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Youth internalizing symptoms, sleep-related problems, and disordered eating attitudes and behaviors: A moderated mediation analysis

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ABSTRACT

Purpose: Internalizing symptoms increase the risk for disordered eating; however, the mechanism through which this relationship occurs remains unclear. Sleep-related problems may be a potential link as they are associated with both emotional functioning and disordered eating. The present study aims to evaluate the mediating roles of two sleep-related problems (sleep disturbance and daytime sleepiness) in the relationship between youth internalizing symptoms and disordered eating, and to explore if age moderates these relations.
Methods: Participants were 225 youth (8–17 years) attending a primary care appointment. Youth and legal guardians completed questionnaires about youth disordered eating attitudes and behaviors, internalizing symptoms, sleep disturbance, and daytime sleepiness. Mediation and moderated mediation analyses were utilized.
Results: The mediation model revealed both youth sleep disturbance and daytime sleepiness independently mediated the association between internalizing symptoms and disordered eating attitudes and behaviors, and explained 18% of the variance in disordered eating. The moderated mediation model including youth age accounted for 21% of the variance in disordered eating; youth age significantly interacted with sleep disturbance, but not with daytime sleepiness, to predict disordered eating. Sleep disturbance only mediated the relationship between internalizing symptoms and disordered eating in youth 12 years old and younger, while daytime sleepiness was a significant mediator regardless of age.
Conclusion: As sleep-related problems are frequently improved with the adoption of health behaviors conducive to good sleep, these results may suggest a relatively modifiable and cost-effective target to reduce youth risk for disordered eating.

1. Introduction

Disordered eating in youth is a major health concern with 9% of American adolescents meeting criteria for a specific eating disorder or an eating disorder not otherwise specified (Field et al., 2012; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Moreover, subclinical disordered eating attitudes and behaviors (e.g. skipping meals, binging, excessive concern about shape and weight) are even more prevalent (Field et al., 2012; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011). Though disordered eating attitudes and behaviors peak in late adolescence to early adulthood, there is growing evidence of their occurrence at increasingly younger ages (Neumark-Sztainer et al., 2011). It is estimated that 28%–55% of girls and 17%–30% of boys (6–11 years) report wanting to be thinner (Ricciardelli & McCabe, 2001), and that 48.2% of girls and 34.8% boys (mean age 12.8 years) engage in unhealthy weight control behaviors, including dieting, fasting, or purging (Neumark-Sztainer et al., 2011). These attitudes and behaviors in youth are concerning as they are associated with negative outcomes including obesity, additional psychopathology, and substance use (Field et al., 2012; Micali, Ploubidis, De Stavola, Simonoff, & Treasure, 2014).

Internalizing symptoms, including symptoms of anxiety and depression, are consistently associated with disordered eating attitudes and behaviors cross-sectionally and longitudinally (Holm-Denoma, Hankin, & Young, 2014; Swinbourne & Touyz, 2007; Gardner, Stark, Friedman, & Jackson, 2000). Measelle, Stice, and Hogansen (2006) found depression in adolescent girls (12–19 years) predicted later disordered eating attitudes and behaviors but not vice versa. Similarly, Kaye et al. (2014) found that 42% of women with anorexia nervosa or bulimia nervosa reported developing one or more anxiety disorders in childhood and that the majority of those women reported their anxiety disorder onset to predate their eating disorder.

Despite this link between internalizing symptoms and disordered eating attitudes and behaviors, little is known about how this association may present across age groups in youth. To our knowledge, only Holm-Denoma et al. (2014) have examined this question. They found that the relationship between depression and eating pathology increased with age and was stronger in girls than in boys, while the relationship between anxiety and eating pathology remained consistent

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across age and gender. Their results suggest that the association between youth internalizing symptoms and disordered eating attitudes and behaviors differs systematically by age and gender; however, the mechanism through which this association occurs remains unclear.

Sleep-related problems may be a potential link as they are associated with both emotional functioning and eating behavior (Taheri, Lin, Austin, Young, & Mignot, 2004; Wheaton, Perry, Chapman, & Croft, 2013). It is estimated that 25–43% of youth experience a sleep-related problem during childhood (Owens, 2008). Children (9–12 years) more frequently report sleep disturbances (i.e. insomnia, nightmares, and somnambulism), while adolescents (13–16 years) are more likely to report subjective daytime sleepiness (i.e. feeling tired during the day; (Alfano, Zakem, Costa, Taylor, & Weems, 2009; Shanahan, Copeland, Angold, Bondy, & Costello, 2014). Moreover, sleep-related problems disproportionally affect youth with internalizing symptoms. A recent study revealed that youth (9–16 years) with anxiety and depression endorsed three times more sleep problems, on average, than youth without a psychiatric diagnosis (Shanahan et al., 2014). While this relationship is likely bidirectional, internalizing symptoms consistently are shown to predate sleep-related problems (Gregory & Sadeh, 2012; Shanahan et al., 2014).

In addition to being highly comorbid with internalizing symptoms, sleep-related problems impact physiological and behavioral factors related to food consumption (Taheri et al., 2004). Furthermore, recent studies have linked sleep-related problems to disordered eating attitudes and behaviors. Wheaton et al. (2013) found that short sleep duration (<7 hours per night) was associated with greater use of unhealthy weight control behaviors in male and female adolescents, while Trace et al. (2012) found sleep disturbance, daytime sleepiness, sleep restriction, sleeping poorly, and problems falling asleep all positively correlated with binge eating in women (20–47 years).

Despite these associations between sleep-related problems and both internalizing symptoms and disordered eating attitudes and behaviors, few studies have evaluated how internalizing symptoms and sleep-related problems may work together to impact disordered eating attitudes and behaviors. To our knowledge, only Nguyen-Rodriguez, McClain, and Spruijt-Metz (2010) have examined this question in children. They found that anxiety, but not depression, mediated the relationship between sleep onset latency and emotional eating in minority children (8–12 years). In adults, Lombardo et al. (2014) found that depression mediated the relationship between insomnia (i.e. >4 weeks of non-restorative sleep and difficulty initiating or maintaining sleep) and disordered eating symptoms in women. However, their follow-up study using a sample of women with diagnosed eating disorders failed to fully support these findings and showed that depression mediated the associations between poor sleep and both drive for thinness and body dissatisfaction, but not the relationship between poor sleep and bulimia symptoms (Lombardo, Battagliese, Venezia, & Salvemini, 2015).

Although these studies provide support for internalizing symptoms and sleep-related problems working synergistically to impact disordered eating attitudes and behaviors, the inconsistent results and dearth of research in youth highlight the need for further research in this area. Considering the high comorbidity between anxiety and depression (Axelson & Birmaher, 2001), the focus of previous studies on depression or anxiety individually may not fully capture the extent of these associations. Thus, the present study aims to evaluate these associations in youth using a broadband measure of internalizing symptoms. We also aim to build on previous research by examining the unique mediating roles of two different types of sleep-related problems (sleep disturbance and daytime sleepiness) in the relationship between internalizing symptoms and disordered eating attitudes and behaviors in youth. Finally, given age-based differences in these factors, this study seeks to explore how these associations present across school-age youth.

We hypothesize that internalizing symptoms, sleep disturbance, daytime sleepiness, and age will all positively correlate with disordered eating attitudes and behaviors. We also expect sleep disturbance and daytime sleepiness to each uniquely mediate the association between youth internalizing symptoms and disordered eating attitudes and behaviors. Finally, based on previously noted age-related differences in eating disturbances and sleep-related problems, we expect that age will moderate these indirect effects. As young children report more sleep disturbance and adolescents report more daytime sleepiness (Alfano et al., 2009; Shanahan et al., 2014), we hypothesize that sleep disturbance will only be a significant mediator in young children while daytime sleepiness will only be a significant mediator in adolescents.

2. Material and methods

2.1. Study design and participants

A total of 225 youth, and their legal guardians, were recruited to participate in a larger study examining youth unhealthy eating and weight control behaviors while attending a regularly scheduled pediatric primary acute or well care appointment. Overall, 409 eligible dyads were approached; 174 chose not to participate in the study after their clinic appointment due to time concerns; 10 agreed to participate but later withdrew or were found ineligible.

Research staff approached eligible patients and caregivers after their clinic appointment. Youth were eligible if they were between the ages of 8 and 17, English-speaking, and accompanied by an English-speaking legal guardian. Youth were ineligible if they were diagnosed with short stature, intellectual disability, or a psychotic disorder. After completing informed consent and assent procedures, participating caregivers and youth separately completed questionnaires and were compensated with a $5 gift card. Research staff was available to answer questions. The governing Institutional Review Board approved the larger study.

2.2. Measures

2.2.1. Demographic information

Caregivers provided demographic information including family income, youth age, sex, and race. Youth height and weight measurements were obtained from the participants' electronic medical records either from that visit or the next most recent clinic visit.

2.2.2. Internalizing symptoms

The Internalizing Problems Scale from the Child Behavior Checklist (CBCL) was used to measure youth internalizing symptoms (Achenbach, 2001). This 32-item, parent-report measure is the composite of the anxious/depressed (e.g., cries a lot; fears going to school), withdrawn/depressed (e.g., unhappy, sad or depressed), and somatic complaints subscales (e.g., physical problems without known medical cause). For every item, parents rate their child's behavior on a 3-point Likert scale from “Not True” to “Very/Often True.” The current study used t-scores; scores between 65 and 69 indicate borderline clinically impaired functioning; scores ≥70 indicate clinically impaired functioning. The CBCL has excellent internal consistency, test–retest reliability, a stable factor structure, and the constructs are highly correlated with other measures of childhood behavior (Dutra, Campbell, & Westen, 2004); Cronbach's alpha for the current study was .89.

2.2.3. Disordered eating attitudes and behaviors

Youth reported disordered eating attitudes and behaviors were assessed with the 26-item Children's Eating Attitudes Test (ChEAT; Maloney, McGuire, & Daniels, 1988). Youth rate how often they engage in specific disordered eating attitudes and behaviors from four domains (Dieting, Restricting and Purging, Food Preoccupation, and Oral Control)