

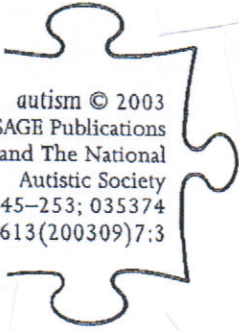
Co-occurrence of autism and deafness

Diagnostic considerations

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ABSTRACT Autism spectrum disorders are particularly difficult to diagnose in the presence of early profound deafness because of communication related issues. Two parts of the Autism Screening Instrument were administered to 13 deaf individuals with autism and two comparison groups: hearing autistic and deaf learning disabled. A parental questionnaire was also used. No differences in autistic symptomatology were found between the deaf autistic and the hearing autistic group. However, the deaf autistic group was diagnosed later than the hearing autistic group. It is concluded that autism can be diagnosed in the deaf; that it resembles autism in the hearing; and that it is not a consequence of deafness *per se*. Learning disabled deaf individuals who are not autistic do not resemble people with autism in behavioural terms. The findings have implications for remediation, education, and the emergence and management of challenging behaviours.

KEYWORDS
autism;
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Deafness and autism are considered as possible diagnoses when a child displays early communication difficulties (Jure et al., 1991). Comorbidity rates may be higher than expected (Gordon, 1991; Jure et al., 1991) and when the conditions co-occur there appear to be difficulties in diagnosis that may lead to either condition being missed or diagnosed late (Garreau et al., 1984). This has implications for providing effective and optimal remediation (Jure et al., 1991).

The study examined whether late diagnoses of autism, developmental delay, and/or deafness were evident in three groups: deaf autistic (DA), deaf learning disabled (DLD) and hearing autistic (HA). Participants' diagnostic and developmental histories were examined for factors that might account

DSM-IV criteria, by a consultant psychiatrist. They were aged 17 years 9 months (SD = 3:3, range 12:8 to 26:5). All were severely or profoundly deaf with a mean loss, in their better ear, of 100.1 dB (SD = 17.7).

There was no statistically significant difference between the mean hearing loss of the deaf autistic and the deaf learning disabled groups, at the five speech frequencies (250, 500, 1000, 2000 and 4000 Hz).

The cognitive abilities of the deaf learning disabled participants were also estimated using the scores on the Hiskey-Nebraska Test of Learning Aptitude (Hiskey, 1966), as recorded in the case notes. The mean age at which participants were tested was 13 years 5 months (SD 1:3, range 11:2 to 16:4), and their mean mental age at the time of testing was 5 years 5 months (SD = 2:5, range = 2:1 to 11:6) (Wilcoxon $z = 2.94$, $p < 0.01$). A broad profile of their communicative abilities was obtained from their case notes. Nine of the 15 used symbols or pictures to communicate; all used a restricted range of signs and gestures; only three used speech and five used finger spelling.

There was no difference between the deaf autistic and deaf learning disabled groups for either chronological or mental age (CA, Wilcoxon $z = 0.66$, $p = 0.55$; MA, Wilcoxon $z = 1.61$, $p = 0.12$).

Hearing autistic group A hearing autistic group was selected on the basis of age and diagnosis of autism. This group of 12 students had a mean age of 18 years 4 months (SD 3:5, range 13:6 to 25:2). They were from a school or residential home in Birmingham where a diagnosis of autism by a consultant psychiatrist is a required criterion for admission. There was no significant difference among the mean ages of the three groups (Kruskal-Wallis $\chi^2 = 2.06$, $p = 0.36$). A broad profile of communicative abilities in the HA group indicated that all used speech and did not rely on signs, gestures or finger spelling.

No test results of cognitive ability were available in their case notes, and instead their school performance is reported as an indication of their abilities. Six participants had basic reading and writing skills at age 14-16 and could count up to 20. Two participants had achieved qualifications in the National Curriculum and GCSE. Three participants had basic numeracy and literacy skills, for example of being able to count up to 20 and read simple words. One participant could not read.

Measures

The Autism Behavior Checklist (ABC) and the Interaction Assessment (IA: Krug et al., 1980) were administered to provide measures of autistic behaviours. These are both components of the Autism Screening Instrument for Educational Planning-2 (ASIEP-2; Krug et al., 1993). The ASIEP-2 was developed for the diagnosis and measurement of autism in educational and

research contexts. The instrument consists of five separate components: ABC; IA; sample of vocal behaviour; educational assessment; and prognosis of learning rate. The ABC and IA were selected for the current study as measures of autistic behaviours. The remaining three components are concerned with the measurement of autistic behaviours for educational planning and progress. The ABC consists of 57 behavioural descriptions that are weighted 1 to 4, with 4 indicting a behaviour that is highly autistic and 1 a behaviour that is slightly autistic, thus providing a measure of autistic behaviour in the form of a total score. The IA is a standardized measure of spontaneous social responses and reactions to requests in three controlled conditions with stimuli presented systematically. The assessment consists of a 12 minute observation period during which the researcher observes and codes a student's responses and behaviours.

A 12-item questionnaire was devised to find parents' views of their child's early development. Three versions of this questionnaire were used, one for each group, with slight differences introduced because of the need to exclude autism related questions for the deaf learning disabled group and hearing loss related questions for the hearing autistic group. The 12 questionnaire items are shown in the Appendix.

The questionnaire was not piloted but was discussed with professionals in the field and modified on their advice. The questionnaire elicited the diagnostic and behavioural history of participants. The term 'developmental disorder' was used in the questionnaire to incorporate the range of additional learning disabilities and/or developmental delays that were present in all three groups.

Procedure

Copies of the ABC (Krug et al., 1993) were given to teachers to complete. They were requested to circle the items that best described the child's behaviour. Teachers' ratings rather than those of parents were used to provide greater consistency of ratings, as all participants were well known to the teachers and the tests were administered in the same classroom environment. Parental consent was obtained for each young person and parents were fully informed of the nature of the research.

The Interaction Assessment, which reliably 'quantifies social interaction behaviors for comparison with that of other individuals' (Krug et al., 1993, p. 4), was completed for each participant. Activities and materials used in the IA were provided for the teachers, and included toys and a variety of educational materials, pictures and books. Observations were conducted over a 4 month period. Teachers were informed of the nature of the assessment, and a copy of the instructions as specified in the manual of the Autism Screening Instrument for Educational Planning (Krug et al., 1993) was also provided.

for late diagnoses. Current levels of autistic symptomatology among the deaf autistic, deaf learning disabled, and hearing autistic groups were also compared to explore any differences in behaviour among the groups. The hearing autistic sample was included to provide a comparison group for the deaf autistic in terms of diagnostic and developmental histories and levels of autistic behaviour. The deaf learning disabled group was included to assess the role of cognitive disability in another group of deaf young people.

It was hypothesized that the deaf autistic group would have a later diagnosis of autism, developmental delay or hearing impairment than the deaf learning disabled or hearing autistic groups. It was also expected that the deaf learning disabled group would display lower levels of current autistic behaviour than the deaf and hearing autistic groups. No differences between the latter two groups in autistic symptomatology were predicted.

Method

Participants

Participants were 40 students from three populations as follows.

Deaf autistic group The deaf autistic group comprised 13 students with a mean age of 19 years 3 months ($SD = 2:9$, range 15:8 to 24:9). All attended a special school in Manchester where deafness and disability were required for admission and were selected according to their previous diagnosis of autism or 'autistic-like' symptoms. A consultant psychiatrist made the initial diagnoses by interviewing parents before the research began using the DSM-IV criteria for autism (American Psychiatric Association, 1994). All the students were severely or profoundly deaf with a mean loss in the better ear over the speech range of 105.8 dB ($SD = 15.9$).

Cognitive abilities of the participants in the deaf autistic group were estimated using the scores on the Hiskey-Nebraska Test of Learning Aptitude (Hiskey, 1966), as recorded in the case notes. The mean age at which participants were tested was 14 years 1 month ($SD = 3:7$, range 6:5 to 19:1), and their mean mental age at the time of testing was 7 years 5 months ($SD = 1:9$, range 3:0 to 11:9). The difference between mental age and chronological age was significant (Wilcoxon $z = 2.55$, $p < 0.05$). A broad profile of participants' communicative abilities was also obtained. Eleven of the 13 used symbols or pictures to communicate; all used a restricted range of signs and gestures; but none used speech or finger spelling.

Deaf learning disabled group The 15 deaf learning disabled students were selected from the same school as the deaf autistic students, on the basis of age. They were assessed to eliminate the possibility of autism, using

Statistical analysis

Group comparisons of the mean age of parental suspicions, and the diagnoses and levels of autistic behaviours, were analysed using Mann-Whitney U-tests and Kruskal-Wallis one-way analyses of variance. When multiple post hoc Mann-Whitney U-tests were used, the significance level was adjusted using the Bonferroni correction.

Results

Parental questionnaires: comparison of diagnostic and developmental histories

Of the 40 questionnaires sent to parents, only 23 of those returned were fully completed, and it is the results of these 23 that are reported. Table 1 shows the median age of the 23 children when their parents began to suspect developmental problems. The median age at which parents began to suspect developmental problems was similar for the deaf autistic and deaf learning disabled, but higher for the hearing autistic group. The median age at which parents first began to suspect hearing problems was similar for the deaf autistic and the deaf learning disabled groups.

Table 1 Median age of earliest parental suspicions and actual time of diagnoses

	Deaf autistic (n = 9) Median (range) (years:months)	Hearing autistic (n = 6) Median (range) (years:months)	Deaf learning disabled (n = 8) Median (range) (years:months)	p-level
Parents suspect developmental problems	0:7 (0:2-1:6)	1:6 (0:3-5:0)	0:8 (0:2-2:0)	n.s. ^a
Parents suspect hearing problems	0:8 (0:3-1:9)	-	0:11 (0:2-2:0)	n.s. ^b
Autism diagnosed	15:0 (5:0-16:0)	7:5 (4:0-11:0)	-	z = 2.37; p = 0.05 ^b
Developmental disorder diagnosed	2:5 (0:9-4:0)	4:0 (0:10-8:0)	1:5 (0:6-8:0)	n.s. ^a
Deafness diagnosed	1:0 (0:6-2:5)	-	1:3 (0:6-2:0)	n.s. ^b

^a The Kruskal-Wallis one-way ANOVA was employed to test for any significant differences among the three independent groups.

^b The Mann-Whitney test was performed to examine differences between two independent groups.

The median age for the clinical diagnosis of autism for the deaf autistic group was significantly higher than for the hearing autistic group. Age of diagnosis of developmental disorder was later in the hearing group, but the difference was not significant. There was no significant difference between the deaf autistic and deaf learning disabled groups for age of diagnosis of deafness, or the age at which parents suspected the child might be deaf.

Similarly there were no significant differences among the three groups for the age at which parents first suspected developmental problems, or the age at which a diagnosis of developmental disorder was given.

Comparison of autistic behaviour among the groups

Table 2 shows that the ABC and IA total median scores varied among the groups. A one-way analysis of variance revealed significant differences among the three groups' total scores on all measures.

Post hoc Mann-Whitney U-tests were computed for the ABC and IA median total scores. For the ABC scores significant differences were found between the deaf autistic and the deaf learning disabled groups, and between the deaf learning disabled and the hearing autistic groups. There was, however, no significant difference in autistic behaviour between the deaf and hearing autistic groups.

Comparisons of IA median total scores showed significant differences between the deaf learning disabled and the two autistic groups (deaf autistic $z = -2.88$, hearing autistic $z = -2.98$, both significant at the 0.017 level). No significant difference was found between the levels of autistic behaviour on the IA scores between the deaf autistic and hearing autistic groups.

Discussion

Consistent with the findings of Jure et al. (1991), a later diagnosis of autism was found for the deaf autistic compared with the hearing autistic groups in this study. In contrast to Jure et al.'s (1991) findings, however, no significant findings were found among the three groups for the age at which their parents began to suspect developmental problems and the age at which these were diagnosed. Similarly, no significant difference was found between the age at which parents first began to suspect deafness and the age at which it was diagnosed in the deaf autistic and deaf learning disabled groups.

Although all participants' parents suspected problems of development and/or hearing between 6 months and 5 years, the later diagnosis of autism in the deaf autistic group may be due to the fact that an earlier diagnosis of developmental disorder and/or deafness obscured the recognition of autistic behaviours.

No significant differences were found between the current levels of

Table 2 Median total ABC scores by teachers and of IA assessments for the three groups

	Deaf autistic (n = 13) Median (range)	Hearing autistic (n = 12) Median (range)	Deaf learning disabled (n = 15) Median (range)	χ^2 (Kruskal-Wallis)
ABC scored by teacher	46 (6-93)	28 (16-70)	9 (0-66)	16.31 ($p < 0.001$)
Interaction assessment (IA)	57 (22-72)	61 (39-75)	21 (9-78)	120.7 ($p < 0.01$)

autistic behaviours displayed by the deaf autistic and hearing autistic groups. This is consistent with previous findings of no differences between those with and those without deafness in their severity of autistic symptoms (Garreau et al., 1984).

Furthermore, there did not appear to be any characteristics specific to the deaf autistic group that would allow for earlier recognition. Rather, a number of authors have advocated a thorough assessment procedure to improve the early detection and diagnosis of autism and deafness. Lewis (1987) recommended that assessment procedures for the disabled child must be modified to take account of each child's particular problems, and efforts should be made to distinguish between behaviours resulting from an additional problem. Several authors have also advocated a comprehensive medical evaluation of children who may have an autistic spectrum disorder, including a hearing test (Coleman, 1993; Jure et al., 1991; Rapin, 1991). Coleman (1993) argued that although this at first may appear an expensive option, efficient and early diagnosis is vital if any challenging behaviour and/or physical symptoms are to be addressed and managed (see also Denmark, 1994).

Late diagnosis has crucial practical implications for the assessment and remediation of this client group, influencing whether the child is educated or managed as primarily deaf or as deaf and autistic. The presence of autism alters the nature of educational provision. For example, an essential component of educational planning and input for children with autism is that educational strategies should be adapted to their specific patterns of skills and disabilities (Jordan and Powell, 1995). Early diagnosis of autism is vital in ensuring such a tailored approach is provided for the child.

Failure to recognize autism at an early age in children who are deaf frequently results in their being placed in services primarily for deaf and

partially hearing children with disabilities. Such services may fail to identify many commonly recognized autistic symptoms that are masked by the deafness and related communication difficulties. This, in turn, creates a situation where the individual needs of the child, related to the autism, are not met.

In conclusion, the findings indicate that although problems in development and hearing in children who are both deaf and autistic are identified at an early age, their autism often goes undiagnosed until much later, even though autistic behaviours are evident. However, it should be noted that the present sample was relatively small (and the response rate from parents low) and so the results should be treated with some caution in any attempt at generalization. Moreover the ABC and IA were designed for hearing populations, and this, too, raises questions concerning the validity of the findings. The retrospective nature of the information obtained from the parental questionnaires is a further drawback, but this was necessary because of the lack of reliable and complete medical and developmental records. Previous writers have commented on the potential unreliability of parents' memories of their children's behaviour and developmental histories when they become adults (Happé, 1994). Finally, there are also limitations concerning the data on the participants' levels of cognitive functioning and communication. Future work in this area should provide more systematic information on the communication methods used, as well as consistent measures of cognitive ability, both verbal and non-verbal, for these three groups.

Appendix: parental questionnaire

The following are the 12 items of the questionnaire used for the parents of deaf autistic participants.

- 1 Were there any complications during the pregnancy or birth?
- 2 How old was your child when you first began to suspect problems of:
 - development
 - hearing?
- 3 What worried you most about your child's early development?
- 4 How old was your child when s/he was first diagnosed as:
 - autistic
 - having a developmental disorder
 - hearing impaired or deaf?
- 5 What professionals did you consult concerning your child, e.g. paediatrician, neurologist, GP?
- 6 If the first diagnosis was different from the above, what was the first diagnosis?

- 7 What family counselling or advice about your child and their diagnosis was given?
- 8 If no counselling was offered, would you have wanted counselling or advice if it was available?
- 9 What treatments or interventions were provided for the child at the time of diagnosis, e.g. medication, psychotherapy?
- 10 Looking back, can you now recognize what behaviours may have indicated a problem?
- 11 What behaviours are you most concerned about now?
- 12 Have you any concerns about the future, e.g. behaviours, residential options?

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References

- AMERICAN PSYCHIATRIC ASSOCIATION (1994) *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn (DSM-IV). Washington, DC: APA.
- COLEMAN, M. (1993) 'Clinical Review: Medical Differential Diagnosis and Treatment of the Autistic Syndrome', *European Child and Adolescent Psychiatry* 2: 161-8.
- DENMARK, J.C. (1994) *Deafness and Mental Health*. London: Jessica Kingsley.
- GARREAU, B., BARTHELEMY, C. & SAUVAGE, D. (1984) 'A Comparison of Autistic Symptoms with and without Associated Neurological Problems', *Journal of Autism and Developmental Disorders* 14: 105-11.
- GORDON, A.G. (1991) 'Co-occurrence of Deafness and Infantile Autism', *American Journal of Psychiatry* 148: 1615.
- HAPPÉ, F. (1994) *Autism: An Introduction to Psychological Theories*. London: UCL Press.
- HISKEY, M.S. (1966) *The Hiskey-Nebraska Test of Learning Aptitude*. Lincoln, NE: Union College Press.
- JORDAN, R. & POWELL, S. (1995) *Understanding and Teaching Children with Autism*. Chichester: Wiley.
- JURE, R., RAPIN, I. & TUCHMAN, R.F. (1991) 'Hearing-Impaired Autistic Children', *Developmental Medicine and Child Neurology* 33: 1062-72.
- KRUG, D.A., ARICK, J.R. & ALMOND, P.J. (1980) 'Behaviour Checklist for Identifying Severely Handicapped Individuals with High Levels of Autistic Behaviour', *Journal of Child Psychology and Psychiatry* 21: 221-9.
- KRUG, D.A., ARICK, J.R. & ALMOND, P.J. (1993) *Autism Screening Instrument for Educational Planning*, 2nd edn. Examiner's Manual. Portland, OR: ASIEP Education Company.
- LEWIS, V. (1987) *Development and Handicap*. Oxford: Basil Blackwell.
- RAPIN, I. (1991) 'Autistic Children: Diagnosis and Clinical Features', *Paediatrics* 87: 751-60.