



Original article

Association Between Childhood to Adolescent Attention Deficit/Hyperactivity Disorder Symptom Trajectories and Late Adolescent Disordered Eating



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A B S T R A C T

Purpose: Disordered eating is more prevalent among adolescents with attention deficit/hyperactivity disorder. Both inattention and hyperactivity/impulsivity symptoms show strong associations with disordered eating, but few investigations of these associations have been longitudinal. Thus, we examined the effect of childhood to adolescent inattention and hyperactivity/impulsivity symptom trajectories on late adolescent disordered eating.

Methods: We used growth mixture modeling to identify distinct inattention and hyperactivity/impulsivity symptom trajectories (called “classes”) across three time points (ages 8–9, 13–14, and 16–17 years) in the Swedish Twin study of CHild and Adolescent Development. The resulting classes were used to predict Eating Disorder Inventory-2 Bulimia, Drive for Thinness, and Body Dissatisfaction subscales at age 16–17 years, with adjustment for sex and body mass index at age 16–17 years.

Results: The combined inattention and hyperactivity/impulsivity symptom trajectory classes included: a “low symptom” class characterized by low inattention and hyperactivity/impulsivity throughout childhood/adolescence; a “predominantly inattention” class characterized by elevated inattention, but not hyperactivity/impulsivity, throughout childhood/adolescence; a “predominantly hyp/imp” class characterized by elevated hyperactivity/impulsivity, but not inattention, throughout childhood/adolescence; and a “both inattention and hyp/imp” class characterized by elevated inattention and hyperactivity/impulsivity throughout childhood/adolescence. After adjusting for sex and body mass index or sex and anxiety/depression symptoms, the “both inattention and hyp/imp” (vs. “low symptom”) class predicted significantly higher Eating Disorder Inventory-2 subscale scores during late adolescence.

IMPLICATIONS AND CONTRIBUTION

In this longitudinal, community-based study, a combination of higher inattention and higher hyperactivity/impulsivity symptoms throughout childhood and adolescence was associated with increased disordered eating risk in late adolescence. These findings encourage increased vigilance by parents, teachers, and health care providers for the emergence of disordered eating among youth with attention deficit/hyperactivity disorder symptoms.

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Conclusions: Increased vigilance for disordered eating among children who have both inattention and hyperactivity/impulsivity symptoms throughout childhood and adolescence could aid in early identification of eating disorders.

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Disordered eating is more prevalent among children and adolescents with attention deficit/hyperactivity disorder (ADHD) than the general population [1]. Furthermore, several large population-based studies have indicated a prospective relationship between ADHD and varying degrees of subsequent disordered eating [2–7]; for instance, girls with ADHD may be up to six times more likely to develop an eating disorder than girls without ADHD [8]. In clinical settings, 20%–24% of adults with bulimia nervosa retrospectively report having experienced ADHD symptoms during childhood [9,10], and ADHD symptoms are associated with greater eating disorder severity [10,11]. ADHD symptoms onset in early childhood, whereas disordered eating tends to onset during adolescence/young adulthood [12]. Thus, gaining a better understanding of the nature of the association between ADHD and disordered eating using longitudinal ADHD data could provide important insight into one risk pathway leading to disordered eating and, potentially, the development of full-threshold eating disorders [13].

To date, few studies have evaluated whether it is the inattention versus hyperactivity/impulsivity symptoms of ADHD that serve as a risk factor for disordered eating [2,3,6]. ADHD is defined by difficulty with self-regulation, specifically in the areas of attention (i.e., inattention) and behavior regulation (i.e., impulsivity), with ADHD-related impairments also observed across a variety of other areas including motivation, emotion regulation, and organizational skills [14]. One hypothesis is that impulsivity and the related construct, lack of inhibition, may contribute to disordered eating behaviors such as binge eating [3,15]. Impulsivity is a predictor of eating disorder severity and poor treatment outcome [16], suggesting that impulsivity may influence eating disorders, especially those marked by binge eating and/or purging behaviors. Another nonmutually exclusive hypothesis is that disordered eating may be influenced by inattentiveness to the internal sense of hunger, satiety, and amount of food consumed on a daily basis, which is also a phenomenon observed in individuals with ADHD [17]. Preliminary evidence suggests that disordered eating in individuals with bulimia nervosa is associated with both inattention and hyperactivity/impulsivity; however, the association may be stronger for inattention than for impulsivity/hyperactivity [10].

Although preliminary results support both of the aforementioned hypotheses, most studies investigating the relative contributions of inattention and hyperactivity/impulsivity symptoms have examined these symptoms cross-sectionally or retrospectively. The few longitudinal studies conducted to date [2–4,6,8] have relied on broad dichotomous classifications of ADHD, thus failing to capture how the specific types of ADHD symptoms relate to disordered eating. In addition, previous studies [2,3,10,11] often recruited individuals with clinical ADHD and/or eating disorders and did not investigate these symptoms in the community, so it is unknown if these associations generalize to nonclinical populations.

Thus, the goal of the present study was to evaluate whether inattention, hyperactivity/impulsivity, or combined symptoms across childhood and early adolescence played a role in the development of disordered eating in late adolescence in a Swedish community-based cohort. We hypothesized that children with persistently high inattention and hyperactivity/impulsivity trajectories across childhood and early adolescence would be more likely to report disordered eating in late adolescence. In addition, given that ADHD symptoms are associated with higher body mass index (BMI) [18] and that higher BMI is a risk factor for disordered eating [19], we also examined if the relationship between ADHD symptoms and disordered eating remained after adjusting for BMI. Likewise, given that ADHD symptoms are also associated with higher levels of anxiety and depression [20], which are risk factors for disordered eating [21,22], we also examined if the relationship between ADHD symptoms and disordered eating remained after adjusting for anxiety and depression symptoms.

Methods

Participants

Our study sample consisted of participants from the Swedish Twin Study of Child and Adolescent Development (TCHAD). TCHAD comprises all twins born between May 1985 and December 1986 in Sweden [23]. The Swedish Medical Birth Register [24] was used to identify the twins and their parents, who were invited to participate by completing parent- and self-report questionnaires at four different time points: wave 1 (ages 8–9 years), wave 2 (ages 13–14 years), wave 3 (ages 16–17 years), and wave 4 (ages 18–19 years).

For the purpose of this study, we used data collected at waves 1–3 (see Supplemental Figure 1). Our analysis sample included 2,315 participants (78.4% of the total sample) who had all covariates observed and data on inattention or hyperactivity/impulsivity at at least one time point. Of the included participants, 50.6% were female and 39.9% were monozygotic twins, with the remaining twins belonging to either same- or opposite-sex dizygotic twin pairs. The mean ages at waves 1, 2, and 3 were $8.7 \pm .5$, $13.7 \pm .5$, and $16.7 \pm .5$ years, respectively.

Consent was obtained from all twins and their parents who participated. Ethical approval for each wave was provided by the Ethics Committee at Karolinska Institutet in Stockholm, Sweden, and the study was approved by the University of North Carolina Institutional Review Board.

Measures

Eating Disorder Inventory-2. The Swedish version of the Eating Disorder Inventory-2 (EDI-2) [25], which has been validated and shown to have good psychometric properties [26], was used to assess disordered eating attitudes and behaviors by adolescent

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