

Autistic traits in a Swedish clinical sample of children with ADHD



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Abstract

The occurrence of autistic traits measured by the social responsiveness scale, SRS, in a Swedish clinical sample of children age 8-12 diagnosed with ADHD was analyzed and found significantly elevated in comparison with a demographically similar control group. 28 children 4 girls and 24 boys diagnosed with ADHD were included in the ADHD group. 25 children 4 girls and 21 boys acted as controls. A mean total SRS raw score of 78,25 was found significantly higher compared to that of the control group at $p < 0,000$. 35,7% of the children in the ADHD group rated as severely impaired in their social behavior. A significant positive correlation of $r = 0,86$ at $p < 0,000$ between severity of ADHD and social impairment was also found.

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Children with ADHD display a behavior that is characterized by a chronic and impairing inattention, hyperactivity and impulsivity. ADHD is today one of the most common psychiatric disorders that affects youths. The diagnostic criteria listed in DSM-IV-TR, the current diagnostic manual used in Sweden, identifies 18 different symptomatic behaviors of which a child needs to display at least 6 from the inattentive symptoms domain and six from the hyperactive/impulsive symptoms domain to be diagnosed with ADHD. The behaviors need to be impairing and have been present for at least six months and exist in more than one condition i.e. in school, at home and/or in their spare time. Symptoms must have occurred before the age of seven to require the diagnosis¹ (American Psychiatric Association, 2000). Prevalence of ADHD in the childhood population is estimated to 3 – 7% (Barkley, 2006). Although the severity of ADHD symptoms tends to decline over the lifespan at least 50 % of children diagnosed with ADHD will still experience impairing symptoms as adults (Nijmeier, Hoeckstra et al., 2008). Today boys are three times as likely to have ADHD compared to girls. In clinical samples it's not uncommon to find an even higher ratio of boys ranging from 5 to 9 times as common (Barkley, 2006). The DSM-IV, distinguishes three subtypes of ADHD, the predominantly inattentive subtype, the predominantly hyperactive/impulsive subtype and the combined subtype. The prevalence of subtypes is estimated to 20-30 % for the predominantly inattentive subtype, <15 % for the predominantly hyperactive subtype and 50 -75 % for the combined subtype (Barkley, 2006). Hence forward the three different subtypes will be referred to as the combined subtype, the inattentive subtype and the hyperactive/impulsive subtype. ADHD is associated with academic, familial, occupational and social difficulties. Children with ADHD often suffer from interpersonal problems such as having conflicts with adults and peers and they suffer more rejection from peers than do controls (Nijmeijer, Minderaa et al., 2008). The DSM-IV criteria for ADHD refer directly to inappropriate social behaviors such as intruding on and interrupting others, blurting out answers to questions etc. (American Psychiatric Association, 1994). The social impairment of children with ADHD may however go beyond criteria listed in DSM-IV. The children often show oppositional and defiant behavior and display conduct problems which corresponds with high rates of comorbid oppositional defiant disorder (ODD) and conduct disorder (CD) (Nijmeijer, Minderaa et al.). The co-occurrence, for both disorders, range between 30 to 50% (Barkley, 2006). However, some children with ADHD show no socially impaired behaviors

¹ Some of the DSM-IV-TR criteria listed have been reviewed and are likely to be changed in DSM-V (American Psychiatric Association, 2010). For further review visit, www.dsm5.org.

and some show especially profound impairment that may suggest additional brain based deficits in social skills (Greene et al., 1996).

ADHD is sometimes portrayed as nonexistent, a fraud, a myth or a benign condition. However, the international consensus statement on ADHD strongly contradicts the notion of ADHD as nonexistent. The worlds' leading clinical scientists all agree that ADHD involves a serious deficiency in a set of psychological abilities and that these deficiencies cause serious harm to most individuals with the disorder. For further information on the matter, please review the International Consensus Statement on ADHD (Barkley, 2002).

First social behaviors commonly seen in children will be presented followed by presentation of research on how these behaviors lead to impairment in their social life and interpersonal relationships. Some research on developmental cycles is also presented and then gender and subtype effects are briefly reported. After that follows a description of what is known of social cognition deficits in relation to ADHD and how that possibly contributes to social impairment. A theory of ADHD and its relation to pervasive developmental disorder, PDD, is explored along with attention and executive functioning and their connection to the social behavior of children with ADHD. The theoretical chapter is concluded with a short summary of previous findings and the presentation of the research hypotheses of the present study.

Social behavior and ADHD

The social behavior and the hyperactive/impulsive behavior of children with ADHD are often described as rule violating, hostile, controlling and as verbally and physically aggressive (Nijmeijer, Minderaa et al., 2008). They are often viewed as socially intrusive because they display context inappropriate behavior that is also resistant to correction. They blurt out answers to questions, interrupt or intrude on conversations of others and fail to attend to important social cues (Greene et al., 1996). They display a behavior that seem unrelated to environmental requirements (Landau and Milich, 1988). The inattentive characteristic in children with ADHD can in social situations cause them to appear as if they are not listening to or are not interested in others. They can appear to be off topic and they display difficulties in switching between roles. They may also appear dreamy, distracted and slow. Although children with ADHD don't lack interest in other people, as sometimes seen in Autism

Spectrum Disorders (ASD), they tend to show difficulties in attuning their behavior to other persons and to changing social situations. A key characteristic of the social behavior in children with ADHD can be described as the lack of a full comprehension of the consequences of their behaviors to others, as expressed in Nijmeijer, Hoeckstra et al. (2008).

Social Impairment

The social behaviors seen in children with ADHD have been found to have impairing consequences. The few studies using sociometric studies to assess peer relations involving children with ADHD all show that children with ADHD suffer more rejection from their peers than other control children (Nijmeijer, Minderaa et al., 2008). The rejection by peers can be fast, Erhardt and Hinshaw (1994) found that only after a day of interacting children with ADHD were significantly more rejected than non ADHD controls. Erhardt and Hinshaw studied the initial sociometric impressions of ADHD boys enrolled in a summer research program. Their results showed that the ADHD boys displayed markedly different social behaviors than the comparison boys and that the ADHD boys were overwhelmingly rejected. Aggression was found as a strong predictor of negative peer nominations. In a study of hyperactive boys the hyperactive subjects in comparison to controls showed poorer social knowledge, poorer knowledge of how to maintain friendships and poorer knowledge of how to solve interpersonal problems. They also demonstrated poor social performance skills and they displayed more negative behavior while performing a cooperative puzzle task (Grenell, Glas & Katz, 1987). Bagwell, Molina, Pelham and Hoza (2001) found that children with ADHD had fewer close friendships and experienced greater peer rejection. Hoza et al. (2005) found that children with ADHD were less socially preferred than controls and had a higher social impact than controls, meaning that they were more socially visible. The children with ADHD also had fewer dyadic friendships than comparison children. Dyadic friendships besides being correlated to rejection and acceptance of peers also represent unique variance in measures of adjustment and predict different aspects of socioemotional functioning (Hoza, Bukowski and Beery, 2000).

ADHD and depression are commonly comorbid but seem to be unrelated to any shared association with anxiety and externalizing symptoms (Blackman, Ostrander and Herman, 2005). Blackman et al. showed that children with ADHD and comorbid depression were more

social impaired than children with only ADHD and control children. In a study by Greene et al. (2002) comorbid disorders such as ODD, CD, anxiety and mood disorders were found to contribute to social dysfunction. However, behaviors associated with ADHD still contributed significantly to social impairment while controlling for comorbid disorders. Hence the social difficulties experienced by children with ADHD cannot solely be explained by difficulties stemming from comorbid disorders.

Impairment in adolescence and developmental processes

Sibley, Evans and Serpell (2009) examined if the impairment in peer functioning and social-cognitive deficits found in pediatric samples also exists in adolescents with ADHD. They found that parents reported poorer peer functioning and peer reports showed that adolescents with ADHD were less liked than adolescents without ADHD, results similar to what have previously been found for children with ADHD. They also found that the adolescents with ADHD showed deficits in social comprehension and problem-solving abilities. A limitation to this investigation was that they could not study possible differences due to ADHD subtype because of instability in subtype diagnoses. Murray-Close et al. (2010) investigate the developmental process of peer problems in children with ADHD. The participants were followed over a six year period, from middle childhood to adolescence. They were assessed on measures of aggression, social skills, Positive Illusory Bias, PIB, (overestimating ones competence in relation to ones actual competence) in both social and behavioral domains, and peer rejection. Children with ADHD showed significantly more problems in all areas assessed, having heightened levels of aggression, exhibiting poorer social skills, more rejected by peers and adopting overly positive self-perceptions compared to controls. Children with ADHD showed more problems in these areas at first assessment, which also compromised functioning in other areas leading to cascading problems over time. Children with ADHD had greater difficulties negotiating important developmental tasks which created vicious cycles where for example peer rejection at first assessment predicted poorer social skills at the second assessment which in turn predicted more rejection at the third assessment. The pattern was found for all problem areas and was true for the control group as well suggesting that the same developmental pattern of social skills is at work irrespective of ADHD status. The evidence of PIB of social competence previously found in boys with ADHD was also found to

be true for girls (Ohan and Johnston, 2011). They also found that PIB was greater in girls with heightened ODD symptoms and less in girls with depressive symptoms although still higher than controls also suffering from depressive symptoms. PIBs in girls with ADHD was positively related to maladjustment but positively related to adjustment in girls without ADHD suggesting a risk of further impairment in girls with ADHD due to PIBs.

Subtype and Gender effects

The behaviors of the three different ADHD subtypes are defined by either the hyperactive/impulsive behavior or the inattentive behavior or a combination of both which suggests that social problems may differ across subtypes considering that they are related to different behaviors, (Nijmeijer, Minderaa, et al., 2008). Maedgen and Carlson (2000) found distinctly different patterns of social dysfunction when analyzing differences between the combined and inattentive subtype of ADHD with the combined subtype being the most impaired.

The higher prevalence of ADHD in boys in community samples and even more so in clinical samples, yet not in adult samples, has raised the idea of biased diagnostic criteria (Biederman et al., 1994; Biederman et al., 1999; Rucklidge and Tannock, 2001; Staller and Faraone, 2006). In the study of Biederman et al. (2002) a large community sample lend support to this idea. Their result show that ADHD manifests itself equally in both genders and that the differences found are more likely to be driven by gender effects and not by gender by ADHD interactions. The higher ratio of boys in clinical samples, and results by Rucklidge and Tannock (2001) may then be explained by possible stereotypical thinking causing ADHD related problems in boys to receive more attention and to be seen as more impairing by parents and teachers.

Social Cognition

People with social cognition deficits will frequently commit errors in social situations. Such deficits, if present early in life, may impair the development of adequate social, communication and occupational skills (Uekermann et al., 2010). Since the ability to

adequately interact with other people is essential for a child's development, social cognition deficits in children with ADHD may cause a vicious cycle, as argued by Murray-Close et al (2010) in the aforementioned study. If children with ADHD are subjected to fewer constructive social interactions, in comparison to others, it further hinders their development of understanding other peoples' emotions. Successful social functioning can partly be achieved through the ability to understand other peoples mind and feelings, which requires intact social cognitive abilities. In addition to core symptoms of ADHD social cognition deficits may be an independent risk factor for social impairment (Uekerman et al.).

Social cognition refers to the ability to understand the mind of other people, and involves encoding, representation and interpretation of social cues, affect perception, theory of mind (ToM), empathy and humor processing. Affect perception involves the ability to identify emotion from facial expressions and to detect affective prosody reflecting the emotional tone of language (Uekermann et al., 2010). According to Edwards, Manstead, and MacDonald (1984), impairment in the ability to identify emotions from facial expressions are linked to low social status among peers and low social competence. In a study by Corbett and Glidden (2000), results indicated that children with ADHD showed mild to moderate deficits in perception of affect and Rapport, Friedman, Tzelepis and, Van Voorhis (2002) found evidence of impairment in affect recognition in adults with ADHD. Some evidence from imaging studies and ERP studies of patients with ADHD suggested dysfunction in critical areas involved in affect perception (Uekermann et al.), which indicates that impairment in affect perception may be results of structural dysfunctions that goes beyond what can be explained by deficits related to core features of ADHD.

Theory of mind is the ability to reason about other peoples' mental states and to predict and understand their beliefs and intentions on the bases of their mental states, which involves higher order cognitive functioning. Empathy can be viewed as theory of mind with an affective component enabling you to reason about other peoples' feelings and emotional states. Patients with ADHD show impairment in regions critically involved in more complex social cognition such as empathy (Uekermann et al., 2010). The research of ToM in patients with ADHD is inconclusive so far. Research so far has shown impairment in ToM in children with ADHD using false belief tasks (Uekermann et al., 2010) but research has also shown no

significant difference between children with ADHD and normal controls as in Charman, Carrol and Sturge, (2001). There is not a lot of research on empathy in children with ADHD but some studies report that children with ADHD are less empathic than normally developing comparison children. In a study by Marton, Wiener, Rogers, Moore and Tannock (2008) parents of children with ADHD reported their children as less empathic compared to controls. However, the self-reports on empathy showed no differences between the children with ADHD and their controls. In a study by Braatens and Rosén (2000) children with ADHD were found to show less state empathy than controls and were by parents rated to exhibit less empathic behavior. However many of their subjects were also diagnosed with conduct problems and the ADHD diagnosis could not explain additional variance in empathy when conduct problems were controlled for.

Marton et al. (2008) studied children with ADHD's ability to understand a social situation from another person's perspective, social perspective taking (SPT). They found that children with ADHD employed less advanced SPT at various problem solving stages than would be expected at their age. They also reported that overall language ability and IQ were significant predictors of SPT. However, ADHD contributed unique variance in SPT when IQ and overall language ability were controlled for. They also showed that girls had more developed overall SPT skills compared to boys. It is important to note that 94% of the subjects were diagnosed with the combined ADHD subtype and hence the results cannot be generalized across subtype.

Sibley et al. (2009) showed that some social cognitive deficits related to problematic interpersonal relationships in children with ADHD may also be present in adolescents with ADHD. Their results indicate that it is plausible that deficits in social cognition may at least partially be responsible for the interpersonal difficulties experienced by children and adolescents with ADHD. However, the module that social cognition deficits mediate the relationship between ADHD and Interpersonal problems was not possible to test statistically. The idea that social difficulties stem from social cognition dysfunction has not yet been adequately resolved and further research is required.

Executive functioning and attention in relation to social functioning

Barkley (1997) presented a theory of ADHD that in short proposes that deficits in behavioral inhibition undermine executive functioning in people with ADHD which in part explains the academic and social difficulties commonly related to ADHD. The behavioral inhibition is stipulated to cause difficulties with separation of affect, prolongation (hindsight and foresight), internalization of language causing poor problem solving skills, and reconstitution causing difficulties with goal directed flexibility and creativity. The hostile, disruptive, intrusive and aggressive social behavior seen in ADHD is then an effect of the inability to regulate or inhibit emotional response. However, the perception of other people's emotions is not an executive function and should therefore be unaffected by behavioral inhibition. Impaired social behavior due to deficits in affect perception is therefore viewed as in opposition with Barkley's theory. Mild to moderate difficulties in affect perception was found in a study by Corbett and Glidden (2000) when the processing of affective stimuli in children with ADHD was studied. They found that children with ADHD exhibit difficulties with perceiving facial expression and prosody. They also found a possible connection between deficits in attention and inaccurate or incomplete encoding of stimulus properties. Contrary to this finding Rapport et al. (2002) reported that adults with ADHD performed worse in affect recognition than adults without the disorder and that the impairment was unrelated to attentional aspects of affect perception, fundamental abilities in face recognition or gross perceptual processes. The study also showed that adults with ADHD experience heightened emotional responses. They appear to experience their emotions more intensely than adults without ADHD, however the sensitivity does not translate to other people's emotions. Huang-Pollock, Mikami, Pfiffner and, McBurnett (2009) studied the mediating role of executive functioning between ADHD status and social adjustment in children. The study assessed global social functioning through parent and teacher ratings of social adjustment and social performance through a standardized observational "chat-room" task. Executive functioning did not mediate the relationship between ADHD status and social adjustment and only partly mediated the relationship between ADHD status and social performance. Executive functioning accounted for 40-50 % of the variance between ADHD status and the ability to detect subtle social cues and memory of the "chat-room" conversation. Number of pro-social, hostile and of topic comments were not mediated by executive functioning. Comorbidity only significantly affected social functioning in regards to memory of the "chat-room"

conversation. No ADHD subtype specific patterns of social performance could be identified. Semrud-Clikeman (2010) evaluated social perception and performance in the combined and in the inattentive subtype compared to controls on direct and indirect measures of social perception and performance. On direct measures of social perception children with either subtype performed worse than controls on interpreting nonverbal and emotional cues. Inattention was found to be significantly more correlated with difficulties in understanding emotional and nonverbal cues than hyperactivity or impulsivity. No difference on performance between the subtypes on this measure was found. Consistent with aforementioned research children of both subtypes were rated as more socially impaired than controls with the combined subtype as more socially impaired than the inattentive subtype. When direct measures of social perception and performance was compared to indirect measures strong correlations indicated that the ability to process social and emotional cues is related to social performance. These findings do not support the theory that social problems in ADHD are related to behavioral inhibition. Limitations to these results are the lack of sufficient number of female participants to enable research on possible gender differences.

There is some evidence of deficits in social cognition that further impairs social behavior in ADHD. Attention and executive functioning has also been presented as contributing to social impairment. However, research still presents an incomplete picture of the problem and its possible explanations. The social behavior and impairments seen in ADHD are somewhat reminding of the social difficulties central to PDDs.

PDDs, Autistic traits and ADHD

Children with ADHD have often been found to have characteristics of autism spectrum disorders (ASD) (Christ, Kanne and Reirsen, 2010; Clark, Feehan, Tinline and Vostanis (1999); Nijmeijer, Hoekstra, et al., 2008; and Reirsen, Constantino, Volk, and Todd, 2007). The impaired social behavior of children with ADHD can be described as lacking in social reciprocity which is a defining characteristic of the social behavior in children with PDDs (Nijmeijer, Hoekstra, et al., 2008). However a diagnosis of ADHD is not allowed if symptoms only occur during the course of a PDD, according to DSM-IV (American Psychiatric

Association, 1994). The most frequently reported PDD symptom in children with ADHD are impairment in social interactions and more closely identified as the inability to perceive and understand other peoples' feelings (Nijmeijer, Hoekstra, et al.). Clark et al. found symptoms of ASDs, in children diagnosed with ADHD, that can be viewed as outside of what could be related to core symptoms of ADHD; high frequencies of stereotyped hand and body movement, problems in nonverbal communication and odd forms of speech was commonly reported, suggesting an overlap of the disorders. In the study by Reiersen et al. (2007) results showed that quantitatively measured autistic traits are elevated in children with ADHD in a community based sample compared to controls. They also found that ADHD subtypes are associated with different levels of social impairment, with the combined subtype having higher mean scores in all autism symptom domains. The study assessed autistic traits in children with ADHD using the social responsiveness scale, SRS, a parent/teacher questionnaire, in an American population based twin sample. The SRS contains items from all three DSM-IV autism symptom domains, social impairment, communication impairment and stereotyped behavior. The results showed that children with severe forms of population derived ADHD subtypes and the inattentive and combined DSM-IV subtypes showed clinically significant symptoms in all three autism symptom domains even while controlling for inattention, hyperactivity, impulsivity and other factors unrelated to autism. However it is unclear whether the moderately elevated SRS scores seen in some subtypes indicate true autistic traits or a more general social impairment. Nijmeijer, Hoekstra, et al. further confirmed that children with ADHD have high levels of PDD symptoms. Furthermore they found that the familiarity of subtle PDD symptoms in a clinical sample of children with ADHD is largely independent of ADHD familiarity suggesting substantial differences in genetic factors for PDD and ADHD. This is contrary to two other studies of the relation between ADHD and PDD in community twin samples (Constantino, Hudziak and Todd (2003) and Ronald, Simonoff, Kuntsi, Asherson and Plomin (2008)). Christ et al. (2010) found a robust correlation between ADHD and ASD symptomatology, and further evidence consistent with the theory that impairment in executive functioning related to ADHD and ASD arise out of disruption of the same neural network, frontostriatal pathways, but that they may differ in aspects of timing, severity and locus of damage leading to a partial but not complete overlap in their neurocognitive profiles.

In summary children, adolescents and adults with ADHD display social behaviors that are impairing and results in rejection from peers and difficulties in interpersonal relationships with fewer friends and shorter friendships. The impairment seem to go beyond what can be explained by core features of ADHD and may be the result of social cognitive deficits and/or comorbid PDDs resulting in impairment more classically related to ASDs.

The aim of this study is to study the social impairment through quantitative measures of autistic traits in a clinical sample of Swedish children with ADHD compared to a control group.

Hypotheses

1. Children with ADHD in comparison to a demographically similar control group will have elevated autistic symptoms when quantitatively measured.

This hypothesis is based on findings from Reiersen et al. (2007) where elevated levels of quantitatively measured autistic traits were found in an American population based twin sample. The sample in this study will be a Swedish clinical sample. Due to the sample being clinically derived it is likely that the results may be even more elevated for the ADHD group.

2. The SRS subscales will within the ADHD group have lower mean scores for social motivation and autistic mannerisms and higher mean scores for social awareness, social cognition and social communication.

The ADHD group is expected to differ significantly from the control group on all subscales in concordance with hypothesis 1. However a differentiated profile within the ADHD group is expected. Autistic mannerisms and social motivation are believed to be the least conceptually related to ADHD and hence scores are expected to be lower on these subscales. Further definitions of the subscales are presented in the method chapter.

3. Severity of ADHD will positively correlate with Autistic traits.

Research has shown that children with more severe symptoms of ADHD are more impaired in academic, social and occupational domains than those with fewer or less severe symptoms (Greene et al., 1996). The same has been found true for autistic traits. Reiersen et al. (2007) showed that children with less severe symptoms of ADHD were rated as exhibiting fewer autistic traits.

Method

Participants

56 subjects were recruited 31 in the ADHD group and 25 in the control group. The overall mean age is 10 years old and 10, 1 years of age for the ADHD group and 9,7 years of age in the control group. Out of the 31 subjects in the ADHD group 21 was recruited from Malmö and 10 from Lund. Three subjects recruited from Lund failed to meet the age requirements. This is believed to be due to parent having rated a sibling of the child identified through the screening process instead of the intended child. Out of the 28 remaining subjects in the ADHD group there were 4 girls and 24 boys. The control group contains 4 girls and 21 boys. Three children lived with their adoptive parents; two were found in the ADHD group and one in the control group. Subject refers to the children rated and participant refers to the parent reporting on its child's behavior. All demographical variables and their distribution in the sample are illustrated in Table 1.

17 subjects in the ADHD group were identified as having the combined subtype, 4 as having the inattentive subtype and 4 as having the hyperactive/impulsive subtype. 3 subjects had no report of subtype diagnosis and it could not be derived from the Swanson, Nolan and Pelham –IV, SNAP-IV, due to inconclusive results. Three of the girls had the combined subtype and one girl had the hyperactive/impulsive subtype. 24 of the children with ADHD were taking medication for their ADHD. The mean age of diagnosis was 8 years old. The median of years since diagnosis was 2 years. The minimum time reported since diagnosis was 6 months and the maximum was 6 years. One child had ODD reported as a comorbid disorder and 11 others could be identified as having ODD through the SNAP-IV.

Material

A compendium of two rating scales, the Swedish version of the SNAP-IV and the Swedish version of the social responsiveness scale, SRS, and a set of demographical questions, was used. The compendium contained instructions on how to fill out each scale. A revised copy of the compendium can be found in Appendix A. The SRS is not included due to copyright restrictions.

SNAP-IV

The Swanson, Nolan and Pelham –IV, (SNAP-IV) is a widely used parent and teacher ADHD and ODD rating scale based on the DSM-IV criteria of ADHD and ODD. It's a 30 item scale; nine items concern the inattention domain of ADHD, nine items the hyperactive/impulsive domain and 9 items concern ODD. Three extra questions, one for each domain, are designed to sum up the general impairment in its respective domain. The SNAP-IV has shown to have acceptable internal consistency and a factor structure concurrent with DSM-IV criteria of ADHD and ODD and effectively distinguishes between different levels of ADHD (Bussing et al., 2008).

SRS

The parent rating scale version of the SRS was used. It's a 65-item rating scale that measures the severity of autism spectrum symptoms. It is based on the child's social impairment in different symptomatic aspects commonly associated with ASDs. The SRS generates a total raw score with higher values representing more impairment. The scale also generates values on five different subscales; *social awareness* (SocAwa), *social cognition* (SocCog), *social communication* (SocCom), *social motivation* (SocMot) and *autistic mannerisms* (AutMan). The SRS assesses symptoms over a broad spectrum and is validated for distinguishing sub threshold autism traits such as previously found in ADHD (Reiersen et al., 2007). The SRS has shown a correlation of 0,7 with the Autism Diagnostic Interview-Revised , ADI-R, and an inter-rater reliability of 0,8 (Constantino et al., 2003).

The SRS has a recommended cut-off point for screening for ASD in clinical samples of a total SRS raw score of 85. The scale also generates t-scores for all subscales and in total. A total SRS t-score of between 60 and 75 are considered as mild to moderate and over 75 as severe. The subscales represent five different aspects of the SRS and can be described as follows. Social awareness refers to the ability to pick up on social cues. Items in this category represent the sensory aspect of reciprocal social behavior. Social cognition refers to the ability to interpret social cues once they are picked up. Items in this category represent the cognitive-interpretive aspect of reciprocal social behavior. Social communication refers to expressive

social communication. Items in this category represent the “motoric” aspect of reciprocal social behavior. Social motivation refers to the extent to which a respondent is generally motivated to engage in social-interpersonal behavior. Items in this category include elements of social anxiety, inhibition, and empathic orientation. Autistic mannerisms refers to stereotypic behavior or highly restricted interests’ characteristic of autism. (Constantino and Gruber, 2005)

Demographical variables

The demographical variables reports on, gender, age, subtype of ADHD, age of diagnosis, number of siblings, position among siblings (i.e. oldest, youngest, middle), other diagnoses besides ADHD, IQ, medication status, prescribed medication and the relationship and familial status of the child. Also the socio economic status, SES, of the parent or parents was reported and the main language spoken at home. The demographical variables reported by the control group lacked the items concerning medication, subtype and age of diagnosis. In addition they were asked whether the child had ever been in contact with a doctor because of, learning disabilities, conduct problems, aggression, depression or anxiety.

Procedure

Recruitment

Participants and subjects in the ADHD group were recruited through the child psychiatric clinics in Lund and Malmö. Due to limited time and resources only 30 participants from Lund and 60 from Malmö were contacted. The parents of the children with ADHD were contacted through mail with an introduction letter from the researcher requesting them to participate. The letter explained the aim of the study and who was conducting it and how to complete the study. The letter clearly stated that no one was required to participate and could choose to quit at any time during the process. It also explained that all participants and subjects would remain anonymous to the researcher at all times and that no information could be traced back to them. A copy of the letter can be found in Appendix B. The compendium and an envelope

in which to return it were included along with the letter from the researcher as well as a letter from their respective clinic explaining the clinics part in the study.

The subjects' eligibility to participate in the study was screened by staff at the clinics before they were contacted. A child had to be diagnosed with ADHD or ADD depending on what diagnostic manual was used at the time of diagnosis. The child also had to currently be listed at the respective clinic and hence still live in the area. In addition the sample was screened according to the following inclusion criteria;

1. The child must be born between 1999-01-01 and 2002-12-31. If this restricts the sample to less than 60 eligible subjectss (30 for Lund) the span of birth can be broadened to 2003-06-30 at the latest.
2. The child must have an IQ of 70 or more.
3. The child should not have any of the comorbid disorders ADS, PDD, anxiety or mood disorders.
4. The child has to live at home.
5. The main language spoken at home has to be Swedish.

The control group was recruited through their workplace. Requests were sent to staff that were thought eligible to participate in the control group at a few different workplaces in the Malmö and Lund area. The locations were chosen out of convenience and do not represent a random selection, although a variety of vocation among participants was pursued. The mere part of the sample lived in Lund and Malmö with surroundings. Two were recruited from outside of Skåne. They received the same letter from the researcher, a part from it asking for participants to the control group and not the ADHD group. The aim was to match the control group on gender and age but successful matching was only achieved for gender. Priority was given to achieve an equal number of participants in both groups rather than a sample matched on age. However the mean age and standard deviation are similar for both groups. The groups can hence be viewed as equal in age. Due to fewer subjects in the control group there is a minimally larger proportion of girls in that group. The control subjects were screened prior to inclusion in the control group. If a child did not primarily speak Swedish at home or if the child had ever been in contact with a doctor because of mood disorders, anxiety or conduct disorders they were not included in the control group.

The participants in the ADHD group were given ten days to complete the form and to return it by mail to the clinics. The control group was given fewer days to complete and return their forms due to time constraints. They were also given the option of returning their forms by e-mail directly to the researcher.

Assessment

To obtain a quantitative measure of autistic traits a parent rating scale was used. Sociometric studies have since long been the gold standard for assessing social skills in children however lately parent and teacher rating scales have been more common (Nijmeijer, Minderaa et al., 2008). In addition they are easier to administer and less costly and time consuming. Hence the use of a parent rating scale was considered preferable. A use of additional ratings by teachers, to further validate the parent ratings was considered, but dropped due to limited time and resources.

The SNAP-IV was included to assess ADHD symptoms in the ADHD group and in the control group. It was used to measure inattentive and hyperactive/impulsive behaviors and to generate a quantitative measure of the ADHD symptomatic behaviors. The SNAP-IV result was also used to define subtype if it was not reported by the parents. 10 cases lacked a parent report of subtype. 9 of those were identified as having the combined subtype and one case was identified as having the inattentive subtype. A symptom is deemed present if it has been rated as a 2 (quite a bit) or a 3 (very much). A minimum of 5 symptoms needed to be rated as present in the inattentive and in the hyperactive/impulsive symptom domain in order for a case to be identified as having the combined subtype. If criteria were met in only one domain the case was identified as predominantly inattentive or hyperactive/impulsive depending on the domain. If no criteria were met for either of the domains the result was deemed inconclusive. The same criteria were used when screening for ODD. This procedure is recommended by the creators of the SNAP-IV and its use is evaluated in Bussing et al. (2008) confirming the validity of the procedure. Missing values on the SRS was replaced with the median score of that question in accordance with the SRS manual (Constantino and Gruber, 2005). One participant had failed to complete the SNAP-IV but had a full SRS score and was hence kept.

Results

When screening for outliers two outliers were identified, one in the total SRS score variable (SRStot) and one in the total SNAP-IV score variable (SNAPIVtot). They were separate cases but both belonged to the control group. Both cases were identified as belonging to the sample and their impact was deemed minor after inspection of box plots and scatter plots and hence they were kept unchanged in the analysis. Tests of normality were nonsignificant for all variables and hence normality was assumed. Leven's test of homogeneity of variance was significant for SRStot, SNAPIVtot, SocCom, SocMot, SocCog and AutMan hence the assumption of equal variance was violated. Only SocAwa had homogeneity of variance. However, ANOVAs are quite robust to unequal variances in groups with equal N (Tabachnick and Fidell, 2007). Hence the violation was deemed to pose no problem.

Initial analysis

Chi² tests were performed for Group x SES, group x Marital Status and Group x Number of Siblings to check for potential sample biases between the ADHD group and the control group.

The SES variable originally contained 4 levels but too many cells had less than five cases and hence the result was not reliable. The SES variable was recoded by joining the two lower levels and the two higher levels of SES. The two new levels represent having completed high school or less as the lower bound or having completed college or more as the higher bound. All cells now contained more than five cases. The result of the chi² test with a continuity correction revealed no significant difference between the groups. Chi² (53)=0,000 at $p=1$. 39,3 % of participants in the ADHD group were found in the lower bound and 36% of the control group. 60.7 % and 64.0 % of participants in the ADHD and control group respectively were found in the higher bound. The total SES distribution was 37.7 % in the lower bound and 62.3 % in the higher bound. The distributions are also presented in Table 1.

The marital status was defined as whether a separation between the child's parents had occurred or not. If the child was living with either both biological- or adoptive parents, married or not, the parents were coded as married and as divorced if the child lived with only one parent or switching between both. The chi² test with continuity correction revealed no

significant difference between the groups. $\chi^2(53)=0,331$ at $p=0,565$. The distribution is presented in Table 1.

The number of siblings was first defined as having no siblings, one sibling or two or more siblings. However that generated more than 20% of cells with less than 5 cases. The research question of interest was whether there were an unequal number of children with no siblings, between the two groups. However that could not be statistically tested for significant differences because too few children had no siblings rendering a χ^2 result unreliable. There were only 4 children in the ADHD group without siblings and non in the control group. The distribution is also presented in Table 1.

Table 1 shows the distribution among the demographical variables obtained across groups and in the overall sample. Some variables are only relevant for the ADHD group and hence not reported for the control group or in total. The percentage of higher SES is derived from the χ^2 results as is the percentage of divorced parents. The percentage of divorced parents is moderately higher in the ADHD compared to the control group yet did not reach significant difference. The percentage of subjects identified as having ODD is quite large but not outside of what can be considered normal. Some over identification may have occurred since as much as 12/13 was not reported by parents but identified through the SNAP-IV. The percentage of subjects with an undefined subtype is 10,9%.

Demographical Variables

Table 1

Descriptive statistics across groups and in total

Variable	ADHD	Control	Total
Gender M/F	24/4	21/4	45/8
M Age	10,1	9,7	10,0
%higher SES	60,7	64,0	62,3
% Divorced	39,3	28,0	34,0
No 0 siblings	4	0	4
No adopted	2	1	3
% on medication	85,7		
M age diagnosis	8		
M Years since	2		
%Subtyp C/IA/HI ^a	60,7/14,2/14,2		
No ODD C/IA/HI ^a	9/1/3		(46,4%)
No Touretts	2		(7,1%)
No Dyslexia	4		(14,3%)

Note. M/F refers to ratio of males to females. "M year since" refers to the mean number of years that have passed since ADHD diagnosis was established. Variables given within parentheses refers only to the ADHD group.

^aC= combined subtype, IA= inattentive subtype and HI= hyperactive/impulsive subtype.

Results ANOVA

Total SRS raw scores

A one-way between subjects analysis of variance was performed to explore the difference in total SRS raw scores between the ADHD group and the control group. The results revealed a significant difference in mean between the two groups. The ADHD group had a higher mean total SRS raw score representing more impairment within that group. The difference in mean total SRS scores between the groups was large according to the calculated partial η^2 . The results are presented in Table 2. The mean total SRS raw score for the ADHD group falls just below the cut-off point for screening for ASD in clinical samples. Looking at the individual results 35,7% of subjects in the ADHD group have scores above the cut-off point . When looking at the individual total SRS *t*-scores 35,7 % of subjects in the ADHD group scores in the severe range and an additional 42,8% score in the mild to moderate range. None of the subjects in the control group scored in the mild to moderate range or higher.

SRS subscales

A set of one-way between subjects analysis of variance were performed to explore group differences on the SRS subscales. The results for all ANOVAs are presented in Table 2. All differences found are significant. The ADHD group has higher mean values on all subscales with higher values representing more impairment within that scale. The biggest difference between groups was found in Autistic Mannerisms and the smallest difference in Social Motivation.

The percentage of total score was calculated for the ADHD group to enable relative comparison between the subscales within the ADHD group. Table 2 also depicts the difference found for the total SRS raw score. The mean found for the ADHD group is a score of 40,1 % of the maximum score. An interesting observation is that the biggest effect was found in AutMan even relative to the total SRS score.

Group differences on total SRS score and subscales

Table 2

Result Analysis of variance of SRStot and all SRS subscales between ADHD group and control group (C)

Variable	M		SD		F [1,51] ^a	Partial η^2
	ADHD	C	ADHD	C		
SRStot	78,25(40,1%)	21,84	29,58	10,37	81,783*	0,62
	Subscales					
SocAwa	9,8 (40,8%)	4,3	2,7	2,3	62,5*	0,55
SocCom	26,2(39,6%)	6,8	11,7	2,3	61,7*	0,55
SocMot	12,7(38,4%)	4,8	6,5	2,2	32,3*	0,39
SocCog	14,0(38,8%)	3,9	5,8	3,0	61,9*	0,55
AutMan	15,6(43,4%)	2,1	6,9	1,8	88,7*	0,64

Note. Values given within parentheses are only relevant for the ADHD group.

^a Values given within brackets is degrees of freedom between the groups and within the groups separated by comma. The values given pertain to all results.

*p<0,000

Results Correlation

The relationship between the total SRS raw scores and severity of ADHD symptoms as measured by the SNAP-IV was analyzed using Pearson correlation coefficient. The preliminary analysis revealed no violations of assumption of normality, linearity and homoscedasticity. There was a strong positive correlation between the two variables, $r = 0,857$, $n = 52$ at $p < 0,000$, with higher values on the SNAP-IV related to higher values on the SRS. Calculating the coefficient of determination revealed an explained variance of 73.4%. The scatter plot of the correlation is depicted in Figure 1.

When analyzing the correlation between total SRS scores and severity of ADHD symptoms divided by group the correlation was no longer significant for the control group, $r = 0,362$, $n = 25$ at $p = 0,075$. A positive correlation was still found in the ADHD group with $r = 0,639$, $n = 27$ at $p < 0,000$. The explained variance was calculated to 40,8%. When splitting the data over the groups rendered the correlation in the control group non significant further inspection was made. After inspection of the scatter plot of the correlation in the control group it was obvious that a previously identified outlier had a considerable impact on the results. Observe that the scatter plot depicted in Figure 1 is over the entire sample and still contains the outlier. The outlier had a major impact because of its combination of total SNAP-IV result and total SRS score. It was considered a multivariate outlier and hence a second correlation was performed without it. This time a significant positive correlation was found, $r=0,555$, $n=24$ at $p=0,005$. Removing the outlier had a minimal impact on the correlation for both groups, $r=0,868$, $n=51$ at $p < 0,000$.

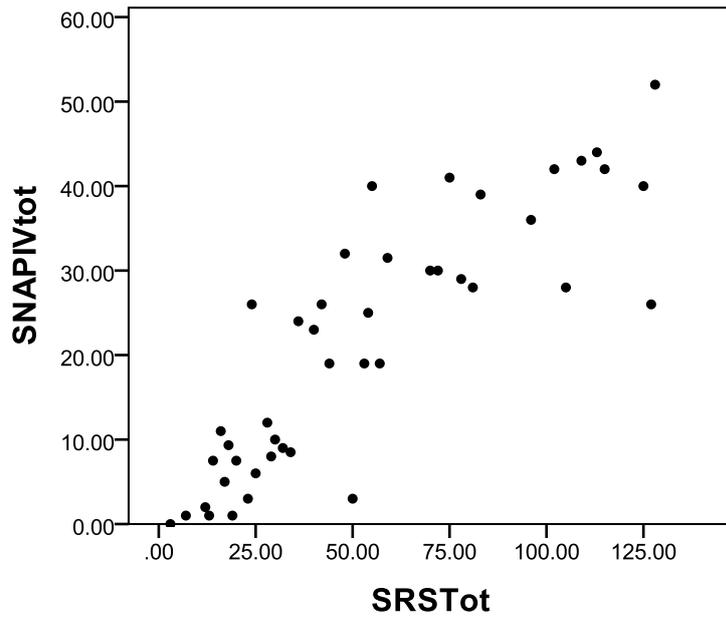


Figure 1. Correlation of total SNAP-IV results and total SRS raw scores

Discussion

It's been well documented that children with ADHD experience social difficulties. However, the social impairment and social behavior seen in children with ADHD sometimes seem to go beyond what can be explained by core features of ADHD. The occurrence of autistic traits in children with ADHD is not uncommon and has previously been found in research. (Clark et al., 1999; Reiersen et al., 2007; Christ et al., 2010) And the present result further supports those results. Elevated autistic traits when quantitatively measured was found in a Swedish clinical sample of children with ADHD when compared to a control group. The results confirms hypothesis 1. A mean total SRS score of 78,25 is slightly higher than what has previously been reported for children with ADHD by Reiersen et al. Their results showed a mean total SRS score of 74 with a standard deviation of 33 for the combined subtype, a total mean of 54 with a standard deviation of 31 for the inattentive subtype and a total mean score of 48 with a standard deviation of 23 for the hyperactive/impulsive subtype. The present sample contains all subtypes and reports a higher mean score.

42,8% of the children in the ADHD group had SRS scores in the mild to moderate range. Scores in this range indicate deficiencies in reciprocal social behavior and can result in mild to moderate interference in every day social interactions (Constantino and Gruber, 2005). 35,7% of children in the ADHD group had SRS scores in the severe range. Scores in this range are strongly associated with a clinical diagnosis in the autism spectrum and suggest severe interference in everyday social interactions (Constantino and Gruber). The present results indicate that 78,5% of the children in the ADHD group suffer from social difficulties that cannot solely be explained by problems related to ADHD symptomatology. The SRS has previously been found to measure social impairment beyond behavior related to inattention, impulsivity, hyperactivity or other factors not related to autism (Reiersen et al., 2007). This suggests that the present result indicate that true autistic symptomatology can be found in children diagnosed with ADHD.

The result found for the group differences on the subscales are a bit surprising. However, it's important to note that the subscales are highly inter-correlated and may stem from the same underlying deficit in reciprocal social behavior (Constantino and Gruber, 2005). Hence the present results are mere indicators of the reciprocal social behavior profile observed in this sample. The smallest difference between the ADHD group and the control group was found

for Social Motivation. The items in this subscale concern the subjects' willingness to participate in social interaction. As stated in Nijmeijer, Hoeckstra et al. (2008) children with ADHD are not uninterested in other people. Yet the results show a significant difference in Social Motivation compared to the control group. According to hypothesis 2 the Social Motivation score was expected to be relatively low within the ADHD group indicating less impairment in this area. The biggest difference between the control group and the ADHD group was found in Autistic Mannerisms which was surprising. This is also the highest score within the ADHD group and was according to hypothesis 2 expected to be relatively low. The same difference between the two groups was found for Social Awareness, Social Communication and Social Cognition. These were expected to have the highest scores within the ADHD group according to hypothesis 2. Overall the subscales scores are very similar and a more differentiated profile was expected. However, the main purpose of the subscales is to present a clearer picture of a single individuals' social impairment in a clinical or treatment context (Constantino and Gruber, 2005). This taken in to account with the high inter-correlation between the subscales the on average, relatively small differences between subscales are not unlikely.

The strong positive correlation that was found between total SNAP-IV scores and total SRS scores confirms hypothesis 3. Severity of ADHD symptoms is positively correlated with impairment in reciprocal social behavior. This was found even in the control group. The big difference in correlation measured for the entire sample and when split over group might be caused by the difference in variation between the two groups. When looking at the scatter plot presented in Figure 1 the dots above a SNAP-IV result of twenty depicts a much greater variation than those below. All but one of the dots around twenty and above belongs to the ADHD group. The further along the x axis you look the more scattered the plots appear. This may suggest that a third factor is affecting the results leading to higher SRS scores. The correlation results lend no further support to ADHD being truly linked to autism but Figure 1 depicts a possibility for an influence by a third factor.

The control group and the ADHD group were found to be similar on all considered relevant aspects such as gender, age, SES, divorce rate and number of siblings. Hence the difference found is not likely to have been affected by sampling biases and can be attributed to the group factor. The high but not unexpected rate of comorbid ODD found in this sample may have influenced the SRS results resulting in slightly higher SRS scores but this is unlikely to in itself have caused the great difference observed between the two groups. 85.7% of the

children in the ADHD group medicate for their ADHD symptoms. A slightly different result could have been found had that not been the case, although it wouldn't be expected to have altered the results in a significant way. The ADHD group had received their diagnoses between 6 months and 6 years prior to participating in the research. Having had more time to adjust to the diagnosis, receiving more treatment etc could possibly have had an effect on an individual's SRS and SNAP-IV scores. Such impact would however not be expected to have had an effect on the overall results. None of the children in the ADHD group although possibly diagnosed 6 years ago, on average 2, have up until prior to this study been diagnosed with any other diagnoses such as depression, anxiety, autism or PDD. However, since their diagnosis their ADHD can have been in full or partial remission. Whether that is the case or not is unknown.

Results in relation to executive functioning

In the introduction Barkley's theory of inhibition is presented. The present results can be viewed as contradicting to Barkley's theory. In short Barkley's theory would mean that the social difficulties seen in children with ADHD are due to problems with inhibiting responses to social occurrences resulting in actions not adequately tuned to the social situation or the emotions of others. This could then be argued to cause the interpersonal problems and socially impaired behavior seen in children with ADHD. The present result reveals significant differences in reciprocal social behavior between the control group and the ADHD group and a major part of the ADHD sample is found in a range that suggests that they suffer mild to severe impairment in their daily social lives. The SRS is constructed to in part measure social awareness, or in other words defined as the ability to pick up on social cues. According to Barkley's theory such abilities should still be intact. However, result of this study showed that children with ADHD significantly differed from the control group on this measure. This is in concordance with Corbett and Glidden (2000) where they found mild to moderate difficulties in affect perception in children with ADHD. In Semrud-Clikeman (2010) a significant difference in social perception and in the ability to interpret nonverbal social and emotional cues was found between children with ADHD and a control group. The ability to interpret social cues once they are picked up is measured by the subscale of the SRS; social cognition. The children in the ADHD group were found to significantly differ from the control group on

this measure. In Semrud-Clikeman's study the deficits in social perception and social cognition was also found to be related to greater social impairment as also indicated by present results.

Results in relation to social cognition

As mentioned in the introduction social cognition refers to the ability to understand other peoples' minds and feelings which involves the interpretation and perception of social cues. As discussed in the previous paragraph such abilities are found to be significantly more impaired in the ADHD group compared to the control group. Social cognition also refers to empathy. The SRS subscale Social Motivation in part concerns empathic orientation. The present results show a significant difference between the ADHD group and the control group on this measure. In Uekerman (2010) evidence of impairment in areas critically involved in empathy has been found in patients with ADHD. Previous research has also reported that children with ADHD are perceived as less empathic and that they show less state empathy. (Marton et al., 2008; Braatens and Rosén, 2000) This is in concordance with present research. However, to clarify, the results of this study concern empathic orientation and not empathic ability. Overall the result of this study lends tentative support to impairment in social cognition in children with ADHD being related to poorer social functioning.

Validity and Reliability

To operationalize the aim of this study two parent rating scales were used. The SRS has previously been deemed both reliable and valid with a strong concurrent validity with the ADI-R. The ADI-R is a parent report interview and has long been the gold standard for establishing a clinical diagnosis of ASDs. The SRS also has a high inter-rater reliability and good temporal consistency (Constantino and Gruber, 2005). The use of the SRS can hence be assumed to generate both reliable and valid results.

The SNAP-IV has shown to have acceptable internal consistency and a factor structure concurrent with DSM-IV criteria of ADHD and ODD and effectively distinguishes between

different levels of ADHD (Bussing et al., 2008). The use of the SNAP-IV can hence be deemed to generate both reliable and valid results.

External validity

The ADHD group represents a clinical sample and is hence not representative to the entire ADHD population. A clinical sample is subjected to referral biases and a higher level of impairment is expected. The ADHD sample represents children between the age of 8 and 12. The results are representative to that age group. The result would however, not be expected to differ that much had it been derived from an older sample considering evidence of equal social impairment in adolescents as found in pediatric samples (Sibley et al., 2009). The present sample also lack an even gender distribution. This, as mentioned in the introduction is not uncommon. A different result would have been expected if an even gender distribution would have occurred in the study considering aforementioned results by Biederman et al. (2002) and Staller and Faraone (2006). It is likely that the results would have revealed a higher mean score for the entire ADHD group, with girls being more impaired than boys. The present results are hence not representative for girls with ADHD.

The ADHD sample consists of all three subtypes. The combined subtype makes up 60,7 % of the sample which is within the expected range of 50 – 75% (Barkley et al., 2007). The inattentive subtype makes up 14,2 % of the sample which is less than expected. The prevalence of the inattentive subtype is 20 – 30 % (Barkley et al.) The hyperactive/impulsive subtype makes up 14,2% of the sample which is high but within the normal range of < 15 % (Barkley et al.). 10,9% of the sample has an undefined subtype due to lack of report and an inconclusive SNAP-IV result. The ADHD sample is not representative when it comes to subtypes due to a smaller proportion of the inattentive subtype than generally prevalent. The results despite its lack of external validity are still relevant and pertain to a large part of the ADHD population.

The control group is not representative for the Swedish population. The participants were not randomly selected and hence external validity is lacking. The results are lower than what has previously been measured in Reirsen et al. (2007) where a total SRS raw score mean of 33

was found. The variation of the total SRS raw scores within the control group was small. It had a SD of 10,37. Had a more representative control group been achieved the variation within the group would probably have been larger. Even if the mean total SRS raw score of the control group had been a bit higher the results would most likely still be significant. Hence the present results are still relevant.

Construct validity

All children in the ADHD sample have previously been diagnosed with ADHD according to DSM-IV or an ADHD equivalent diagnosis according to DSM-III criteria which qualified them for the inclusion in the ADHD group. The aim of the study is to analyze whether elevated autistic traits as reported by parents are present in the ADHD group compared to the control group. This assumes that all children in the ADHD group have an ADHD diagnosis and not a diagnosis within the autism spectrum disorder where autistic traits are subsumed. The results found in this study could, if previous statement is true, be evidence of a link between autism and ADHD. The results could also be evidence of inadequately defined constructs of ADHD and ASD, and that they are in fact one and the same. The results are still valid but the cause and effect relationship between ADHD and the presence of autistic traits is not clear. That question is however, not addressed by the present research and is for future research to analyze.

Internal validity

The issue of selection has previously been discussed and was found not present in regards to age, gender, SES, marital status and number of siblings. A selection bias due to factors not analyzed could hypothetically still be present. However, the large effect size observed in this study indicates that such selection bias is unlikely to have been present.

The SRS have shown to have good temporal consistency and hence the results found are not likely to have been subjected to other co-occurrences that could have affected the results (Constantino and Gruber, 2005). Neither are subjective variations in mood at the time of rating likely to have had an effect on the significance of the present results.

An effect of repeated testing is probably not relevant for the SRS results due to its specific concern. The SNAP-IV however, concerns behaviors that are very obviously related to ADHD symptomatic behavior. The parents participating are likely to have been subjected to questions regarding these behaviors many times. The familiarity of questions may hence cause the parents to answer as they always have and not in accordance with their child's behavior over the past six months as instructed. The results of the SNAP-IV may hence not reflect their current behavior and hence be a threat to the internal validity of the correlation study.

Limitations

A few limitations to this study can be identified. The ADHD group lacked an even distribution over gender and subtype. This also means that the results presented cannot be generalized to both genders and all subtypes which was an original aim of this study. The sample was predominantly male and had the combined subtype and the results can hence be most successfully generalized to that group. This is considered a major drawback of this research. Also the design did not strive to enable generalization beyond those represented in the sample although the ability to do so would have been desirable. However, that would have required resources that weren't available.

Also the research relies solely on parents' ratings of their child. To have obtained other kinds of measures of the occurrence of autistic traits, such as observations, would have further strengthen the results. A second rating by a teacher could also have further confirmed the results but was deemed too costly and time consuming. The lack of secondary measures although desirable is only considered a moderate limitation considering the SRS previous result of being highly correlated to other measures such as the ADI-R (Constantino et al., 2007). Parent and teacher ratings have also previously been found to be highly correlated for the SRS (Constantino et al., 2003).

No measure of IQ was attainable in the present study. The researcher had no access to patient files and not enough resources were available to perform additional IQ tests for the control group. All participants in the ADHD group are highly likely to have had IQ tests performed hence they were questioned about those results. However, very few of the participants reported such results. The majority of participants reported that they could not recall the

results or were unaware of them. Hence IQ status could not be reported or utilized in the analysis. All that is known is that all participants in the ADHD group had an IQ of above 70, since they were screened for that prior to the inclusion in the study. Nothing of the IQ status of the control group is unfortunately known. But any inclusion of children in the control group with an IQ below 70 is deemed unlikely to have occurred. If that however, has been the case it is believed to have had very little impact on the results in this case. Since, within the normal range of cognitive functioning SRS scores are not significantly correlated with IQ (Constantino and Gruber, 2005).

Ethical considerations

All participants gave informed consent to participating in the study. The research aim was well explained in the letter addressed to the participants prior to participating in the study. Patient – doctor confidentiality has been strictly adhered to throughout the study. No identity of those participating in the ADHD group has been known to the researcher at any point in time during the course of the research. Nor has such identification been made possible through the research process. The identities of those participating in the control group have only been known to the researcher in cases where it was chosen by the participants. Identity information obtained has been handled with strict confidentiality and no personal information has been made available to anyone but the researcher at any point during the course of the research. The results in whole will be made available to all those who participated and willing to part take in the results at the point of conclusion of the research. No ethical violations have been identified.

Conclusion, clinical implications and future research

A significant difference in the occurrence of autistic traits was found in a clinical sample of Swedish children diagnosed with ADHD when compared to a control group. 35,7 % of the children in the ADHD group were identified as being severely impaired in their reciprocal social behavior. This severe kind of impairment is highly associated with a clinical diagnosis in the autism spectrum. The results indicate a link between true autistic symptomatology and

ADHD. 78,5 % of the children in the ADHD group were rated as suffering at least mild impairment in their daily social life. The high co-occurrence of ADHD and autistic symptoms warrants a revision of the diagnostic criteria. Also different treatment approaches might be needed when children suffer from both ADHD and autistic traits. To further explore the link between ADHD and autism and to establish cause and effect relationships are desirable in future research.

The present results may also be considered to have ethical legal implication. In Sweden, children with ADHD and children with autism fall under different laws that regulate available funding by the state. Considering the high occurrence of autistic traits in children with only the ADHD diagnosis, such practice might be considered discriminating towards them.

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The compendium presented here is the one given to the ADHD group. The one given to the control group differs on the profile page. The differences are reported in the methods chapter.

Instruktioner

Fyll i skattningsformulären utefter bästa förmåga. Komihåg at det är viktigt at du kontrollerar att du svarat på alla frågorna då det är viktigt för att resultaten inte ska bli missvisande.

ADHD, SNAP-IV

Det första skattningsformuläret handlar om beteenden som rör uppmärksamhet, hyperaktivitet, impulsivitet och trots. Försök skatta ditt barns beteende så som det sett ut de närmaste 6 månaderna. Ringa in den siffra som bäst beskriver ditt barns beteende.

Det finns fyra svarsmöjligheter.

0 = Inte alls; 1 = Bara lite; 2 = En hel del 3 = Våldigt mycket

Socialkompetens, Social Responsiveness Scale (SRS)

Det andra skattningsformuläret handlar om social kompetens. Försök skatta ditt barns beteende så som det sett ut de närmaste 6 månaderna. Ringa in den siffra som bäst beskriver ditt barns beteende.

Det finns fyra svarsmöjligheter.

1 = Stämmer inte; 2 = Stämmer Ibland; 3 = Stämmer oftast; 4 = Stämmer nästan alltid

Profilblad

Fyll i de uppgifter som efterfrågas kring ditt barn och dig själv som ifyllare. Ni kommer vara anonym genom hela processen och inga resultat eller uppgifter kommer att kunna kopplas till dig eller ditt barn.

Tack för din medverkan!

Var god returnera dina svar i bifogat kuvert inom tio dagar från det att du mottagit utskicket.

Ringa in den siffra som bäst beskriver barnets beteende:

0 = Inte alls; 1 = Bara lite; 2 = En hel del 3 = Våldigt mycket

1. Är ofta ouppmärksam på detaljer eller gör slarvfel i skolarbetet eller andra aktiviteter	0	1	2	3
2. Har ofta svårt att hålla kvar uppmärksamheten på uppgifter eller leka	0	1	2	3
3. Verkar ofta inte lyssna på direkt tilltal	0	1	2	3
4. Följer ofta inte givna instruktioner och misslyckas med att genomföra skolarbete eller arbetsuppgifter	0	1	2	3
5. Har ofta svårt att organisera uppgifter och aktiviteter	0	1	2	3
6. Undviker ofta, ogillar eller är ovillig att utföra uppgifter som kräver mental uthållighet (tex skolarbete eller läxor)	0	1	2	3
7. Tappar ofta bort saker som är nödvändiga för olika aktiviteter (tex leksaker, läxmaterial, pennor eller böcker)	0	1	2	3
8. Är ofta lätt distraherad av yttre stimuli	0	1	2	3
9. Är ofta glömsk i det dagliga livet	0	1	2	3
10. Har ofta svårt att hålla sig alert och följa uppmaningar och anvisningar	0	1	2	3
11. Har ofta svårt att vara stilla med händer och fötter eller kan inte sitta still	0	1	2	3
12. Lämnar ofta sin plats i klassrummet eller i andra situationer där man förväntas sitta kvar	0	1	2	3
13. Springer ofta omkring eller klättrar mer än vad som är lämpligt för situationen	0	1	2	3
14. Har ofta svårt att leka eller utöva fritidsaktiviteter lugnt och stilla	0	1	2	3
15. Verkar ofta vara på språng eller på högvarv	0	1	2	3
16. Pratar ofta överdrivet mycket	0	1	2	3
17. Kastar ofta ur sig svaret innan frågan är färdigställd	0	1	2	3
18. Har ofta svårt att vänta på sin tur	0	1	2	3
19. Avbryter eller stör ofta andra (tex kastar sig in i andras samtal eller lekar)	0	1	2	3
20. Har ofta svårt att vara still, vara tyst, eller hålla tillbaka impulser i klassrummet eller hemma	0	1	2	3
21. Tappar ofta humöret	0	1	2	3
22. Argumenterar ofta mot vuxna	0	1	2	3
23. Trotsar ofta aktivt eller vägrar underordna sig vuxnas krav eller regler	0	1	2	3
24. Förargar ofta andra med avsikt	0	1	2	3
25. Skyller ofta på andra för egna misstag eller dåligt uppförande	0	1	2	3
26. Är ofta lättretad och stingslig	0	1	2	3
27. Är ofta arg och stött	0	1	2	3
28. Är ofta hämndlysten eller elak	0	1	2	3
29. Grälar ofta	0	1	2	3
30. Är ofta negativ, trotsig, olydig, eller fientlig mot vuxna	0	1	2	3

Profilblad

Barnets ålder _____

Barnets kön flicka pojke

Antal helsyskon (inklusive barnet) _____

Placering i syskonskaran _____

Antal halvsyskon _____

Antal styvsyskon _____

När fick barnet sin diagnos? Ange barnets ålder då diagnos ställdes _____ Vet ej

Medicinerar barnet? Ja Nej Vet ej

Om ja, vilken/vilka mediciner _____

Vilken underdiagnos av ADHD har barnet?

Dominant uppmärksamhetsstörning Dominant hyperaktivitet/Impulsivitet

Kombinerad typ Vet ej

Har barnet någon annan diagnos utöver ADHD? Ja Nej Vet ej

Om ja, vilken? _____

Har barnet något fysiskt handikapp? Ja Nej

Har begåvningsstest utförts för barnet Ja Nej Vet ej

Om ja, vilket test har genomförts? _____ Resultat: _____

Barnets familjesituation:

Bor med båda bioföräldrarna

Bor med båda adoptivföräldrarna

Föräldrar är skilda och barnet bor huvudsakligen...

Hos båda föräldrarna

Hos den ena föräldern, Mamma Pappa

Vilket språk talas huvudsakligen i hemmet?

Svenska

Annat _____

Civilstatus förälder (gäller uppgiftslämnaren)

Gift

Sambo

Singel

Markera den högsta utbildning avklarad av förälder

Mamma: Högstadium Gymnasium Folkhögskola Universitet/Högskola

Pappa: Högstadium Gymnasium Folkhögskola Universitet/Högskola

Tack för din medverkan!

Var god returnera dina svar i bifogat kuvert inom tio dagar från det att du mottagit utskicket.

Appendix B; Introduction letter

The introduction letter presented here is the one sent out to the ADHD group.



LUNDS
UNIVERSITET

Förfrågan om deltagande i forskningsstudie

Hej,

Du/ni har blivit kontaktade för att vi nu söker föräldrar till barn med ADHD för deltagande i en studie kring social förmåga och ADHD.

Forskning kring barn med ADHD och deras sociala färdigheter är i dagsläget bristande. Stor del av forskningen kring ADHD fokuserar på problematik som är relaterad till skola och arbetslivet. Personer med ADHD kan uppleva sociala svårigheter men hur dessa svårigheter ser ut samt hur man bäst bemöter dessa har fått mindre uppmärksamhet i forskning. Det är ett viktigt område att vidare studera eftersom ett positivt socialt umgänge är gynnsamt för ett barns utveckling. Genom att delta i studien utgör ni ett viktigt bidrag till ökad kunskap på området.

Specifikt om studien

Studien utförs för att beskriva social förmåga hos barn med ADHD. Studien består av två skattningsformulär som ni som föräldrar fyller i. Det ena formuläret syftar till att bedöma och kartlägga barns sociala kompetens så som den tar sig uttryck i barns naturliga omgivning och i samspel med andra. Det andra formuläret syftar till att skatta uppmärksamhet, hyperaktivitet, impulsivitet och trotsbeteenden hos barnet.

Utöver den information som samlas in via frågeformuläret är vi intresserade av en del demografiska uppgifter samt uppgifter som rör barnets diagnos och familjesituation som är relevanta för studien. Specifikt så är vi intresserade av när diagnos ställts, vilken medicinering som ordinerats samt subtyp av ADHD. Har begåvningsstest gjorts så vill vi även att ni berättar om det resultatet.

Ni och ert barn kommer att vara helt anonyma genom hela processen, inget barn eller förälder kommer på något sätt att kunna identifieras i den statistiska processen eller på annat sätt genom

studien. Personen som utför studien kommer aldrig ha tillgång till några personuppgifter utan all kontakt mellan den som utför studien och er sker via BUP. Om ni väljer att delta kan ni givetvis när som helst välja att avbryta studien utan att meddela varför. Vi är oerhört tacksamma för alla som deltar.

Är du intresserad av att delta fyller du enskilt eller tillsammans med din partner i bifogat frågeformulär. Lägg formuläret i det bifogade kuvertet, porto är betalt, och skicka in senast 10 dagar efter utskick. Kom ihåg att ditt bidrag är unikt och är viktigt för att studien inte ska bli missvisande.

Tack så mycket för er medverkan.

Vem genomför studien

Studien utgör ett examensarbete på Institutionen för Psykologi vid Lunds Universitet.

Jag som kommer att genomföra studien heter Lisa Davidsson och är student på masterprogrammet i psykologi vid Lunds Universitet. Jag har lång erfarenhet av att arbeta med barn och ungdomar som har ADHD och andra neuropsykiatriska funktionshinder. Jag är för närvarande behandlingsansvarig vid ett HVB-hem med neuropsykiatrisk specialisering.

Arbetet handleds av Aki Johanson, professor i neuropsykologi vid Institutionen för Psykologi.

Studien är godkänd av Peik Gustafsson, Överläkare BUP Malmö.

Studien är godkänd av Annika Nilsson, Enhetschef BUP III Lund

Är ni intresserade av att efter studiens genomförande ta del av resultaten är ni välkomna att kontakta Lisa Davidsson. Resultatet kommer även lämnas till BUP. Individuella resultat kommer tyvärr inte att kunna redovisas.

Kontakt

Lisa Davidsson

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