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**The association of autistic traits and behavioural patterns in adolescents
receiving special educational assistance**

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Abstract

Introduction: The study aim was to describe behaviours associated with autistic traits.

Methods: The Childhood Behaviour Checklist (CBCL) and Social Communication Questionnaire (SCQ) were used as measures of behaviour and autistic traits respectively in 331 adolescents receiving educational support. CBCL scores were compared between three groups defined by SCQ score: autism, pervasive developmental disorder (PDD) and non-PDD. **Results:** The PDD and autism groups had significantly higher scores on the CBCL than the non-PDD group across all CBCL scales except Delinquent Behaviour. On 7 of the 8 scales, there was no difference between the autism and PDD groups. **Conclusion:** Those with PDD or autism display significantly higher levels of withdrawal, somatic complaints, anxiety/depression, social, thought and attention problems, and aggressive behaviour.

Keywords: autism; behaviour; pervasive developmental disorder.

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special educational assistance

According to standardised diagnostic classifications, the autism spectrum is defined by atypical functioning in social interaction, communication and repetitive behaviour (WHO 2010; American Psychiatric Association 2013a). However, there is also known to be a wide range of behaviours associated with the diagnosis of an autism spectrum disorder (ASD), which are not necessarily captured by the characteristic diagnostic features. Children with ASD have been found to display atypical behaviours across many domains including problems with eating and sleeping, self-injurious behaviours, emotional disturbances, challenging behaviour and inattention (Sikora et al. 2007; Dominick et al. 2007; Hartley et al. 2008; Holden and Gitlesen 2006). Interestingly these behaviours may be more distressing to those who care for the affected individual than the social communication difficulties and repetitive behaviours which define the condition (Hastings et al. 2005; Lecavelier et al. 2006).

In addition to the distress to caregivers, we have previously reported that in individuals receiving special educational assistance, their behaviour as adolescents is highly predictive of their functional outcomes when they reach adult life (McGeown et al. 2013). Whilst the degree to which the person exhibited traits of autism showed some correlation with poorer functioning in adult life, this was ultimately shown to be mediated by the behaviours exhibited by the individuals as opposed to the core autistic characteristics themselves (McGeown et al. 2013). This suggests that therapies targeted towards reducing the co-occurring behaviours that may be

associated with ASD, as opposed to the core features of ASD, may be more effective in improving adult outcome.

We sought to describe the relationships between a variety of behavioural patterns and autistic traits in a large population of individuals receiving special educational assistance. We hypothesized that individuals likely to have a pervasive developmental disorder would display higher levels of these behaviours than those without, regardless of intellectual level, particularly in regard to social and emotional domains. Furthermore, we hypothesized that within the group of individuals with a likely pervasive developmental disorder, those with a greater number of traits of autism would show higher levels of these behaviours than those with fewer such traits.

Methods

Data for this study were collected as part of the Edinburgh Study of Comorbidity, the full details of which have been outlined elsewhere (Johnstone et al. 2007). This was a longitudinal study of adolescents receiving special educational assistance in Scotland, which began in 2003. Ethical approval for this project was obtained from the Multicentre Ethics Committee for Scotland.

The study included pupils from 99 schools who were receiving special educational assistance and were estimated by their teachers to be functioning in the mild-borderline intellectual disability range (IQ assessments are not routinely conducted within the Scottish special education system). Families could opt in to the study following receipt of an explanatory letter. Exclusion criteria were as follows: known syndromal intellectual disability, severe or profound intellectual disability, lack of speech, major sensory impairment or severe cerebral palsy (Johnstone et al. 2007). Of the 394 participants who opted in and were not excluded (n=42), the parents of 331 adolescents completed the Social Communication Questionnaire (SCQ) and the

Childhood Behaviour Checklist (CBCL). IQ scores were determined on a subsample (n=139) of this cohort using the Wechsler Intelligence Scale for Children (Wechsler, 1991a) and the Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1991b) as appropriate to the individual's age. Details of the subsample selection process and breakdown of the reasons for exclusion are given in Johnstone et al. (2007).

The Social Communication Questionnaire (SCQ), originally called the Autism Screening Questionnaire (ASQ), was developed from the much longer Autism Diagnostic Interview (Lord et al. 1994) to provide a screening tool which could be used to rapidly assess for autistic features (Berument et al. 1999). It has been shown to perform favorably in comparison with other screening questionnaires with regards to sensitivity (0.86), specificity (0.78) and positive predictive value (0.74); and has a good correlation (0.83, $p < 0.001$) with the ADI-R, another informant-completed autism measure (Charman et al. 2007). It is completed by a caregiver and consists of 40 questions related to both the child's current and previous behaviour and a score is given of between 0 and 39. We used the cut-offs reported in the original validation study of the SCQ, which suggested a cut-off of 15 or above is indicative of a pervasive developmental disorder (PDD) and a score of 22 or above is indicative of autism (Berument et al. 1999).

The Childhood Behaviour Checklist (CBCL) is also filled out by a care-giver and reports the activities, behaviours and functioning of the child (Achenbach 1991). We used the 1991 version to allow direct comparisons with our large dataset collected using this scale in the Edinburgh High Risk Study (Johnstone et al 2005). The care-giver scores each item 0 if it is "not true", 1 if it "sometimes or somewhat true" and 2 if it is "very true or often true" of the child (Achenbach 1991). When the checklist is scored, results are divided into 8 syndrome scales to give some insight into the types

of behaviours displayed by the child. These scales are: Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Aggressive Behaviour and Delinquent Behaviour. Whilst most of these categories are self-explanatory, the Thought Problems scale includes items covering a variety of behaviours, such as *can't get his/her mind off certain thoughts; obsessions, stores up things he/she doesn't need, sees things that aren't there, and strange behavior.*

The CBCL has been shown to have validity in representing behaviour (Cohen et al. 1985) predicting a psychiatric diagnosis (Novik 1999) and is consistent across cultures (Rescorla et al. 2012). Hartley et al. also used the CBCL in people with autism in this age group to illustrate that almost half of the study population exhibited at least two clinically significant maladaptive behaviours as identified by the CBCL, with the most common ones being Withdrawal, Attention Problems and aggressive Behaviour (Hartley et al. 2008).

Statistical analyses were conducted using IBM SPSS Statistics 19. A chi squared test and an ANOVA were used to determine whether age and IQ differed significantly across SCQ groups respectively. Multivariate ANOVA was conducted to examine for differences between the groups derived from the SCQ scores. Group and gender were the fixed factors with the eight syndrome scales of the CBCL entered as the dependent variables. When the between subject effects were significant, pairwise comparisons were used to examine for differences between any two of the three SCQ groups.

Results

A total of 331 individuals were recruited. Table 1 shows the characteristics of the sample studied, with 33 in the autism group, 49 in the PDD group and 249 in the non-

PDD group. There was a significant difference in gender ratio between the groups with a higher proportion of males in the PDD and autism groups. There were no significant differences in age and IQ between the groups.

	Non-PDD (249)	PDD (49)	Autism (33)	Significance
Gender (M:F)	151:98	37:12	27:6	0.01
Age	15.5 (1.7)	15.9 (1.8)	15.3 (1.5)	0.834
Total SCQ score	6.9 (3.9)	17.9 (2.1)	26.4 (3.7)	
Full scale IQ*	74.9 (17.0)	74.6 (13.4)	69.1 (24.2)	0.415
Full scale IQ range*	42 - 125	47 - 100	40 - 131	
Verbal IQ*	75.7 (16.5)	75.3 (15.6)	72.1 (23.6)	0.487
Performance IQ*	78.7 (17.7)	77.3 (11.5)	69.5 (20.0)	0.140
IQ subsample size	93	28	18	

*For the subset of 139 participants for which IQ scores are available.

Table 1: population characteristics

Results are given as mean (standard deviation)

Figure 1 and Supplementary Table 1 show the mean scores attained by the participants in each of the 8 syndrome scales assessed by the CBCL. The between group tests indicated that for all behaviour except Delinquent Behaviour, participants in the PDD and autism groups attained significantly higher scores than those in the non-PDD group ($p < 0.03$ – $p < 0.001$, see supplementary table 1 for full results). However, there were no significant differences between the scores attained by the

PDD and autism groups except in relation to Thought Problems. In this item, there were significant differences between all three groups ($p < 0.001$), with those in the autism group scoring highest, followed by those in the PDD group and then those in the non-PDD group. The scores for Delinquent Behaviour showed no significant difference between any of the groups.

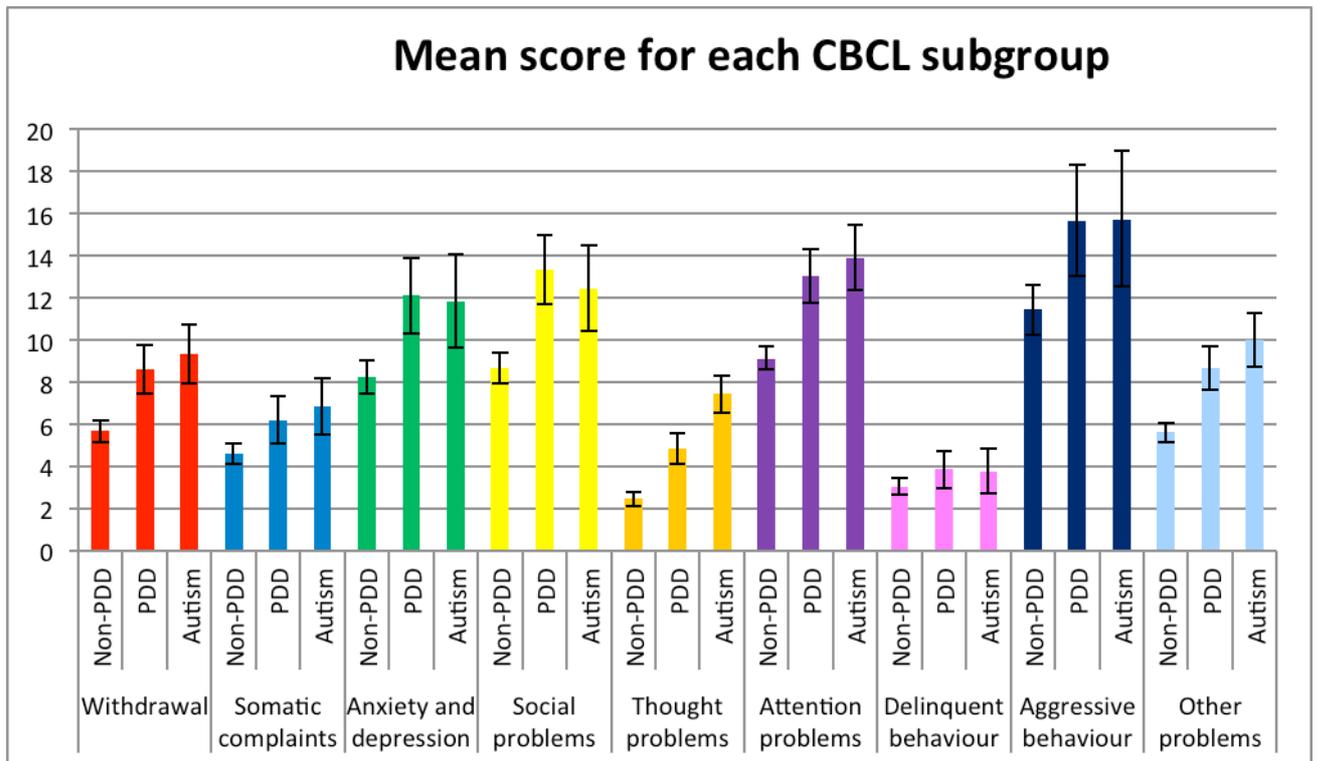


Figure 1. Mean scores attained by those in the non-PDD group, the PDD group and the autism group in each syndrome scale of the CBCL

Discussion

In this large group of adolescents receiving special educational assistance, individuals likely to be on the autism spectrum, i.e. those likely to have PDD or autism as measured by the SCQ, had significantly higher scores on the CBCL than those not on the spectrum. This pattern was evident across all CBCL syndrome scales except Delinquent Behaviour, where there was no significant difference between any of the

three groups. Only in Thought Problems was there a significant difference between those in the PDD group and those in the autism group.

The current study is broadly consistent with Sikora et al. (2007) who examined a younger group of children aged 3-6 years. They found that those with autism were noted to attain significantly higher scores in the Withdrawn, Anxious/Depressed, Aggressive Behaviour and Pervasive Developmental Problems syndrome scales of the CBCL than those who were not on the autism spectrum. Taken together these studies suggest that these behaviours start from a young age and persist into adolescence in those with autism. Interestingly, in contrast to the current study, Sikora et al. did not find a significant difference in these behaviours between those with PDD and those not on the spectrum.

Improved recognition of the behaviours that we report to be associated with a likely PDD or autism diagnosis has the potential to highlight the need for access to appropriate services in this population. For example, an awareness of the significantly higher levels of anxiety and depression identified in the current study may facilitate earlier detection and treatment, especially in those with impaired communication in whom these conditions may be more difficult to detect. Treatment of depression has been shown to dramatically improve quality of life in people with autism (Ghaziuddin et al. 2002). Similarly, there was a significant difference between those in the non-PDD group and those in both the PDD and autism group in terms of Attention Problems. Although we did not specifically examine the overlap between autism and attention deficit hyperactivity disorder (ADHD), it is possible that the increased attention problems we report are reflective of increased occurrence of ADHD in people with ASD (Leyfer et al. 2006; Simonoff et al. 2008). Our findings highlight the importance of enquiring for such symptoms, which may be amenable to treatment.

In keeping with this, diagnostic classification systems have moved from deeming the two diagnoses of autism and ADHD mutually exclusive towards recognition of comorbidity (Taurines et al. 2012).

The only behaviour that did not significantly differ in prevalence between those in the ASD groups and those in the non-PDD group was Delinquent Behavior, for which the scores were low across all three groups. This includes items relating to truancy, cheating, arson, swearing, lying and vandalism (Achenbach 1991). We did however report an increase in reported Aggressive Behaviour in the autism and PDD groups, which includes items such as *argues a lot, destroys others' things, gets in fights & attacks people*. It is likely that significant aggressive behaviour without significant delinquent behaviour indicates that these aggressive behaviours take place not with the intention of causing damage as might be the case in delinquency, but rather that they are borne of frustration or anxiety associated with the other difficulties highlighted in these groups such as social, thought and attention problems. There is evidence to suggest that aggressive behaviour is used as a form of communication in those with autism (Chiang 2008) and that when communication is facilitated, aggressive behaviours improve (Frea et al. 2001).

We also identified a difference between the PDD and autism groups in Thought Problems, the only syndrome scale in which this pattern was seen. The Thought Problems syndrome scale of the CBCL measures a range of behaviours common in a variety of mental disorders but in particular includes items which reflect common symptoms in autism such as *repeats acts, can't get mind off thoughts* and *nervous movements*. It is therefore not unexpected that these behaviours which are more classically associated with autism were reported as being significantly more common in the groups with SCQ-defined autism and PDD; thought problems being

significantly more common in the autism group compared to the broader PDD group, but also compared to the non-PDD group.

The fact that the results of this study show a lack of distinction between PDD and autism (as defined by SCQ-score) in terms of the behaviours displayed is relevant to the recent changes to the diagnostic criteria for ASD in DSM-5. Prior to the changes, DSM-IV previously listed four separate diagnoses: Autistic Disorder, Asperger's disorder, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder - Not Otherwise Specified (American Psychiatric Association 2013b) whereas DSM-5 outlines one umbrella diagnosis of Autism Spectrum Disorder (ASD) (American Psychiatric Association 2013a). Whilst previous studies have shown differences between these subdivisions of Pervasive Developmental Disorder (Tonge et al, 1999; Gadow et al, 2005), the results from this study support this change towards an ASD continuum as, in seven of the eight behaviour groups, there were no significant differences between the behaviours displayed by those in the PDD and autism groups. The lack of significant differences between these two groups supports the idea that any distinction is arbitrary. Furthermore, individuals with very similar symptoms and needs may be inappropriately receiving different support and services based upon this distinction. Thus, the results of this paper are supportive of the transition to an umbrella diagnosis of ASD detailed in the DSM-5.

There are several factors about the current study methodology that require further consideration. Whilst the SCQ has been validated as a useful screening tool for autism (Berument 1999), there may be some children for whom the final diagnosis differs from the initial screening result. Furthermore, the SCQ has been shown to perform less well at distinguishing autism from PDD, and better at distinguishing PDD from non-PDD (Berument 1999). This is an important consideration given that

the results of this paper show fewer significant differences in behaviours between the autism and PDD group than between the non-PDD groups and it must be considered whether the use of the SCQ has influenced these results. In addition, although we examined the influence of gender, age and IQ on behavior we did not consider all possible influencing factors such as a disrupted home life and relationship with parents, which have been shown to influence the behaviours displayed by the child (Peterson and Zill 1986). Interestingly, however, these factors have been shown to be associated with higher levels of delinquent behaviour (Juby and Farrington 2001), which was not found to be significant in this study. There is also evidence to suggest that socio-economic status plays a role in influencing the level of challenging behaviour displayed by a child or adolescent (Allen and Davies 2007) and we have not examined this.

Notwithstanding these limitations, this study has shown that those scoring highly enough on the SCQ to suggest a diagnosis of pervasive developmental disorder or autism display significantly higher levels of behaviours in the wide-ranging areas of withdrawal, somatic complaints, anxiety/depression, social problems, thought problems, attention problems, and aggressive behaviour but not delinquent behaviour. Whilst these higher levels of behavior in the PDD and autism groups could reflect a combination of both core pervasive developmental disorder symptomatology and increased co-morbidity, we consider it likely that the greater contribution is from co-morbid conditions, given our previous finding that core autistic traits predict future functional outcome less well (McGeown et al, 2013). The study highlights the importance of actively identifying such problems and targeting treatments towards them in order to minimize their effects on the quality of life of people with ASD.

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Autistic traits and behavioural patterns in adolescents

CBCL syndrome scale	Non-PDD (1)	PDD (2)	Autism (3)	Between-group tests	Significance
Withdrawn	5.7 (0.3)	8.6 (0.6)	9.3 (0.7)	1<2,3	p<0.001
Somatic complaints	4.6 (0.3)	6.12 (0.6)	6.8 (0.7)	1<2,3	p<0.03
Anxious/depressed	8.2 (0.4)	12.1 (0.9)	11.8 (1.1)	1<2,3	p<0.007
Social problems	8.6 (0.4)	13.3 (0.8)	12.4 (1.0)	1<2,3	p<0.002
Thought problems	2.4 (0.2)	4.8 (0.4)	7.4 (0.5)	1<2<3	p<0.001
Attention problems	9.1 (0.3)	13.0 (0.6)	13.9 (0.8)	1<2,3	p<0.001
Delinquent behaviour	3.0 (0.2)	3.8 (0.4)	3.8 (0.5)		ns
Aggressive behaviour	11.4 (0.6)	15.7 (1.3)	15.7 (1.6)	1<2,3	p<0.04
Other problems	5.6 (0.2)	8.7 (0.5)	10.0 (0.7)	1<2,3	p<0.001
Total	57.1 (31.4)	82.2 (33.9)	90.1 (34.9)	1<2,3	p<0.001

Supplementary Table 1: Mean (standard deviation) for each CBCL syndrome scale by SCQ group