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The impact of attention deficit/hyperactivity disorder on adaptive functioning in children diagnosed late with autism spectrum disorder—A comparative analysis☆

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ABSTRACT

This study investigated the relationship between ASD, ADHD and adaptive behavior in children aged 7–17 years at the time of their first ASD diagnosis. Results showed that 68.1% of the participants had a clinical diagnosis of ADHD in addition to ASD. A hypothesis of an additive negative effect of ADHD on adaptive behavior of children with ASD was partly supported. When controlling for age, gender, IQ, and autistic symptoms, communication was the only adaptive behavior domain that remained significant. Further analyses of the data showed that this effect was limited to high functioning boys (IQ $\geq$ 80). The reasons why ADHD did not impinge on the adaptive behavior of low functioning boys and low and high functioning girls are discussed.

1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition with heterogeneous etiologies, which have in common clinically significant, persistent deficits in social communication, and restricted, repetitive patterns of behavior and/or interest (WHO, 1993). In a recent Icelandic study, the prevalence of ASD was estimated at 1.2%, which is congruent with the current literature. Increased ASD prevalence can be explained in large part by a rise in the number of cases that receive late diagnosis (i.e., after 6–7 years of age) (Jónsdóttir, Saemundsen, Antonsdóttir, Sigurdardóttir, & Ólason, 2011; Saemundsen, Magnússon, Georgsdóttir, Egilsson, & Rafnsson, 2013). This growing group has received limited attention from researchers (Mandy, Charman, Gilmour, & Skuse, 2011). Attention deficit/hyperactivity disorder (ADHD) is also of neurodevelopmental origin, characterized by diminished attention and/or hyperactivity and impulsivity with concomitant difficulties in academic performance, and/or in the social arena (WHO, 1993). The prevalence of ADHD is estimated to be in

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the range of 4–7% (Spencer, Biederman, & Mick, 2007; Willcutt, 2012). Symptoms of both disorders are distributed on a continuum (Lai, Lombardo, & Baron-Cohen, 2014; Marcus & Barry, 2011).

ASD and ADHD may present in the same individual, although a dual diagnosis has been controversial (Hanson et al., 2013; Rommelse, Franke, Geurts, Hartman, & Buitelaar, 2010). According to the ICD-10 (WHO, 1992, 1993) and the DSM-IV (APA, 1994, 2000) diagnostic criteria, these disorders are mutually exclusive, which has resulted in limited research into their relationship (Sikora, Vora, Coury, & Rosenberg, 2012; Sinzig, Morsch, Bruning, Schmidt, & Lehmkulh, 2008; Yerys et al., 2009). The reason for the exclusion criteria was that ADHD symptoms were seen as part of the ASD symptomatology or resulting from it (Rommelse et al., 2010; van der Meer et al., 2012). Despite the exclusion criteria, it has been quite common in clinical practice to give the diagnosis of ASD and ADHD concurrently, thus emphasizing the importance of an idiographic approach to treatment selection (Matson, Rieske, & Williams, 2013; Rommelse et al., 2010). However, in the latest revision of the DSM, ASD and ADHD can be diagnosed concurrently (APA, 2013). Recent studies show a high degree of co-occurrence of ASD and ADHD, especially in clinical samples. The percentage of individuals with ASD who have ADHD has been found to be in the range of 16–83% (Frazier et al., 2001; Goldstein & Schwebach, 2004; Hanson et al., 2013; Holtmann, Bölte, & Poustka, 2007; Simonoff et al., 2008; Sinzig, Walter, & Doepfner, 2009; Yoshida & Uchiyama, 2004). Several reasons may explain this huge range in prevalence, e.g., different study groups and different methodologies (Hanson et al., 2013). In the only population-based study on the subject, the rate of ADHD was estimated to be 28.2% in children with ASD (Simonoff et al., 2008).

It is well established in research that individuals with either ASD or with ADHD both show functional impairment in daily life or deficits in adaptive behavior (Kanne et al., 2011; Stein, Szumowski, Blondis, & Roizen, 1995; Sparrow, Cicchetti, & Balla, 2005). In individuals with autism, a discrepancy between cognitive abilities and adaptive functioning, where IQ was consistently higher than measures of adaptive behaviors, has been known for some time. Recent research indicates that this discrepancy is less noticeable in lower-functioning ASD individuals, and most prominent in those who have IQ in the normal range (Kanne et al., 2011). Adaptive behaviors within the ASD group tend to show similar profiles, where those who are most impaired in the social arena are also impaired in communication, but show relative strength in daily life skills (Kanne et al., 2011). Functional impairment is generally found to be less severe in children with ADHD than in those with ASD (Nijmeijer et al., 2008; Stein et al., 1995; Yerys et al., 2009). According to a study by Sparrow et al. (2005), ADHD symptoms show similar patterns of adaptive abilities. If ASD and ADHD discretely cause impairment in adaptive behavior, the hypothesis follows that the negative impact on adaptive behavior may be additive when these conditions are both present in the same individual. However, there is limited knowledge on how significant ADHD symptoms affect daily functioning of individuals with ASD.

Yerys et al. (2009) were the first to compare the adaptive functioning of typically developing children, children with ASD and children with ASD and ADHD. Typically developing children functioned better than the ASD group in all domains on the Vineland Adaptive Behavior Scales–Second Edition (VABS-II). The ASD + ADHD group received significantly lower scores in the domain of daily living skills compared with those with ASD-only. On other domains of the VABS-II, communication and social skills, the ASD + ADHD group had lower scores, but the difference was not significant. A more recent study with a much larger sample also found that the ASD + ADHD group was more impaired than the ASD-only group, with a statistical difference between groups on all VABS-II domains, as well as the composite score (Sikora et al., 2012). These results suggest that the groups are clinically distinct, which is important to study in more detail, especially regarding the role of key factors such as age, gender, IQ, and autistic symptoms.

Studies have shown conflicting results when comparing these groups on IQ. Holtmann et al. (2007) and Sinzig et al. (2009) found that the ASD-only group had higher IQ than the ASD + ADHD group, while Hanson et al. (2013) found no difference in IQ between the groups. The Holtmann et al. study found more ASD symptoms on the social interaction domain of the Autism Diagnostic Interview–Revised (ADI–R; Rutter, Le Couteur, & Lord, 2003) for the group of children with ASD + ADHD than for a group of children with ASD only. A possible explanation for this is that ADHD symptoms exacerbate ASD symptoms (Goldin, Matson, Tureck, Cervantes, & Jang, 2013).

Children diagnosed late (i.e., after 6–7 years of age) are a rapidly growing group, who are more likely to have ASD diagnoses other than autism, and to be less cognitively impaired (Jónsdóttir et al., 2011; Kim et al., 2011; Saemundsen et al., 2013). The relationship between ASD, ADHD and adaptive behaviors may present differently in these children than in children diagnosed earlier who are likely to have more severe autistic symptomatology and to be more cognitively impaired. Thus, the present study investigates the prevalence of the co-occurrence of ASD and ADHD in children diagnosed after 7 years of age, and how this co-occurrence impacts on adaptive behavior, while controlling for age, gender, IQ, and autistic symptoms.

2. Methods

2.1. Participants and procedures

All children who received their first ASD diagnoses after turning 7 at the tertiary level of services in Iceland during a three-year period (2008–2010) were included. Out of the 295 participants, 218 were male (73.9%), 77 were female (26.1%), and mean age was 12.78 years (SD = 2.9). The current age of the children is their age at the time of ASD diagnosis. The data are based on a systematic review of the medical records of these children. All diagnostic measures were administered at the time of the diagnosis except for occasional IQ measures that were done at the time of referral.

In cases of suspected ASD or a preliminary diagnosis of ASD at the primary or secondary levels of services, children are referred to the tertiary level in Iceland for specialized diagnostic procedures. Only two institutions offered specialized