attempt to cope with negative affect (Dube, LeBel, & Lu, 2005; Mikolajczyk, El Ansari, & Maxwell, 2009). In adolescent girls and young adult women, depressive symptoms predict the onset of perceived overeating or overeating accompanied by feelings of loss of control (Skinner, Haines, Austin, & Field, 2012; Stice, Presnell, & Spangler, 2002).

Existing data suggest that individuals with elevated depressive symptoms also may be prone to overeating specific types of foods that promote obesity. For example, in adults, greater depression, perceived stress, and negative emotions have been associated with higher self-reported intake of carbohydrates, sweets and fast food, especially in females (Dube et al., 2005; Jeffery et al., 2009; Konttinen, Mannisto, Sarlio-Lahteenkorva, Silventoinen, & Haukkala, 2010; Mikolajczyk et al., 2009). In adolescents, depressive symptoms or stress have been related to higher self-reported consumption of sugary foods, percent calories from fat, or soft drinks (Fulkerson, Sherwood, Perry, Neumark-Sztainer, & Story, 2004; Kim, Yang, Kim, & Lim, 2013).

The current investigations had three aims. The first aim was to determine the relationship between depressive symptoms and observed eating behaviors in youth. In contrast to self-report measures of food intake, which may be limited by inaccurate recall and biased by social desirability (Fisher, Johnson, Lindquist, Birch, & Goran, 2000; Wolkoff et al., 2011), laboratory test meal studies have the advantage of providing observational data of participants' eating behaviors in a standardized environment (Hadigan, Kissileff, & Walsh, 1989; Tanofsky-Kraff, Haynos, Kotler, Yanovski, & Yanovski, 2007). We hypothesized that depressive symptoms would be related to greater observed total energy intake and to greater intake of energy from sweet snack foods, even when accounting for body composition.

The second aim was to test whether sex and dietary restraint moderated the relationship between youth's depressive symptoms and eating behavior. Prior literature supports an especially strong link between depressive symptoms and obesity in girls (Blaine, 2008; Larsen et al., 2013; Rofey et al., 2009). Also, females may be more likely than males to consume sweet snack foods in response to negative emotions (Dube et al., 2005; Mikolajczyk et al., 2009). Therefore, we hypothesized that the link between depressive symptoms and observed energy intake might be more pronounced in girls than boys. In addition, based upon adult data illustrating that individuals with dietary restraint are likely to overeat in response to negative mood and depressive symptoms (Heatherton et al., 1991; Polivy & Herman, 1976), we predicted that youth with both high depressive symptoms and high dietary restraint would eat more total energy and more energy intake from sweet snack foods as compared to youth with either high depressive symptoms or high restraint alone.

The third aim was to investigate eating behavior as a proposed mediator of the association between youths' depressive symptoms and adiposity. Based upon the notion that depressive symptoms, in theory, may contribute to excess weight gain via their effect on eating behavior, we hypothesized (i) that there would be a positive association between depressive symptoms and adiposity and (ii) that measured food intake patterns would mediate the depressive symptoms-adiposity relationship. To examine these aims and hypotheses, we conducted secondary analyses of two separate large, laboratory feeding studies.

Study 1

Methods

Participants and procedure

Participants were a convenience sample of adolescent boys and girls who took part in an observational study of eating behavior in youth recruited through flyers and school parent e-mail listservs in the Washington, DC and greater metropolitan area (ClinicalTrials.Gov ID: NCT00631644). The study was advertised as an investigation of eating behaviors in adolescents, and materials indicated that no treatment would be provided. Eligibility criteria were ages 13–17 years and good general health as indicated by a physical examination and medical history conducted by a nurse practitioner or endocrinologist. Adolescents who had chronic illnesses, were on medications likely to affect energy intake, were pregnant, in ongoing weight-loss treatment, had a psychiatric condition that would interfere with adherence to study procedures, or reported liking fewer than 50% of foods offered at the test meal were excluded. Participants provided written assent and their parents or legal guardians gave written consent for participation. The study was approved by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) Institutional Review Board. Participants were given monetary compensation for their participation. Participants attended an initial outpatient screening visit at the National Institutes of Health (NIH) Hatfield Clinical Research Center. Eligible adolescents returned for an outpatient test meal appointment on a separate day. On both days, adolescents were instructed to fast after 10:00 pm the night prior to the visit.

Measures

Pubertal assessment. Testicular volume (mL) was measured by using a set of orchidometer beads as standards according to Prader (Tanner, 1981) and breast development was assigned according to the five stages of Tanner (Marshall & Tanner, 1969, 1970). Testicular volume and breast development staging were utilized to