Growing up with autism spectrum disorders: outcome in adolescence and adulthood

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CHAPTER 4

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Overlap of autistic and schizotypal traits in adolescents with autism spectrum disorders

Abstract

This study addresses the unraveling of the relationship between autism spectrum and schizophrenia spectrum traits in a population of adolescents with Autism Spectrum Disorder (ASD). Recent studies comparing isolated symptoms of both spectrum disorders as well as diagnostic criteria for each (DSM-IV-TR) suggest resemblances in the clinical phenotype. A group of 27 adolescents with ASD (11-18 years) and 30 typically developing adolescents, matched for age and gender, participated in this study. Within the ASD group 11 adolescents satisfied DSM-IV-TR criteria for schizotypal personality disorders. Autistic and schizotypal traits were identified by means of well validated questionnaires (Autism Questionnaire, AQ and Schizotypal Personality Questionnaire-Revised, SPQ). Significantly more schizotypal traits in adolescents with ASD were found than in typically developing controls. Besides high levels of negative symptoms, adolescents with ASD also displayed high levels of positive and disorganized symptoms. There appeared to be a relationship between the mean level of autistic symptoms and schizotypal traits, as well as specific associations between autistic symptoms and negative, disorganized and positive schizotypal symptoms within individuals. Schizotypal symptomatology in all sub dimensions that are reflected by the SPQ scores, was most prominently associated with attention switching problems of the autism symptoms from the AQ. These findings indicate that patients diagnosed with an ASD show schizophrenia spectrum traits in adolescence. Although other studies have provided empirical support for this overlap in diagnostic criteria between both spectrum disorders, the present findings add to the literature that behavioral overlap is not limited to negative schizotypal symptoms, but extends to disorganized and positive symptoms as well.

1. Introduction

Autism Spectrum Disorders (ASD) and Schizophrenia Spectrum Disorders (SSD) are both characterized by significant impairments in social functioning (American Psychiatric Association (APA), 2000). Although these spectrum disorders have distinct classification criteria according to the current DSM-IV-TR standards, the extent of overlap with respect to the clinical presentation of the disorders and the underlying mechanisms of each, have been topics of scientific discussion for many decades. In the early '40s, Kanner (1943) adopted the term 'autism' from Eugene Bleuler (1911), who had coined it to describe the self-absorbed withdrawn behaviors that were characteristic of adults with schizophrenia. Bender (1947) argued that ASD could be an age specific expression of a developmental disorder that in adulthood is characterized by schizotypal symptoms. Recent reports have provided empirical support for a conceptual overlap in diagnostic criteria between both spectrum disorders (Hurst et al., 2007; Konstantareas & Hewitt, 2001; Sheitman et al., 2004). Kolvin (1971) and Rutter (1972), however, have regarded ASD and SSD as mutually exclusive categorical diagnoses (APA, 2000) with clearly distinct developmental pathways. Despite the clear differences in clinical presentation and age of onset, recent studies have pointed to the co-occurrence of autistic and schizophrenic symptomatology in individuals. A number of these studies have focused on the presence of schizophrenia spectrum pathology in patients with ASD, further illuminating the possible overlap between both disorders. Negative symptoms and to a lesser extent disorganized symptoms, have been reported in adults and adolescents with ASD (Dykens et al., 1991; Konstantareas & Hewitt, 2001; Rumsey et al., 1986). Signs of positive symptoms of SSD have not been consistently found in individuals with ASD (Craig et al., 2004; De Bruin et al., 2007; Solomon et al., 2008; Van der Gaag et al., 2005).

Other studies have focused on the presence of high levels of autistic traits in patients with SSD (Bender, 1970; Esterberg et al., 2008; Sheitman et al., 2004). Moreover, follow-up studies have indicated that a substantial proportion of children diagnosed with an ASD developed SSD later in life, with conversion rates reported up to 34.8% (Mouridsen et al., 2008; Stahlberg et al., 2004; Van Engeland & Van der Gaag, 1994). This suggests that in some children with ASD a developmental shift towards schizotypy might occur. In these cases, it is likely that (subclinical) schizotypal traits were already present in adolescence, and it is relevant to examine to what extent autistic and schizotypal symptoms already coincide during adolescence.

A major factor affecting the clarity of previous findings stems from the categorical approach employed in the majority of studies. Only a small number of studies have explored the relation between the behavioral expressions of both disorders from a dimensional perspective. As Konstantareas and Hewitt (2001) have argued, this allows for a degree of overlap of specific symptom expression, and can therefore provide more insight into the putative common grounds in symptomatology. Hurst and colleagues (2007) have incorporated this dimensional approach and have found strong positive associations between autistic and schizotypal features in a large non-clinical population. However, it is obviously important to study these relations in clinical samples that meet diagnostic criteria for either ASD or SSD.

In the present study we add to the literature by direct comparison of autistic symptoms to schizotypal traits in a sample of adolescents, already diagnosed with ASD in childhood, in order to explore the possible correspondence in symptomatology. It is hypothesized that adolescents with ASD show more schizotypal traits than typically developing adolescents. The main hypothesis is that there is an overlap between autistic symptoms and schizotypal traits in adolescents with ASD.

2. Methods

2.1. Subjects

Twenty-seven adolescents with ASD (11-18 years) and 30 typically developing controls, matched on age and gender participated in the study. The participants with ASD consisted of a group of consecutive referrals to the inpatient Department of Child and Adolescent Psychiatry at the University Medical Centre Utrecht, the Netherlands (1998-2004). A total of 55 inpatients diagnosed with ASD were sent a letter informing them about the aims of the study and checking their willingness to participate in the study. Twelve adolescents refused participation. Forty-three adolescents and their parents decided to participate in the study of which three cancelled their participation later on. A written informed consent was collected prior to entry in the study.

To qualify for the current study the participants had to meet the fol-

lowing inclusion criteria. First, a diagnosis of ASD at childhood was required, based on 100% diagnostic agreement with regard to the DSM-IV-TR classification between two board-certified psychiatrists. During the follow-up period, the ASD diagnoses were validated using the Dutch translation of the Autism Diagnostic Interview – Revised (ADI-R) (Lord et al., 1994). A diagnosis of ASD was considered if the adolescent obtained a score meeting or exceeding the cut-off criteria on two domains, including the ADI-R reciprocal social interaction domain and a score within one point of the cut-off on either the communication or restricted activities/interests domain. Second, adolescents were included if they had an estimated Full Scale IQ of 70 or higher, based on the subtests Vocabulary and Block Design of the Dutch adaptation of the Wechsler Intelligence Scales for Children (WISC-IIINL; Wechsler, 2002) or Adults (WAIS-IIINL; Wechsler, 2005). Following these two criteria, eight adolescents were excluded because they did not meet the ADI cut-off criteria and three were excluded because they had a Full Scale IQ below 70. Two adolescents were excluded because of too much missing data. Reliable scores for 27 adolescents with ASD (20 boys, 7 girls) were obtained. Eleven adolescents with ASD (40.7%) met the criteria for a schizotypal personality disorder (DSM-IV-TR 301.22). In addition, 23 adolescents met criteria for affective or anxiety disorders, three for somatic disorders, nine for attention deficit/hyperactivity disorders, and five for oppositional defiant disorders or conduct disorders.

The typically developing (TD) group consisted of 30 adolescents (23 boys, 7 girls) with ages 10-18 years. They were recruited by contacting regular public secondary schools. All individuals were screened for global intelligence (Full Scale IQ of 70 or higher, based on the subtests Vocabulary and Block Design of the WISC-IIINL or WAIS-IIINL). None of the typically developing controls satisfied the criteria for ASD or schizotypal personality disorder. Moreover, all individuals needed to be free of problem behavior as indicated by total problem scores below the clinical range of 70 on the CBCL (Achenbach, 1986).

2.2. Measures

Autism traits were evaluated using the Autism Questionnaire (AQ, Baron-Cohen et al., 2001). The AQ is a 50 item self-report questionnaire and assesses the degree to which an individual of normal intelligence might show features of the core autistic phenotype: poor social skills (e.g., 'I find it hard to make new friends'), poor attention switching (e.g., 'I prefer to do the same thing over and over again'), exceptional attention to detail (e.g., 'I tend to notice details that others do not'), poor communication skills (e.g., 'I frequently find that I don't know how to keep a conversation going') and poor imagination (e.g., 'When I'm reading a story, I find it difficult to work out the characters' intentions').

Schizophrenia spectrum pathology was measured using the revised Schizotypal Personality Questionnaire (SPQ, Raine, 1991; Vollema & Hoijtink, 2000). The SPQ is a 74 item self-report measure of schizotypal traits, which have shown to be normally distributed in the general population. Factor analytical studies have revealed three dimensions of schizotypy: positive schizotypy (e.g., referential thinking and delusional atmosphere), negative schizotypy (e.g., constricted affect and social anxiety) and disorganization (odd speech and eccentric behavior) (Vollema & Hoijtink, 2000). Raine (1991) described the development of the SPQ which is modeled on DSM-III-R criteria for schizotypal personality disorder. A chi-square analysis indicated a significant association between 'group membership' based on scores on the SPQ (high/low) and clinical diagnosis (yes/no) of schizotypal personality disorder (X^2=7.3, p=.007). The point-biserial correlation between diagnosis of schizotypal personality disorders and SPQ scores was also significant (r=.60, p<0.001) (Raine, 1991). These analyses demonstrate that high scores on the SPQ are indicative of a diagnosis of schizotypal personality disorder. In addition, in a study of Vollema et al. (2002) the SPQ was used as an indicator of the vulnerability to schizophrenia. First-episode schizophrenia patients and relatives of schizophrenia patients were compared with respect to SPQ scores. Schizophrenia patients differed largely from the relatives on all three SPQ dimensions. Based on these studies, the SPQ is regarded as an indicator of the genetic vulnerability of schizophrenia and it is sensitive to gradient levels of schizophrenia proportional to the risk of schizophrenia associated with the degree of kinship with schizophrenic family members. The SPQ was slightly modified to better accommodate a young population (e.g., items referring to work were changed into referring to school) (Sprong et al., 2008).

2.3. Statistical analyses

Group differences were tested using univariate (total AQ and SPQ scores) and multivariate (subscales of the AQ and SPQ) analyses of variance, controlling for IQ. Partial eta squared (η_p^2) was used to estimate effect sizes (weak effect:

η_p^2~0.03; moderate: η_p^2~0.06; large: η_p^2≥0.14) (Stevens, 1986). The degree of relationships between total scores and dimensions of the AQ and SPQ were examined by Spearman's bivariate correlations (*r*) (small effect size: *r*=0.1−0.23; medium: *r*=0.24−0.36; large: *r*≥0.37) (Cohen, 1992), which are converted into the proportion of explained variance.

3. Results

3.1. Age, gender and IQ

Comparison of the ASD and typical developing adolescents revealed no difference in age (ASD: mean age=14.6, *SD*=2.1; TD mean age=15.4, *SD*=2.1) (*p*=.157) and gender (*p*=.820). There was a significant difference in global intelligence level (ASD mean TIQ=93.6, *SD*=13.7; TD mean TIQ=114.0, *SD*=9.6) (t(55)=6.56, *p*<.001). As a consequence, IQ was used as a covariate in all analyses.

3.2. Autistic traits

The mean total AQ score was significantly higher in the ASD group (*M*=22.0, *SD*=7.2) than in the TD group (*M*=10.1, *SD*=5.9) (*F*(2,54)=16.96, *p*<.001, η_p^2=.239). As shown in Figure 1, the adolescents with ASD displayed more autistic traits than typically developing adolescents in four domains, with moderate to large effect sizes: Social skills (*F*(2,54)=7.65, *p*=.008, η_p^2=.124), Attention switching (*F*(2,54)=9.78, *p*=.003, η_p^2=.153), Attention to detail (*F*(2,54)=13.08, *p*=.001, η_p^2=.195) and Communication (*F*(2,54)=11.59, *p*=.001, η_p^2=.177). No significant difference was found on Imagination (*p*=.363).

3.3. Schizotypal traits

The mean total SPQ score was significantly higher in adolescents with ASD (*M*=32.2, *SD*=16.4) than in typically developing adolescents (*M*=10.9, *SD*=8.3) (*F*(2,54)=13.76, *p*<.001, η_p^2=.203). The scores on all three dimensions were significantly higher in adolescents with ASD than in typically developing controls, with moderate to large effect sizes (see Figure 2): Negative symptoms (ASD: *M*=15.33, *SD*=8.4; TD: *M*=4.87, *SD*=3.4) (*F*(2,54)=11.06, *p*=.002, η_p^2=.170), Positive symptoms (ASD: *M*=9.59, *SD*=7.2; TD: *M*=3.57, *SD*=3.9) (*F*(2,54)=7.83, *p*=.007, η_p^2=.127) and Disorganized behavior (ASD: *M*=7.22, *SD*=4.4; TD: *M*=2.80, *SD*=3.2) (*F*(2,54)=6.90, *p*=.011, η_p^2=.113).

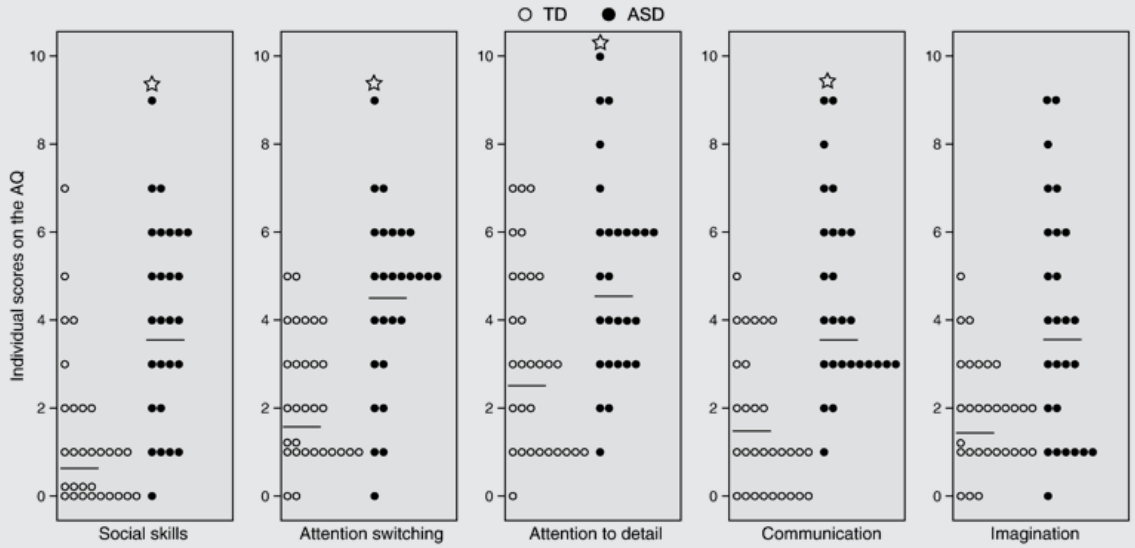

Figure 1. Levels of autism traits as measured with the Autism Questionnaire (AQ; individuals scores and median) in adolescents with autism spectrum disorders (ASD) as compared to typically developing (TD) adolescents. * p<.05

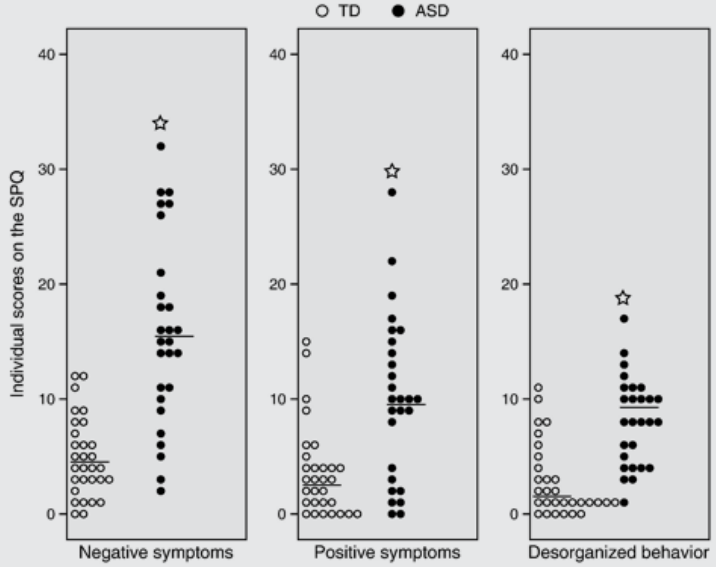

Figure 2. Levels of schizotypal traits as measured with the Schizotypal Personality Questionnaire (SPQ, individuals scores and median) in adolescents with Autism Spectrum Disorders (ASD) as compared to typically developing (TD) adolescents. * p<.05

3.4. Overlap between autistic and schizotypal traits

Within the ASD group, a significant correlation was found between the mean level of autistic and schizotypal traits (r=.38, p=.024), with a proportion of explained variance of 14%. The SPQ total score was significantly correlated with the autistic traits Attention switching (r=.57, p=.001) and Communication (r=.45, p=.009), resulting in respectively 32% and 20% explained variance.

The SPQ negative dimension was significantly correlated with the AQ domains Social skills (r=.57, p=.001), Attention switching (r=.60, p<.001), Communication (r=.68, p<.001), and Imagination (r=.56, p=.001), with respectively 32%, 36%, 46% and 31% proportions of explained variance. The SPQ disorganized dimension was significantly correlated with the AQ domains Attention switching (r=.43, p=.013) and Communication (r=.36, p=.031), accounting for respectively 19% and 13% of the explained variance. The SPQ positive dimension was significantly correlated with the AQ domain Attention switching (r=.37, p=.027), with a proportion of explained variance of 14%.

4. Discussion

The objective of this study was to examine to what extent patients diagnosed with an ASD in early childhood show schizophrenia spectrum traits in adolescence in order to explore the correspondence between autistic and schizotypal symptoms. The outcome revealed higher scores on all dimensions of the schizophrenia phenotype in adolescents with ASD than in typically developing adolescents. Besides high levels of negative symptoms, adolescents with ASD also displayed high levels of positive symptoms and disorganized symptoms.

Although autism spectrum and schizophrenia spectrum disorders have distinct classification criteria according to the current DSM-IV-TR, and have clearly different developmental pathways, our findings demonstrate a striking resemblance of their clinical phenotypes. That is, there appears to be an overlap between autistic symptoms and schizotypal traits. When considering the different dimensions of schizotypy separately, an overlap between negative traits and autistic features in terms of explained variance ranged from 31% to 46%. Autistic features were also related to disorganized symptoms (13% to 16% explained variance) and positive symptoms (14% explained variance). Our finding that an overlap between autistic traits and negative schizotypal symptoms was found is equivalent to the vision of Bleuler (1911) and supports the idea of correspondence in diagnostic criteria between both spectrum disorders (Hurst et al., 2007; Konstantareas & Hewitt, 2001; Sheitman et al., 2004).

The present findings suggest that behavioral overlap is not limited to negative schizotypal symptoms but extends to disorganized and positive symptoms as well. These results were consistent with other studies by Dykens et al. (1991) and Rumsey et al. (1986) who reported shared symptoms in ASD and schizophrenia, like poverty of speech. Considering positive symptoms, Blackshaw et al. (2001) and Craig et al. (2004) indicated some degree of paranoid ideation in adults who were diagnosed with Asperger syndrome. In addition, Solomon et al. (2008) and Van der Gaag et al. (2001) described illogical thinking and loose associations in children with ASD.

It may be emphasized that the associations between autistic and schizotypal symptomatology in the present study were almost exclusively accounted for by two autistic traits, i.e., attention switching problems and communication difficulties. High levels of communication problems were associated with more negative and disorganized symptoms. The autistic feature attention switching stands out prominently, as it appeared to be related to all three dimensions of schizotypy. This suggests that inattentional behavior might be a common denominator underlying the manifestation of a broad range of schizotypal behaviors. Examples of behavioral abnormalities as measured by the AQ domain of attention switching include: ‘New situations make me anxious’, ‘I like to carefully plan any activities I participate in’, or ‘I prefer to do the same thing over and over again’. These items reflect rigidity and perseveration. In the autism literature, it has often been suggested that these impairments are related to underlying executive dysfunctions, such as difficulties with planning, cognitive inflexibility, and the failure to inhibit inappropriate actions (Hill, 2004). These executive functions, however, are also needed to control, organize and regulate thoughts and feelings. When impaired, they might contribute to positive and disorganized schizotypal features, as demonstrated by earlier studies (Diwadkar et al., 2006; Solomon et al., 2008). Indeed, neurocognitive dysfunctions have been reported for schizophrenia within the domain of executive functioning and attention (e.g., Frangou, 2010; Mesholam-Gately et al., 2009; Ventura et al., 2009). Future studies are needed to identify putative common underlying cognitive mechanisms that contribute

to both autism spectrum and schizophrenia spectrum pathologies.

Although speculative, the current findings might have clinical implications. As high levels of schizotypy appear to reflect a higher risk of developing schizophrenia (Mata et al., 2000; Miller et al., 2002; Vollema et al., 2002), the significant association of positive symptoms in the ASD group might implicate an increased risk of schizophrenia spectrum pathology in some of these patients. To better appreciate the degree of schizotypal symptoms in our population, SPQ scores of the study of Vollema et al. (2002) and the mean scores of the adolescents in our ASD group were compared. The SPQ dimension scores of our group (negative schizotypy: *M*=15.3; positive schizotypy: *M*=9.6; disorganization: *M*=7.2) were equal to the mean scores of 51 first-episode schizophrenia patients of the study of Vollema and colleagues (negative: *M*=15.2, Cohen's *d*=.01; positive: *M*=11.9, *d*=.29; disorganization: *M*=6.0, *d*=.25). Moreover, the total score of our patient group (*M*=22.0) was equal to that of the patient group of 93 schizophrenic adults (*M*=36.2, *d*=.24) in the study of Rossi and Daneluzzo (2000). These findings indicate that the behavioral problems as measured in our ASD sample have a high degree of schizotypal characteristics, which might imply vulnerability of schizophrenia. However, this hypothesis should be further explored in a longitudinal design. So far, this idea is supported by some longitudinal studies, showing shifts from an autism spectrum diagnosis in childhood towards a schizophrenia spectrum diagnosis in adulthood, with risk percentages amounting to 34.8% (Mouridsen et al., 2008; Stahlberg et al., 2004; Van Engeland & Van der Gaag, 1994). However, results from Esterberg et al. (2008) illustrated that, although a strong association was found between autistic features and schizotypal symptoms in adolescents with schizotypal personality disorder, the autistic symptoms appeared not to be predictive of later conversion to a psychotic disorder. Due to the cross-sectional character of this study we cannot yet make implications about the prognostic value of specific childhood autistic traits for developing adult schizophrenia later in life.

It should be noted that the present study has several limitations. Firstly, the information obtained from the questionnaires was subject to limitations inherent in self-report. Secondly, the relatively small sample size precluded the examination of the possible influence of age on schizotypal behaviors. Thirdly, the inclusion of an inpatient ASD population limits the representativeness of the sample and, as such, reduces the generalizability to the whole autistic spectrum. Future studies are needed to identify common underlying cognitive mechanisms that account for co-occurring behavioral abnormalities. Moreover, it is recommended that these studies incorporate a developmental context, since the exact manifestation of behaviors may be dependent on the dynamics of underlying cognitive development. Finally, longitudinal studies are recommended for making statements about the prognostic value of autistic behaviors for later conversion to SSD. In conclusion we still feel that we should draw attention to the overlap of autistic and schizotypal symptomatology.

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