The Association Between Autism Spectrum Disorder and Psychotic Experiences in the Avon Longitudinal Study of Parents and Children (ALSPAC) Birth Cohort

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Objective: Studies report overlap between autism spectrum disorders and psychosis. This may indicate a relationship between the 2 disorders or an artificial overlap due to similarity of symptoms. The aim of this study was to investigate whether autism spectrum disorder and autistic traits predict psychotic experiences in early adolescence. **Method:** This study analyzes prospective data from a cohort. A dataset was analyzed of 5,359 cohort members who had provided data on autistic traits and/or a diagnosis of an autism spectrum disorder and psychotic experiences at age 12 years. **Results:** A diagnosis of an autism spectrum disorder (odds ratio = 2.81, 95% confidence interval = 1.07, 7.34 $p = .035$) and childhood autistic traits (odds ratio = 1.15, 95% confidence interval = 1.05, 1.26 $p = .0018$) were associated with psychotic experiences after adjustment for confounders. **Conclusions:** These findings suggest a shared neurodevelopmental origin for autism and psychosis. J. Am. Acad. Child Adolesc. Psychiatry, 2013;52(8):806–814. **Key Words:** Avon Longitudinal Study of Parents and Children (ALSPAC), autism spectrum disorder, birth cohort, longitudinal, psychotic experiences

Existing evidence suggests similarities between autism and psychosis spectrum disorders. First, there is overlap in the terminology used in historic descriptions of these conditions. Autism was one of the cardinal features of schizophrenia,[1,2] and conditions currently known as autism were often referred to as childhood schizophrenia.[3] Second, a literature review[4] reported that childhood-onset schizophrenia is preceded by, and comorbid with, autism in 30% to 50% of cases. However, a more recent review[5] found that comorbidity of schizophrenia with autism and Asperger syndrome was uncommon.

In clinical practice, deficits observed in these disorders overlap, albeit with varying severity. Relevant deficits include social skills, interpersonal relationships,[6,7] social cognition,[8,9] executive dysfunction,[10,11] coherence, and pragmatic language.[12,13] Furthermore, brief psychotic episodes in people with autism are common meaning that some with autism have been misdiagnosed with schizophrenia.[14,15] Likewise, the social disinterest and emotional coldness of schizotypal personality traits are reminiscent of autism.[16]

There are also similarities in risk factors associated with autism and psychotic spectrum disorders including: advanced paternal age,[17] a winter season of birth,[18,19] obstetric complications,[18,20] and maternal infections.[21,22] Studies[4,23,24] have also suggested common candidate genes and genetic mechanisms. These observations have led to hypotheses that autism and psychosis lie on the same spectrum of social disability[25] and have a common neurodevelopmental etiology.[26] Alternatively, the co-occurrence of these conditions may simply be due to the overlap of certain symptoms observed in both disorders, that is, an artificial overlap due to the similarities in descriptive phenomenology.

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IQ is an important potential mediator in any association between autism spectrum disorders and psychotic experiences, because autism is associated with a reduced IQ[27] and there is evidence that lower IQ is a risk factor for psychotic experiences.[28]

The majority of previous research has been cross-sectional and have investigated either symptomatic overlap between autism spectrum (ASD) and schizophrenia spectrum disorders (SSD) or between autistic or schizotypal traits. The findings are mixed, with the majority finding an overlap,[29-35] but with 2 studies finding no evidence of an association.[36,37] These results are difficult to interpret because of methodological problems such as no comparison group, small sample sizes, lack of confounder adjustment, and the possibility of information bias.

There have been 3 previous longitudinal studies. A case-control study[38] investigated the differences in earlier comorbid psychiatric diagnoses between individuals with ASDs and a control group and found that those with ASDs were more likely to have been previously diagnosed with SSDs. Another case-control study[35] asked parents of adolescents with schizotypal personality disorder questions about childhood autistic traits and compared these with groups with groups of individuals with nonschizotypal personality disorders. The results showed evidence of differences in childhood social impairment, unusual interests, and behavior between the groups. A cohort study[39] investigating the association between autistic traits and later psychotic experiences (PEs) reported an association between speech problems and ritualistic behavior (but not social interaction problems) that occurred before the age of 3 years and persisted until age 7, and PEs at 12 years. These findings are surprising, because social interaction difficulties are features of both SSDs and ASDs and suggests that there may not be complete overlap.

If the disorders have common neurodevelopmental origins, it could be hypothesised that the full spectrum of autistic traits, including social, language, and repetitive behaviors, would predict later PEs. On the other hand, an artificial overlap due to common symptoms may mean that only autistic spectrum traits that are also core symptoms of psychosis would be associated with PEs. This distinction could help our understanding of both conditions.[29]

We tested the relationship between ASD, autistic traits, and later PEs in a population-based cohort. We hypothesised that children with ASD and/or high autistic trait scores related to social and language development, but not repetitive-stereotyped behavior, would be more likely to report PEs at 12 years.

METHOD

Study Design and Population

The study design was a prospective cohort study using the population of the Avon Longitudinal Study of Parents and Children (ALSPAC). ALSPAC recruited 14,541 pregnant women resident in Avon, UK with expected dates of delivery April 1, 1991, to December 31, 1992. Of these initial pregnancies, there were a total of 14,676 fetuses, resulting in 14,062 live births and 13,988 children who were alive at 1 year of age.

Ethical approval for this study was obtained from the ALSPAC Law and Ethics Committee and the Local Research Ethics Committees.

Dataset

We included participants who had complete data on all variables, that is, PEs at age 12 years, autism spectrum traits from the ages of 6 months to 9 years, and any potential confounding variables collected at various ages (n = 5,359). A description of the numbers of participants available with data on PEs and autistic traits is shown in Figure 1.

Outcome Variable

PEs over the past 6 months were assessed using a semistructured clinical interview at the age of approximately 12 years.[28] The interviews were carried out by trained psychologists. The questions assessed the 12 core positive psychotic symptoms: hallucinations (auditory and visual), delusions (being spied on, being persecuted, thoughts being read, reference, control, grandiose ability, and other unspecified delusions), and experiences of thought interference (insertion, withdrawal, and broadcasting). The average kappa value for interrater reliability was 0.72. PEs were coded as present if 1 or more of the symptoms was "suspected" or "definitely present" and included only if they could not be directly attributed to falling asleep/waking, fever, or substance use.

Explanatory Variables

Autism Spectrum Disorder. Children with autism spectrum disorder (ASD) were identified either from community pediatric records or from the special educational needs database for the region.[40] Clinical records were reviewed by a consultant pediatrician to confirm the diagnosis according to ICD-10 criteria. There were 86 such children identified by age 11 years, giving a prevalence of 62 per 10,000 children within the ALSPAC core sample. Only 80 of the original 86