



## Research Paper

# Relationships of bullying involvement with intelligence, attention, and executive function in children and adolescents with attention-deficit/hyperactivity disorder



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## ARTICLE INFO

Number of reviews completed is 1.

**Keywords:**

Attention-deficit/hyperactivity disorder

Bullying

Intelligence

Executive function

## ABSTRACT

This study investigated the relationship of bullying victimization and perpetration with the levels of intelligence, attention, and executive function in children who had received a diagnosis of attention-deficit/hyperactivity disorder (ADHD). The experiences of bullying involvement in 105 children with ADHD were assessed using the Chinese version of the School Bullying Experience Questionnaire. Their scores for four intelligence indexes on the Wechsler Intelligence Scale for Children 4th Edition-Chinese version were determined. Their levels of attention and executive function were assessed using the Comprehensive Nonverbal Attention Test Battery. The results of logistic regression analyses indicated that a high Perceptual Reasoning Index was significantly associated with a decreased risk of being victims of bullying. A high level of executive function was significantly associated with a decreased risk of being victims and perpetrators of bullying. Bullying victimization and perpetration in children with ADHD having a low PRI and low executive function should be routinely surveyed.

**What this paper adds?**

This paper adds knowledge to the field of examining the relationship of neurocognitive functions, including intelligence, attention, and executive function, with bullying victimization and perpetration in youths with ADHD.

**1. Introduction****1.1. Bullying involvement and attention-deficit/hyperactivity disorder**

Children and adolescents with attention-deficit/hyperactivity disorder (ADHD) have been identified to have a high risk of

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bullying victimization and perpetration. Cross-sectional community studies have reported that both ADHD diagnosis and ADHD symptoms are significantly associated with bullying victimization and perpetration (Holmberg & Hjern, 2008; Kumpulainen et al., 1998; Yen et al., 2014). A study evaluated children and adolescents with ADHD and reported that compared with controls, children with ADHD had significant victimization experiences (Twyman et al., 2010). In addition, prospective cohort studies have reported that ADHD symptoms predict subsequent bullying victimization (Yang, Stewart et al., 2013) and perpetration (Verlinden et al., 2015). These results indicate that children and adolescents with ADHD may more likely be involved in bullying.

### 1.2. Relationship between intelligence quotient and bullying involvement

Identification of risk factors and protective factors for bullying involvement in youths is fundamental for developing prevention and intervention strategies. In particular, unchangeable risk factors for bullying involvement can be used as indicators of prevention and early detection. Moreover, modifiable risk factors and protective factors can serve as targets of interventions for preventing bullying involvement. Among youths with ADHD, being a female (Elkins, Malone, Keyes, Iacono, & McGue, 2011), young age (Chou, Liu, Yang, Yen, & Hu, 2014), ADHD symptoms (Kawabata, Tseng, & Gau, 2012), high behavioral temperament of inhibition (Chou et al., 2014), comorbid autism spectrum disorders (Chou et al., 2014), and low satisfaction with family relationships (Chou et al., 2014) have been associated with severe bullying victimization, whereas being a male (Novik, Hervas, & Ralston, 2006), ADHD symptoms (Kawabata et al., 2012), high fun-seeking behavior (Chou et al., 2014), and low satisfaction with family relationships (Chou et al., 2014) have been associated with severe bullying perpetration. However, as a neurodevelopmental disorder (American Psychiatric Association, 2013), the relationship between neurocognitive function and bullying involvement in youths with ADHD remains unexamined. Intelligence consists of multidimensional neurocognitive abilities that help in adapting to daily life activities within an environment (Wechsler, 2003). Given that low intelligence quotient (IQ) may render effectively resolving peer conflicts and developing complex nonaggressive social problem-solving skills difficult for youths (Huesmann, Eron, & Yarmel, 1987), it is reasonable to hypothesize that low IQ increases the risk of peer victimization and perpetration. However, related studies on different populations have yielded inconsistent results. A follow-up study reported that low IQ increased the risk of chronic victimization in children in a community (Bowes et al., 2013), whereas low IQ was associated with low verbal victimization (Day et al., 2015) but with high bullying perpetration (Yau et al., 2013) in extremely low-birth-weight children. Therefore, additional studies evaluating the relationship between intelligence and bullying involvement in children and adolescents who receive a clinical diagnosis of ADHD are required.

Except for differences in study samples, another possible etiology accounting for the discrepancies among the results of previous studies is that only specific components of IQ, but not the overall IQ, is significantly associated with bullying involvement. A prospective cohort study reported that low nonverbal IQ predicted the risk of victimization (Verlinden et al., 2014). In addition, a cross-sectional study reported an association of lower fluid intelligence with both perpetration and physical bullying victimization (Huepe et al., 2011). Additional studies examining whether various components of intelligence have different relationships with bullying involvement in youths with ADHD are required.

### 1.3. Relationship of attention and executive function with bullying involvement

Both inattention (Salum et al., 2014) and executive function impairment (Sonuga-Barke et al., 2008) are the core neurocognitive characteristics of ADHD. Self-reported (Kumpulainen et al., 1998; Yen et al., 2014) and parent-reported (Yang, Stewart et al., 2013) inattention symptoms have been significantly associated with bullying victimization and perpetration. However, clinical inattention symptoms were correlated with but not equal to inattention performance measured using neurocognitive tests (Salum et al., 2014). No study has yet examined the relationship between inattention measured using neurocognitive tests and bullying involvement in youths with a clinical diagnosis of ADHD. Executive function is one of the neurocognitive functions crucial for building a successful peer relationship among youths (Séguin & Zelazo, 2005). A prospective cohort study reported that executive function problems at the age of 4 years increased the risk of bullying victimization and perpetration in the first grade of elementary school (Verlinden et al., 2014). However, no study has yet examined the relationship between executive function and bullying involvement in children and adolescents with ADHD.

### 1.4. Aims of this study

This study investigated the relationship between bullying victimization and perpetration by examining the levels of neurocognitive functions, including intelligence, attention, and executive function, in children who had received a clinical diagnosis of ADHD. We hypothesized that low intelligence, inattention, and low executive function are significantly associated with the risk of bullying victimization and perpetration.

## 2. Methods

### 2.1. Participants

Participants were recruited from the child psychiatric outpatient clinic of a medical center in Kaohsiung, Taiwan. Children aged 6–12 years who had received a diagnosis of ADHD on the basis of diagnostic criteria outlined in the Diagnostic and Statistical Manual

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