The comorbidity of ADHD in children diagnosed with autism spectrum disorder

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ABSTRACT

Background: The purpose of the present study was to investigate the comorbid presence of ADHD in a population of children diagnosed with ASD in a nationally representative sample. Comorbidity estimates range widely, with estimates as low as 37% and as high as 78%.
Methods: The data were drawn from the Survey of Pathways to Diagnosis and Services (Pathways), a nationally representative survey conducted by the National Center for Health Statistics (NCHS), Centers of Disease Control, and Prevention (CDC) in 2011. Analysis of variance and chi square analysis were used to test for significant differences between groups comprised of children with ASD; ASD + ID, ASD + ADHD, and ASD + ADHD + ID.
Results: In a population of children diagnosed with ASD, the rate of ADHD + ASD was 42% and the rate of ADHD + ASD + ID was 17%, resulting in a 59% total comorbidity rate of ADHD and ASD. Statistically significant differences in age when parents first wondered about problems with development, age when medical assistance was first sought, and age of reported ASD diagnosis were found between the ASD + ADHD and all other groups, with the ASD + ADHD being older. Average age at diagnosis was over 6 years for children with ASD + ADHD but close to 2.5 years for children with ASD only.
Conclusions: The study of a nationally representative sample helps to elucidate prevalence rates but also raises questions about early identification and diagnosis when symptoms of both disorders are present. The findings point to the need for future research to understand why comorbidity is associated with delays in the age when medical assistance is sought.

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1. Introduction

The estimated prevalence rate for comorbid psychiatric diagnoses in Autism Spectrum Disorder (ASD) is high, with prevalence rates found to be slightly above 50% across studies (e.g., Ghanizadeh, 2012; Goldstein & Schwebach, 2004; Ponde, Novales, & Losapio, 2010). Although ASD has been associated with a wide range of conditions, Attention-Deficit/ Hyperactivity Disorder (ADHD) has frequently been identified as having a strong connection. Simonoff et al. (2008) suggested that ADHD may be the second most common comorbid disorder in individuals with ASD and Leyfer et al. (2006) found it to be the third. Leitner's (2014) review of 35 ASD and ADHD "co-occurrence" studies yielded estimates ranging from a low of 37% to a high of 85% in clinic samples.

The variation in prevalence rates likely reflects the underlying neuropsychological deficits shared by ADHD and ASD. That is, some of the core symptoms of ADHD overlap with those seen in some individuals with ASD (Mayes, Calhoun, Mayes, & Molitoris, 2012). In fact, until the publication of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM 5; American Psychiatric Association, 2013, 2000), the ADHD diagnosis was excluded if ASD was present. Therefore, the majority of investigations of comorbid ASD and ADHD prevalence rates were conducted using small, clinic samples. Although researchers working with small samples can more easily provide clinical diagnoses or at least verify diagnoses than researchers working with larger community-based samples, small samples can result in sampling bias, which limits researchers' ability to generalize to the population. Understanding prevalence data for children with co-occurring ASD and ADHD is important as this information can support probability analyses often conducted by clinicians who are investigating a large set of symptoms (Maserejian, Lutfey, & McKinlay, 2009; Reynolds, 2001).

The purpose of the present study was to investigate the prevalence rate of comorbid ASD, ADHD, and Intellectual Disability (ID) as well as identify differences in the ages when parents first wondered if something was not right with their child's development, when medical assistance was sought, when ASD diagnosis was reportedly made, and delays in diagnosis between children experiencing comorbidity and those not, as such rates can support diagnostic decision making. Specifically, we sought to answer the following six questions: 1) What is the prevalence rate of co-occurring ASD and ADHD? 2) Does a statistically significant difference exist in parents' report of age when they first wondered if something was not right with their child's development between children with comorbid ASD and ADHD and those with ASD alone? 3)Does a statistically significant difference exist in parents' report of age when medical assistance was first sought between children with comorbid ASD and ADHD and those with ASD alone? 4) Does a statistically significant difference exist in parents' report of age of ASD diagnosis between children with comorbid ASD and ADHD and those with ASD alone? 5) Does a statistically significant difference exist in the amount of time between parents' report of age when they first wondered if something was not right with their child's development and report of age of ASD diagnosis between children with comorbid ASD and ADHD and those with ASD alone? 6) Does a statistically significant difference exist in the amount of time between parents' report of age when medical assistance was first sought and report of age of ASD diagnosis between children with comorbid ASD and ADHD and those with ASD alone?

Understanding the prevalence rate of ASD and ADHD is challenging when the diagnostic criteria of researchers likely differs. For example, Leyfer et al. (2006) found a 31% comorbid prevalence rate when ASD was considered but a 55% rate when the subsyndromal criteria, evidenced by significant impairment despite falling just short of DSM criteria, were applied. Researchers have also found that children with high functioning ASD may be more likely to be misdiagnosed as having ADHD alone (Jenson, Larrieu, & Mack, 1997; Perry, 1998), prompting the advice that children with ADHD also be assessed for ASD (Clark, Feehan, Tinline, & Vostanis, 1999). These findings show that not only is the comorbidity rate between ASD and ADHD high, but also prevalence rates vary considerably based on the sample.

Although the use of small samples for prevalence research may pose a sampling bias, which limits researchers' ability to generalize to the population, small samples drawn from clinics may allow for more accurate diagnostic information. For example, Mattila et al. (2010) investigated comorbid diagnoses in children with Asperger's Syndrome and high functioning ASD in a sample of 50 children drawn from both outpatient and community clinic settings. A semi-structured interview and assessment of functioning scale were used by trained clinicians to identify comorbid diagnoses. The researchers found that 38% of participants with ASD also had ADHD. Although Miodovnik, Harstad, Sideridis, & Huntington (2014) relied on parent report of diagnosis in a much larger sample of 1496 children, they found a similar comorbidity rate of about 43%.

In contrast, Lee and Ousley (2006) found an ASD and ADHD comorbidity rate of 78% in a clinic sample comprised of 83 children between the ages of 4 and 20. This suggests that comorbidity prevalence rates yielded from small, clinic samples may provide important information about those specific samples, but rates based on larger samples, typically including parent report of diagnoses rather than direct clinical examination, may be appropriate for setting general expectations for prevalence. In other words, both types of research are needed, as prevalence rates for comorbidity might differ by age as well as population and rates could differ depending on whether diagnoses are verified by clinicians or simply reported by parents. If clinicians and researchers rely too greatly on studies of small clinic samples, the internal validity will likely be strong but external validity questionable. However, results from studies conducted with nationally representative samples may have strong external validity but weak internal validity.

The rate of comorbidity of ASD and ADHD could further differ across estimates when the population of focus is children with ASD. In a sample of children identified as having ASD per parent report, Miodovnik et al. (2014) found that the 20% of children diagnosed with ADHD before ASD received their ASD diagnosis approximately three years later than the group including children that were diagnosed with ADHD and ASD simultaneously, as well as later than the group including children with ADHD diagnosed after ASD. The children with ADHD diagnosed first were 30 times more likely to receive their autism diagnosis after the age of six. This suggests that when samples comprised mostly of young children, especially those under age six are studied, the resulting prevalence estimates for ASD could be understated. This conclusion is further supported by the finding that many children do not receive an ASD diagnosis until they approach school age (Mandell, Novak, & Zubritsky, 2005).

Mandell et al. (2005) found that children with Asperger's disorder were identified, on average, at approximately age seven, which suggests that higher functioning is associated with later identification. Although the study's authors did not have access to intelligence scores, they found that children displaying behaviors associated with lower functioning, including toe walking, severe language deficits, and hand flapping were identified earlier. Although researchers have found a