



ORIGINAL ARTICLE

# Anxiety and depression among adolescents with attention-deficit/hyperactivity disorder: The roles of behavioral temperamental traits, comorbid autism spectrum disorder, and bullying involvement



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## KEYWORDS

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**Abstract** The aim of this study was to examine the associations of behavioral temperamental traits, comorbid autism spectrum disorder (ASD), and bullying involvement with anxiety and depression among adolescents with attention-deficit/hyperactivity disorder (ADHD) in Taiwan. A total of 287 adolescents aged 11–18 years diagnosed with ADHD participated in this study. Their severities of anxiety and depression were assessed. Multiple regression analysis was used to examine the correlates of anxiety and depression. The results show that adolescents with ADHD who reported a higher behavioral inhibition system (BIS) score, had comorbid ASD, and were bullying victims, reported more severe anxiety and depressive symptoms. Adolescents with ADHD who bullied others reported more severe depressive symptoms than those who did not bully. The results of this study indicated that behavioral temperamental traits on the BIS, comorbid ASD, and bullying involvement were significantly associated with anxiety and depression among the adolescents with ADHD.

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## Introduction

Attention-deficit/hyperactivity disorder (ADHD) is classified as one of the neurodevelopmental disorders with onset in the developmental period according to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) [1]. Evidence shows that a high proportion (26–65%) of ADHD persists into adolescence or early adulthood [2]. Previous studies also demonstrate that compared with adolescents without ADHD, the adolescents with ADHD have significant functional impairment in the domains of quality of life, psychological adjustment, work performance, and interpersonal relationships [2]. The results of previous studies indicate that mental health problems in adolescents with ADHD warrant further study.

Comorbid anxiety and depression are prevalent among the adolescents with ADHD. Research indicates that over one-third of adolescents with ADHD have comorbid anxiety disorders [3]. The individuals with comorbid ADHD and anxiety had worse working memory deficits [4], worse overall functioning [5], poorer psychosocial quality of life [6], and a lower response rate to stimulant treatment [7] than those with pure ADHD. Meanwhile, the 2007 National Survey of Children's Health in the United States found that children and adolescents with ADHD were more likely to have depression than those without ADHD (14% vs. 1%) [8]. Comorbid ADHD and depression result in greater levels of psychosocial impairment than those with pure ADHD [9]. Depression also mediates the association between ADHD symptoms and suicidality in female adolescents [10]. These characteristics support that comorbid anxiety and depression need routine scrutiny among adolescents with ADHD.

Not every adolescent with ADHD, however, has comorbid anxiety and depression, indicating that there may be risk or protective factors that increase or reduce the possibility of comorbid anxiety and depression in adolescents with ADHD. Investigators identified several risk factors for depression and anxiety in youths with ADHD, such as female sex, disruptive behaviors, substance use disorder, and poor coping skills [11–13]. According to the transactional model of developmental psychology, developmental changes occur as a result of continuous reciprocal interactions between an active organism and its active environmental context [14]. As important individual and environmental factors for adolescents' mental health, the roles of behavioral temperamental traits measured using the behavioral inhibition system (BIS) and the behavioral approach system (BAS), comorbid autism spectrum disorder (ASD) and involvement in peer bullying for comorbid anxiety and depression have not been examined in a clinical group of adolescents with the diagnosis of ADHD.

According to Gray's reinforcement sensitivity theory [15], BIS represents sensitivity to punishment and reflects the degree to which respondents feel anxious when confronted with cues for punishment (e.g., "I feel pretty worried or upset when I think or know somebody is angry at me") [16]. BAS represents sensitivity to reward and comprises subscales of reward responsiveness, drive, and fun seeking [16]. Reward responsiveness measures the degree to which rewards lead to positive emotions (e.g., "When I'm doing well at something I love to keep at it"). Drive relates to a person's tendency to pursue appetitive

goals actively (e.g., "I go out of my way to get things I want"). Fun seeking describes the tendency to seek and impulsively engage in potentially rewarding activities (e.g., "I'm always willing to try something new if I think it will be fun") [16]. Depue and Iacono [17] conceptualized depression as the result of an inactive BAS that fails to produce positive effect or incentive-reward motivation. However, the results of previous studies regarding the association between depression and BAS are mixed. One earlier study found that low BAS levels were correlated with greater concurrent depression severity in the individuals with depression [18], whereas another study found that BAS sensitivity was not associated with concurrent levels of depression in adolescents with bipolar disorder [19]. Research indicates that compared with nondepressed individuals, those with depression reported higher BIS scores [18]. BIS scores correlated positively with self-reported anxiety in adolescents with bipolar disorder [19]. Researchers found that compared with the general population, people with ADHD have low inhibition as measured using the BIS [20], low drive as measured on the BAS [21], and high fun-seeking behavior on the BAS [22]. Investigators hypothesize that difficult temperament accounts for poor adaptability to new situations and negative mood states in children with ADHD [23]. Examining the effects of behavioral temperamental traits on anxiety and depression in adolescents with ADHD should improve our understanding and ability to help these young people manage their disabilities.

Another possible correlate of anxiety and depression deserving further examination is comorbid ASD. The DSM-5 revised the criteria for ADHD and allowed for the comorbidity of ADHD and ASD (American Psychiatric Association, 2013) [1]. Anxiety and depressive disorders are prevalent among children and adolescents with ASD [24]. The children with comorbid ASD and ADHD are more likely to have anxiety and depressive disorders than those with pure ASD [24]. However, the influence of comorbid ASD on anxiety and depression in adolescents with ADHD warrants further study.

Research shows that being the victim of bullying results in more severe anxiety and depression than in those who were not involved in bullying [25]. Research also revealed that the patients with comorbid ADHD and anxiety were more likely to experience being bullied than those with pure ADHD [26]. Additionally, being a perpetrator of bullying results in more severe anxiety than in those not involved in bullying [25]. However, the associations of bullying perpetration with anxiety and depression in adolescents with ADHD are not well characterized.

The aim of the present study was to examine the associations of behavioral temperamental traits, comorbid ASD, and bullying involvement with anxiety and depression among adolescents with ADHD in Taiwan. We hypothesize that after controlling for the effects of demographic and ADHD characteristics, comorbid ASD and being a bullying victim or perpetrator is significantly associated with the severity of anxiety or depression or both. We also hypothesize that the BIS score is positively associated with the severity of anxiety and depression, whereas the BAS scores are negatively associated with the severity of anxiety and depression in adolescents with ADHD.

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