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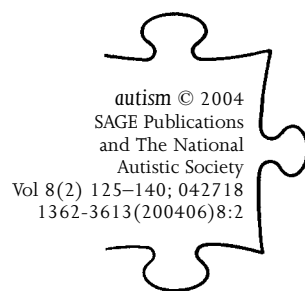
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Autism and learning disability



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ABSTRACT In this article a short overview is given of the relationship between autism and learning disability. Autism exists with any level of intelligence, but many individuals with autism suffer also from learning disability. Although both disorders show overlap in some behaviours they are different in many aspects. Are they distinct syndromes which influence each other, or do they belong to a broad spectrum of a condition?

KEYWORDS

autism;
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Introduction

Autism and learning disability are co-associated.¹ On the one hand, autism is more common among individuals with learning disability, and increasingly so with lower levels of IQ. Equally importantly, on the other hand, autism impacts on all learning, especially among more severely affected individuals. The two conditions are so closely linked that there has been some debate regarding whether they can be viewed as distinct syndromes. But whereas learning disability is characterized by global delay, autism is synonymous with both delay and deviance (Ghaziuddin, 2000). What are the various strands of the relationship between autism and learning disability?

A few clinical examples serve as indicators of the complexity of the interrelationships observed between autism and learning disability. First, in addition to the overall relationship between the higher prevalence of autism and lower IQ, the presenting clinical picture in individuals affected by autism varies as one moves down the IQ spectrum. In general, the severity of autistic symptomatology varies according to the level of learning disability. Conversely, some children with learning disability display autistic features, without fulfilling the criteria necessary for a diagnosis of autism (Gillberg and Coleman, 2000). Also, 50–60 percent of individuals with severe to profound learning disability display the triad of impairments in social interaction, verbal and non-verbal communication, and imagination

that is typical in autism (Wing and Gould, 1979). But a diagnosis of autism becomes difficult in individuals with profound learning disability, because it is almost impossible to determine whether the impairments observed are due to gross cognitive delay or to autism (Howlin, 2000). In that case one could argue that the diagnosis of autism may be of less relevance, because of the extent to which the severity of their learning disability dominates the presentation.

In this introductory review, aspects of the overall epidemiological relationships between autism and learning disability are considered, in the light of studies of issues such as adaptive behaviour, the triad of impairments in autism, and maladaptive behaviour. The importance of the underlying and associated medical conditions is reviewed briefly. The implications for clinical assessment are explored – the assessment both of learning disability in the context of autism, and of autism in the context of learning disability. In all considerations, the pathoplastic effect of IQ on symptomatology – the extent to which IQ shapes or determines behavioural symptoms – is explored. Throughout, the clinical importance of consideration of such comorbidity is emphasized, particularly in respect of social adaptation and long-term outcome.

Methodology

Medline (1966 to 5 September 2002) and Web of Science (1981 to 5 September 2002) were searched using the following terms: ‘autism’, ‘PDD’, ‘autistic spectrum disorder’ and ‘autistic disorder’. These terms were combined with ‘learning disability (including range from mild to profound)’, ‘mental retardation’, ‘mental handicap’ and ‘intellectual disability’. In addition, the reference sections of articles acquired through electronic searches were searched. All articles were in English and referred to either DSM-IV or ICD-10 definitions of autism/autistic spectrum disorder and of learning disability/mental retardation.

Epidemiology: the co-occurrence of autism and learning disability

The co-associations of autism and learning disability reflect broader aspects of the psychopathology of learning disability. Overall, psychopathology in children with learning disability is approximately three to four times more common than in children without a learning disability (Rutter, 1970), increasingly so as the severity of learning disability increases, and particularly in children with an IQ below 50 (O’Brien, 2000). Autism is by far the greatest single contributor to this high rate of disorder, with rates of autism

of at least 30 percent reported among children with severe learning disability (here defined as IQ < 50) (Gillberg, 1997). Similarly, autism or autistic features were found to occur in approximately 20 percent of children with severe learning disability and in 5 percent of children with mild learning disability (Nordin and Gillberg, 1996a). Another study (Deb and Prasad, 1994), investigating the prevalence of autism among people with learning disability, indicated that 14.3 percent of a sample of school-aged children with learning disability met DSM criteria for autism. Of those with a diagnosis of autism and learning disability, 36.5 percent had an IQ less than 35, placing them in the severe to profound range. Thus, the overall message is clear: autism is more common in individuals with severe to profound learning disability, in all reported studies.

Studies of the prevalence of learning disability in autism have been equally informative. It has long been recognized that many individuals with autism have learning disability; indeed, it was previously estimated that as many as 75 percent of individuals with autism have a learning disability, and that half functioned in the severe range (Rutter and Lockyer, 1967). Overall, until recently the literature has consistently shown that two-thirds of children with autistic disorder (DSM-IV 299.00) have an IQ below 50; one-fifth have an IQ between 50 and 69; and the remaining group function within borderline to normal intelligence (Steffenburg and Gillberg, 1986; Wing, 1993; Wing and Gould, 1979). Some more recent studies have reported lower prevalence rates of learning disability among children within the whole PDD group, ranging from 25.8 percent (Chakrabarti and Fombonne, 2001) to 40 percent (Baird et al., 2000). In a comprehensive review of 23 studies of the epidemiology of autism, Fombonne (1999) found that across all the studies reviewed, 19.4 percent functioned within the normal range of intelligence, 29.4 percent had mild to moderate learning disability and 41.9 percent had severe to profound learning disability. These results should be interpreted with caution due to differences in methodology, assessments and IQ bandings, but they nonetheless give us a good indication of the level of learning disability within the autism population.

Adaptive behaviour

There is good evidence that adaptive behaviour is more severely impaired in individuals with autism, as compared with deficits in overall or general intelligence. Furthermore, the profile of impairment of adaptive functioning in autism with comorbid learning disability is qualitatively different from that observed among non-autistic children with learning disability. Research using the Vineland Adaptive Behavior Scales (VABS: Sparrow et al.,

1984) has indicated that children with autism and learning disability perform significantly lower than matched non-autistic children with learning disability on the socialization domain of the VABS (Carpentieri and Morgan, 1996; Liss et al., 2001). In addition, they display impairments in verbal reasoning skills (Carpentieri and Morgan, 1994). The low score on the socialization domain of the VABS is independent of level of intelligence, and appears specific to autism. Regardless of increases in IQ and age, social skills remain a significant problem for children with autism (Schatz and Hamdan-Allen, 1995). These findings are consistent across comparison groups, including developmental language disorder (Liss et al., 2001) and Down's syndrome (Rodrigue et al., 1991). However, there is research to suggest that the relationship between adaptive functioning and IQ becomes stronger in groups of low-functioning individuals with autism (Liss et al., 2001; Vig and Jedrysek, 1999). In higher-functioning individuals, the autistic behaviours may interfere with the process of learning adaptive skills.

Assessing level of learning disability in autism

Previously, it was thought that individuals with autism and learning disability were untestable (DeMeyer et al., 1974). However, greater understanding of autism together with advances in psychometric testing have refuted this belief. With careful selection of measures, IQ data can be extracted from this population.

In children, many scales have been used to measure IQ, including: various versions of the Wechsler scales, namely the Wechsler Preschool and Primary Scale of Intelligence Testing (WPPSI) for preschool children, and the WISC-III for children aged 6 upwards, which has typically been used in high-functioning individuals with autism (VIQ and PIQ > 70) (Goldstein et al., 2001; Siegel et al., 1996); the Merrill-Palmer (Chakrabarti and Fombonne, 2001); the Kaufman Assessment Battery for Children (Kaufman and Kaufman, 1983); and the Griffiths Scales. The Differential Ability Scales have also been used in children with autism due to the minimization of verbal skills needed to complete the test. In older children and adults, the WRAT-R (Bryson et al., 1988) and the WAIS-R have been used; and more recently, the abbreviated short form of the WAIS (WASI) has proven appropriate for use in people with autism. One scale attracting considerable attention through its adoption in the studies of the International Molecular Genetic Study of Autism Consortium (2001) is Mullen's Scale of Early Learning, which gives reliable assessments of early cognitive and motor development at all levels of intelligence (Mullen, 1995).

Assessing autism in learning disability

Learning disability often overshadows psychopathology, in that all psychiatric disorders may easily be missed among people with learning disability. The same may be true of autism. Although there are strict diagnostic criteria to aid clinicians, the comorbidity of learning disability can impede a diagnosis of autism. Many of the behaviours that typify autism overlap with behaviours common in learning disability. Consequently, it is also possible to overestimate the extent of autism among people with learning disabilities. For example, negativism may be misinterpreted as a sign of a child's being unable to cooperate in a social situation, thus leading to a diagnosis of autism; whereas it might be that the child is simply finding a task too difficult.

There are a number of instruments that can be used to screen and/or diagnose autism in children and adults who also have learning disability. The Autism Diagnostic Observation Schedule (ADOS) is a well-established diagnostic instrument. It consists of four modules that can be used according to the individual's developmental level and language ability, ranging from no receptive or expressive language to verbally fluent individuals (Lord et al., 1999). Thus it is applicable to individuals across the autistic spectrum (Lord et al., 1989; 1999). The ADOS can be used with both children (modules 1–3) and adults (module 4). The content of the ADOS is comparable to the triad of impairments that is typical in autism. The Autism Behaviour Checklist (ABC) (Krug et al., 1980), a screening instrument that is widely used in autism, particularly with individuals with severe learning disability, provides a measure of overall level of autistic behaviour in individuals with severe learning disability. The Childhood Autism Rating Scale (CARS) (Schopler et al., 1980) is also widely used in autism. Both the ABC and the CARS can reliably differentiate autism from a more global learning disability (Nordin and Gillberg, 1996b) and are recommended when a diagnosis of autism is suspected in individuals with learning disability (Gillberg, 1997). The Diagnostic Assessment for the Severely Handicapped (DASH) (Matson et al., 1991) has also been used in autism. The DASH is a screening instrument that measures behavioural and psychiatric symptomatology in adults with severe to profound learning disability. It consists of 13 subscales, including pervasive developmental disorders, anxiety, depression and self-injurious behaviour. The DASH-II (Matson et al., 1996) has been used to identify core features of autism in adults with severe to profound learning disability. The Developmental Behaviour Checklist (DBC) (Einfeld and Tonge, 1995) has been used to assess autistic behaviours in children with learning disability. The DBC was revised in 2002 (Einfeld and Tonge, 2002) to include an autism screening algorithm.

The use of screening instruments in the absence of other methods of assessment is not enough to diagnose autism. An extensive assessment is needed, using different sources of information. Interviewing parents, teachers and/or caregivers in a standardized way is an indispensable method in classifying autism. Instruments such as the Autism Diagnostic Interview–Revised (Lord et al., 1994) and the Diagnostic Interview for Social and Communication Disorders (DISCO) (Wing et al., 2002) utilize a standardized interview format and capture a wealth of information about the child.

This brief review cannot do justice to the wide range of assessment schedules available for autism. Some of these are further reviewed in O'Brien et al. (2001).

Impact of learning disability on the autistic triad of impairments

Impairments in social interaction

Impairments in social interaction are typical in children with autism, but are also displayed in children with learning disability. Severity of learning disability is correlated with the degree of social impairment: children with severe learning disability display greater social impairments than individuals with mild learning disability (Wing and Gould, 1979). Comparative studies of children with autism, with and without learning disability, have demonstrated that social impairments, particularly poor relatedness (ignoring a passive adult and lack of cooperation during play), are more common in children with autism than in a learning disabled group. Freeman et al. (1981) reported an age related finding when comparing autistic children with an IQ below 70 with a learning disabled group. They found that ignoring a passive examiner was a better discriminatory variable for children aged 5 compared with children aged 4. Bartak and Rutter (1976) found that 77 percent of children in an autism group with an IQ under 70 did not become involved in joint play, as compared with 21 percent of individuals with autism and normal intelligence. Njardvik et al. (1999) found that adults with autism, in comparison with a sample of adults with learning disability and a sample with PDD-NOS, showed deficits in the use of positive social skills (as measured by the MESSIER). Positive social skills are defined as showing affection to familiar people and cooperation with others. They also found that positive non-verbal behaviours, such as smiling in response to positive statements, were also deficient in comparison with adults with learning disability and adults with PDD-NOS. In general, adaptive social skills are more severely affected in autism, followed

by PDD-NOS and finally those with learning disability (Njardvik et al., 1999).

As in other research on autism, most studies on social impairment have been done on children rather than adults with autism. In adulthood, although the ability to initiate and maintain social interaction is still impaired, people often show increased levels of social interest, so the problem is still inherently lack of social development.

Impairments in verbal and non-verbal communication

Around 50 percent of individuals with autistic disorder do not develop functional speech. Development of speech and language is highly correlated with IQ, with more elaborate routines and rituals displayed in individuals who are less affected by learning disability (Gillberg and Billstedt, 2000). Many children with autism and an IQ < 50 do not speak. If they do develop speech, they begin much later than normal. They often show abnormalities such as echolalia, idiosyncrasy and neologisms. Freeman et al. (1981) found that children with an IQ below 70 frequently repeat sounds, even in comparison with children with learning disability who are not on the autism spectrum. The expressive language is mostly better than the receptive language. Not only is verbal communication deviant, but also non-verbal communication. Face expression, body language and use of gestures are very limited. Deb and Prasad (1994) found that impaired verbal and non-verbal communication and restricted and repetitive activities were more marked than impairments in social interaction in a learning disabled autistic sample. Disturbing behaviour, such as screaming, overactivity and destructiveness, has been found to distinguish autism from a socially impaired group with learning disability (Shah et al., 1982).

More information about the impairments in communication will be given in the contribution by Noens and van Berckelaer-Onnes in this issue.

Restrictive, repetitive and stereotyped behaviours and imaginative impairments

Repetitive behaviours can impair and interfere with learning. Clinicians should acknowledge that some repetitive, self-stimulatory activities serve to relax the individual and can be utilized as a coping mechanism against anxiety. Research suggests that stereotypies and other abnormalities are more common in cases with lower IQ (Eaves and Eaves, 1996; Waterhouse et al., 1996), and links them in with associated impairments in social interaction and language. Waterhouse et al. (1996), in comparing children with high and low IQ, found a higher incidence of stereotypies and greater impairments in language and social interaction in children with a low IQ. Hand stereotypies, such as flicking fingers, wiggling fingers and hand

flapping, were all displayed in both the high- and low-functioning groups. Hand flapping was also displayed in 31 percent of the children with learning disability, who constituted the comparison group. These hand and finger stereotypies are pervasive. Lord (1995) found that they persist with age, as demonstrated in a follow-up study looking at children with autism and mild learning disability at ages 2 and 3. In addition, she found that at 2 years old, of the sample with autism, 87 percent displayed hand and finger mannerisms, compared with 38 percent of the learning disabled group. However, at follow-up at age 3, whilst the autistic group continued to display hand and finger mannerisms (87 percent), the presentation had decreased in the learning disabled group to 8 percent. Bodfish et al. (2000), in comparing two groups with severe to profound learning disability, with and without autism, found that despite comparison with matched controls, the autism group displayed higher levels and increased severity of stereotypies, compulsive and self-injurious behaviours. This is in agreement with Hermelin and O'Connor (1963) who found high levels of stereotypies in children with autism and severe learning disability compared with a matched control group of children with severe learning disability without autism. Repetitive and restrictive behaviour form part of the diagnostic criteria for autism. This may explain the elevated levels of such behaviour in the autism group, despite matching for age and IQ in the LD group (Bodfish et al., 2000). Bodfish et al. also found that severity of autism, as measured by the Autism Behaviour Checklist, could be predicted by severity of repetitive behaviour.

It has elsewhere been reported that complex repetitive behaviours, such as circumscribed interests or rituals, are more likely to present in higher-functioning groups and individuals with Asperger syndrome. Freeman et al. (1981) found that ordering and arrangement of objects were more common in children with autism and an IQ over 70, compared with children with autism with an IQ below 70. Hand flapping is a particular persistent behaviour in lower-functioning groups. Bartak and Rutter (1976) observed a greater incidence of hand flapping in a group of children with autism with mean IQ of 46 when compared with children of normal intelligence (mean IQ of 93). Other research comparing high-functioning (IQ > 70) and low-functioning (IQ < 70) children with autism with a learning disabled sample supports this finding (Freeman et al., 1981).

It has been suggested that the symptom profiles of high- and low-functioning groups are distinct. Low-functioning groups display more: (1) motor stereotypies; (2) significant impairment in language comprehension and associated low verbal and non-verbal IQ; (3) impaired social imitation skills; (4) sensory abnormalities. High-functioning groups more typically display: (1) higher verbal and non-verbal IQ; (2) language abnormalities

such as impaired prosody; (3) perseverative behaviours (Waterhouse et al., 1996). Impairments in social behaviour such as lack of physical responsiveness or smelling adults, impaired language delay, desire for sameness, stereotypies, and self-injury such as head banging, are more common among children with a non-verbal IQ of 69 or less. In their study of children with autism, Bartak and Rutter (1976) found that level of learning disability had implications for the manifestation of autistic symptomatology and subsequent outcome. Children with a non-verbal IQ over 70 displayed impairments in social interaction and ritualistic behaviour, but to a lesser degree than those of lower IQ, with a change in the quality of the behaviours. They displayed more ritualistic behaviour than children with lower non-verbal IQ, probably as a function of increased imaginative capacity. In addition, sensitivity to noise is also reported in children with autism and normal IQ. Self-injury has been reported in children with autism with non-verbal IQ over 70, but is less in degree than in children of lower IQ (Bartak and Rutter, 1976). Impairment in social relationships, impairment of language, and restrictive and repetitive behaviours are shared by individuals with autism, regardless of presence or absence of learning disability. Freeman et al. (1981) found that specific behaviours can aid in the differentiation between autistic and non-autistic samples, at both low and high levels of functioning. The fundamental issue is the degree and severity to which these abnormalities manifest. Wing (1981) postulated that the relationship between autism and learning disability is best understood in the wider context of the triad of social and language impairments and repetitive, restrictive stereotyped behaviours. In comparing children with and without social impairments, they found that the percentage of subjects with social impairment declined as IQ increased. In children with severe learning disability and social impairments, half the sample displayed mutism, echolalia and repetitive stereotyped behaviour (Wing, 1981).

Maladaptive behaviour

It is widely accepted that the incidence of maladaptive behaviours increases as IQ decreases. The incidence of self-injurious behaviour in individuals with both autism and learning disability is high, especially in those with more severe levels of learning disability. Self-injury is considered to serve a self-stimulatory function in some of these individuals. Aggression is a common observed problem in individuals with mild to moderate learning disability, who because of communicative impairments may feel that their needs are thwarted (O'Brien, 2000).

Research using the PDD subscale of the Diagnostic Assessment for the Severely Handicapped (DASH) in adults with and without autism with

severe and profound learning disability highlights the behavioural correlates that are associated with autism (Matson et al., 1996). Restlessness and lack of cooperation with caregivers were highlighted as critical behaviours that distinguished the autism sample from a learning disabled sample without autism. In addition, particular forms of psychopathology occurred more frequently in the autistic sample, scoring highly on the 'stereotypies' and 'mania' subscales of the DASH. However, there is substantial overlap between the PDD and the stereotypy subscale, so this finding is not unexpected.

Behaviour abnormalities such as smelling or touching objects are common among people with autism (Howlin et al., 1995). Such behaviours appear to occur predominantly in cases with severe to profound learning disability. Mouthing, which is displayed in typically developing children at approximately 5–9 months, has been shown to manifest in children with autism aged 23 to 65 months. Freeman et al. (1979), comparing children with autism and learning disability, found that mouthing behaviour was characteristic in both groups. Research on these behavioural idiosyncrasies highlights the diagnostic overlap between autism and severe learning disability. Given that people with severe learning disabilities with and without autism share many of the abnormalities of behaviour, clinicians should be aware of this when making a diagnosis. The overlap in symptom profile in terms of behaviour abnormalities makes it increasingly difficult to accurately diagnose autism in the severely learning disabled population.

Associated medical conditions

A variety of medical conditions is associated with autism and comorbid severe learning disability (Ritvo et al., 1990). However, any causal link between medical conditions and autism should be advanced with caution, as in people with severe and profound learning disability the probability of an associated medical condition rises by up to 50 percent (Dykens and Volkmar, 1997). Associated medical conditions, particularly neurological or chromosomal disorders, are thought to be present in approximately 10 to 25 percent of all cases with autism (Gillberg and Billstedt, 2000). The most commonly reported associated medical conditions include tuberous sclerosis, which has been reported to be present in 2–9 percent of all cases with autism. It has been suggested that this figure may be higher in individuals with autism and learning disability (Gillberg and Billstedt, 2000). Neurofibromatosis type I (NF1) has also been cited in autism, with a rate of 6 percent of cases with autism meeting diagnostic criteria for NF1 (Gillberg and Coleman, 1996). Fragile X syndrome, despite sharing similarities in autistic behaviour, has a rate of 2–10 percent in autism (Gillberg

and Coleman, 1996). Despite being relatively rare, there are increasing case reports in the literature of Down syndrome in autism (Howlin et al., 1995). The majority of these cases describe individuals who have additional severe to profound learning disability. However, these individuals exhibited repetitive behaviours far more prominently than others in this IQ range who are not on the autism spectrum.

Where autism and learning disability are co-associated in the context of a genetic condition, it is appropriate to think of autism as a feature of the *behavioural phenotype* of the condition in question, especially as this has implications for management (O'Brien, 2002). It has already been stressed that the expression of autistic symptomatology varies in lower IQ groups. This pathoplastic effect is particularly apparent in consideration of these discrete genetic conditions, in that the nature or clinical picture of autism varies between some of the conditions in question. In tuberous sclerosis, for example, we see a very florid picture of disinhibited overactivity and autism, more so than in fragile X syndrome. There is currently substantial interest in the extent to which different medical conditions may be associated with different symptom patterns of autism.

Long-term perspectives: outcome of comorbid autism and learning disability

In conclusion, it is the long-term prognosis for people affected with autism and learning disability which is the greatest concern, particularly for parents and carers. While prognosticating in the individual case is fraught with difficulty, certain key themes emerge from long-term studies of learning disability and of autism.

Long-term naturalistic outcome studies of people with learning disability (reviewed in O'Brien, 2001) highlight certain important prognostic factors. First, the severity of learning disability, in terms of IQ in childhood, exerts a major influence on subsequent development and adjustment. Also, the presence of any major physical disability has a substantial bearing on long-term outcome. Furthermore, studies on such diverse issues as parental and family coping, service engagement and societal acceptance of the person with disability, all emphasize the importance of considering the individual in the wider context when considering long-term prognosis. Consequently, when considering the outcome for the person with comorbid learning disability and autism, all of these issues should be borne in mind.

Long-term outcome studies of people with autism have identified certain prognostic factors in common with those in learning disability outcome studies, in addition to others which are more specific to autism.

Again, IQ is a crucial determinant of outcome. Studies of autism have found that children with an IQ above 70 have a greater propensity to acquire more useful language than those with an IQ below 50 (Adams and Sheslow, 1983). The language profile of an individual with an IQ below 50 is somewhat limited (Gillberg and Coleman, 2000; Wing and Gould, 1979). For those with an IQ between 50 and 70 the picture is less clear, with level of language being variable. Overall, however, language development is a fundamental determinant of outcome in autism – the presence or absence of communicative speech before the age of 6 being one pivotal factor in good or poor outcome (Gillberg, 1993). Childhood educational functioning is also a recognized factor in the prognosis of autism (DeMeyer et al., 1974). Other factors reported include lack of reaction to sound in infancy or early childhood, which is associated with a poor outcome, while milder forms of behaviour disorder in children with autism are notably associated with more positive outcome (reviewed in Gillberg and Coleman, 2000).

When considering the individual child with autism and learning disability, definitive long-term outcome prediction should be avoided. However, the factors highlighted above do serve as pointers to the domains of assessment on which the clinician might usefully focus. This in turn can highlight opportunities for intervention and therapy over the individual's lifespan – opportunities crucial for the outcome of people with learning disability and autism.

Notes

1 Throughout this article, the UK term 'learning disability' refers to the international ICD-10/DSM-IV term 'mental retardation'.

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