



Language development in autism

Jill Boucher*

Department of Psychology, University of Warwick, CV4 7AL Coventry, UK

Abstract

In this short review article, a summary of the behavioural impairments most commonly associated with the spectrum of autism-related disorders is presented, with a slightly amplified account of the defining communication impairment. The patterns of language ability and disability which typically occur in some forms of autism are then outlined, followed by a short section on possible cognitive, or psychological, explanations of these patterns. In particular, the hypothesis that socio-affective and socio-cognitive ('theory of mind') deficits cause language impairments, and the hypothesis that temporal processing deficits cause these impairments, are outlined and briefly discussed. An extensive list of references is included, to support and amplify the summary data included in the review.

© 2003 British Association for Paediatric Otorhinolaryngology (BAPO). All rights reserved.

Keywords: Communication; SLI; Theory of mind; Temporal processing

1. Diagnosis and definition

Autism is a neurodevelopmental disorder, or group of related disorders, currently defined in terms of certain impairments of social interaction, communication, and behavioural flexibility [1,2]. Language is commonly impaired or absent, almost always in conjunction with mental retardation. Additional impairments, for example, of sensory–perceptual or motor functions, are common and possibly universal. Individuals with the defining impairments of social interaction, communication, and behavioural flexibility whose language and general learning abilities are within normal limits may be diagnosed as cases of Asperger syndrome (AS) (see Table 1). However, it is controversial as to

* Tel.: +44-2476522133.

E-mail address: j.boucher@warwick.ac.uk (J. Boucher).

Table 1

Behavioural impairments associated with the spectrum of autism-related disorders

| | Defining impairments | | | Concomitant impairments | | |
|-----|----------------------|---------------|-------------------------|-------------------------|------------------------|--------------------|
| | Social interaction | Communication | Behavioural flexibility | Language acquisition | Mental retardation | Sensory–perceptual |
| AS | yes | yes | yes | no | no | yes? |
| HFA | yes | yes | yes | yes—mild | yes—mild | yes |
| LFA | yes | yes | yes | yes—moderate to severe | yes—moderate to severe | yes |

AS=Asperger syndrome; HFA=high functioning autism; LFA=low functioning autism.

whether or not AS constitutes a discrete subtype of autism, or whether it is continuous with other forms of the condition [3].

2. The communication impairment

The communication impairment which partially defines autism is closely related to the impairment of social interaction, and includes impaired use of language even when language is present. Thus, language if present tends to be used for instrumental rather than for social purposes, and the content of what is said is repetitive and egocentric [4]. Conversation is one-sided and nonreciprocal, showing poor pragmatic abilities [5,6]. The comprehension and use of nonverbal communication signals is also impaired, regardless of whether or not language is present. So, for example, the comprehension and use of facial expression, gesture, and vocal prosody is always abnormal, even in individuals with Asperger syndrome [7–9].

3. The language impairment

The language impairment itself, when present, is not confined to difficulty in acquiring spoken language, the ability to acquire signed language usually being equally affected. However, signing may have an advantage over speech in those individuals who have additional problems such as hearing loss or oral dyspraxia, and it is sometimes easier to teach a minimal vocabulary of signs than it is to teach speech to mentally retarded autistic individuals. If both oral and manual dyspraxia are present, which is not uncommon [10,11], also in the case of the most severely mentally retarded individuals, pictures may be used for communicating basic needs, rather than signs. It is interesting to note that individuals at the other end of the spectrum, that is to say those with AS or HFA, sometimes find written language easier to learn than spoken language [12]. This observation may be relevant to understanding the causes of autistic language impairment, as discussed below.

When at least some spoken language is acquired, there is a typical distribution of linguistic impairments across the spectrum. This distribution is indicated in Table 2, ignoring the considerable individual variation which occurs in practice.

Table 2

The distribution of linguistic impairments across individuals within the autistic spectrum who have at least some language

| | Comprehension vs. expression | Pragmatic impairment | Semantic impairment | Grammatical impairment | Phonological impairment |
|-----|------------------------------|------------------------|---------------------|------------------------|-------------------------|
| AS | Comprehension < expression | yes—moderate | yes—mild | no | no |
| HFA | Comprehension < expression | yes—moderate to severe | yes—moderate | yes—mild to moderate | no |
| LFA | Comprehension < expression | yes—severe to profound | yes—severe | yes—severe | yes—mild to moderate |

Key as for Table 1.

The fact that *comprehension is often more impaired than expression* may appear logically impossible. However, this anomaly results from the fact that an unusually high proportion of autistic expressive language is formulaic: thus well-formed phrases may be learned and used as unanalysed chunks (delayed echolalia, see [13]); or there may be repetitive use of particular grammatical frames [14]. Truly generative expressive language is almost certainly not in advance of comprehension.

Pragmatics may be defined as the conventions and rules governing the on-line use of language for communication. These conventions and rules may involve social knowledge (such as the appropriate way to address peers as opposed to authority figures), or socio-cognitive understanding (such as taking into account another person's knowledge and intentions). Impaired use of these kinds of conventions and rules forms an important component of the defining communication impairment, outlined above. However, pragmatics also involves knowledge of the linguistic devices used to structure coherent discourse or narrative, and to disambiguate meaning. Both nonlinguistic and linguistic pragmatic impairments are marked and pervasive in individuals with autistic spectrum disorders, including the most able [15].

The very mild *semantic impairments* attributed in Table 2 to individuals with AS relate to difficulties in understanding and using nonliteral or allusive language. So, for example, people with AS have problems with metaphor, irony, and jokes involving word play, despite their normal vocabulary and grammar [16]. Individuals with HFA or LFA have very much more marked difficulties with linguistic meaning, tending to use words and phrases in narrow, context-bound ways, and having particular difficulty with abstract terms [17] and especially deictic terms, i.e. terms that change their meaning according to time, place, or speaker, e.g. 'now', 'there', 'I' [18]. Specific impairments in the acquisition of terms referring to states of mind or emotions have also been noted in some studies [19,20].

The *grammatical impairments* which occur in individuals with HFA and in those individuals with LFA who acquire at least some language have not been well researched, and in the past it was sometimes claimed that grammatical ability in individuals with HFA, as well as in people with AS, was relatively normal. However, more recent studies have clearly shown that this is not the case, grammatical errors and anomalies being common [21], especially in spontaneous speech [22]. In people with LFA, grammatical competence is low, communication being achieved with isolated words or signs, and rote-learned phrases.

Phonology is the area of language least likely to be impaired in people with autism. Echolalia is common in young or less able individuals with autism [18] and is generally phonologically accurate, demonstrating an implicit knowledge of the phonological categories of the speaker's native language. However, in those individuals without language who do not echo, one may assume that phonological as well as grammatical and semantic aspects of language cannot be acquired.

4. Explaining the language impairment

The immediate cause of impaired language acquisition in autism is biological, although the impairment can be aggravated by adverse environmental conditions. Clearly the language problems are not the result of unimodal sensory impairment, although they can be aggravated by hearing or visual impairment, both of which are more common in people with autism than in the normal population [23,24]. Nor can the language impairment be explained in terms of motor output abnormalities or physical handicaps although these, too, can aggravate the impairment and are quite commonly associated with autism [25,26]. Rather, the immediate cause, or causes, of language impairment must be psychological (with less proximate causes being sought at the level of brain structure and/or function, and at the level of fundamental genetic or disease factors).

Psychological researchers have not shown much interest over recent years in attempting to explain the language acquisition impairment which occurs in less able people with autism, most psychological research into autism being directed to understanding the defining features of the condition as they occur in cases of Asperger syndrome (see Table 1). The only hypothetical explanation argued for with any vigour over this period has been that impaired language acquisition is caused by the social and emotional malfunctions which prevent people with autism from developing a 'theory of mind' [27,28]. This explanation rests on the argument that early stages in the development of a theory of mind are necessary for the ability to use symbols, such as words or manual signs [29]. This hypothesis, however, has difficulty in explaining why people with AS do acquire language, even in the absence of the usual early-developing theory of mind skills [30].

An earlier hypothesis concerning the psychological cause(s) of language impairment in autism suggested that there is a fundamental deficit in the ability to process transient, sequential stimuli, i.e. stimuli with a temporal dimension, such as speech or manual signing [31,32]. I have recently revived this hypothesis, re-articulating it in terms of a 'time parsing' deficit [33,34]. Specifically I have argued that: (i) all individuals with autistic spectrum disorders have impaired time-parsing of events with relatively extended durations, including conversational exchanges, and that this contributes to the linguistic aspects of their pragmatic impairment. (ii) Individuals with HFA or LFA have, in addition, impaired time-parsing of events of shorter durations, such as sentences, and this adds semantic and syntactic impairments to their pragmatic impairments. (iii) Individuals with LFA but some language have further additional impairments of time-parsing at the level of words and morphemes, aggravating the semantic and grammatical impairments. (iv) Individuals with LFA and no language have yet further additional impairments of time-parsing at the level of syllables and phonemes—thus no capacity for any aspect of

language acquisition. This hypothesis is capable of explaining why some but not all individuals with autism have language impairments. It is also compatible with the behavioural overlap [21] and familial links [35] that exist between specific language impairments (SLI), developmental dyslexia, and autism (but only if the two former disorders also involve temporal processing deficits, as often suggested). According to the time-parsing deficit hypothesis, the socio-emotional and socio-cognitive deficits associated with impaired acquisition of theory of mind are the main cause of the communicative, as opposed to the linguistic, problems associated with autism. However, it is not denied that impaired theory of mind will also have some adverse effects on language acquisition.

A further hypothesis that has been argued for in the past is that sensory–perceptual impairments and anomalies cause language impairments in autism, and possibly some of the defining behavioural impairments as well [36–38]. Consistent with these claims is the raised prevalence of hearing impairment and the fact that this impairment covaries with the severity of the autism, rather than with levels of intelligence [23]. It is also consistent with the evidence of hypo- and hyper-sensitivity to sound (sometime occurring in the same individual) [23]. The claims made for a particular type of intervention called ‘Auditory Integration Therapy’ [38] might also be consistent with the hypothesis, although the efficacy of this therapy is disputed [39]. Finally, the hypothesis is consistent with the evidence cited above for etiological links between autism and SLI. My personal view is that the time-parsing deficit hypothesis and a hypothesis identifying sensory, also sensory–motor, integration processes as the immediate cause of language impairments in autism, are not incompatible. However, this suggestion is currently unresearched.

There is increasing theoretical interest in the sensory and perceptual impairments and anomalies associated with autism [40], and much-needed research into the origins of autistic language impairment may develop from this. Audiologists would necessarily have a role in such investigations. At the practical level it is also important that medical practitioners are aware of the high rates of neural and especially of conductive deafness in children with autism, as the results of undetected hearing loss in these children can be serious [41].

References

- [1] World Health Organisation, *International Classification of Diseases: 10th Revision (ICD-10)*, Author, Geneva, 1993.
- [2] American Psychiatric Association, *Diagnostic and Statistical Manual*, 4th ed., Author, New York, 1994, DSM-IV.
- [3] F. Volkmar, A. Klin, Diagnostic issues in Asperger syndrome, in: A. Klin, F. Volkmar, S. Sparrow (Eds.), *Asperger Syndrome*, Guilford Press, New York, 2000, pp. 25–71.
- [4] H. Tager-Flusberg, Current theory and research on language and communication in autism, *Journal of Autism and Developmental Disorders* 26 (1996) 169–172.
- [5] C. Baltaxe, N. D’Angiola, Cohesion in the discourse interaction of autistic, specifically language-impaired, and normal children, *Journal of Autism and Developmental Disorders* 22 (1992) 1–21.
- [6] J. Fine, G. Bartolucci, P. Szatmari, G. Ginsberg, Cohesive discourse in pervasive developmental disorders, *Journal of Autism and Developmental Disorders* 24 (1994) 315–329.
- [7] J. Fine, G. Bartolucci, G. Ginsberg, P. Szatmari, The use of intonation to communicate in subjects with pervasive developmental disorders, *Journal of Child Psychology and Psychiatry* 32 (1991) 771–882.

- [8] D. Tantam, D. Holmes, C. Cordess, Nonverbal expression in autism of Asperger type, *Journal of Autism and Developmental Disorders* 23 (1993) 111–133.
- [9] M. Howard, P. Cowell, J. Boucher, A. Mayes, A. Farrant, N. Roberts, Convergent neuroanatomical and behavioural evidence of an amygdala hypothesis of autism, *NeuroReport* 11 (2000) 2931–2935.
- [10] I. Rapin, Neurological examination, in: I. Rapin (Ed.), *Preschool Children with Inadequate Communication*, CUP, Cambridge, 1996, pp. 98–122.
- [11] B. Seal, J. Bonvillian, Sign language and motor functioning in students with autistic disorder, *Journal of Autism and Developmental Disorders* 27 (1997) 437–466.
- [12] T. Jolliffe, R. Lansdown, C. Robinson, Autism: a personal account, *Communication* 26 (1992) 12–19.
- [13] K. Loveland, B. Tunali-Kotoski, The school-age child with autism, in: D. Cohen, F. Volkmar (Eds.), *Handbook of Autism and Pervasive Developmental Disorders*, 2nd ed., Wiley, New York, 1997, pp. 283–308.
- [14] S. Dobbins, M. Perkins, J. Boucher, Structural patterns in conversations with a woman who has autism, *Journal of Communication Disorders* 31 (1998) 1–22.
- [15] R. Landa, F. Volkmar, A. Klin, Social language use in Asperger syndrome and high functioning autism, Diagnostic issues in Asperger syndrome, in: A. Klin, F. Volkmar, S. Sparrow (Eds.), *Asperger Syndrome*, Guilford Press, New York, 2000, pp. 125–155.
- [16] F. Happé, *Autism: An Introduction to Psychological Theory*, University College Press, London, 1994.
- [17] G. Eskes, S. Bryson, T. McCormick, Comprehension of concrete and abstract words in autistic children, *Journal of Autism and Developmental Disorders* 20 (1990) 61–73. in: D. Cohen, F. Volkmar (Eds.), *Handbook of Autism and Pervasive Developmental Disorders*, 2nd ed., Wiley, New York, 1997, pp. 195–225.
- [18] C. Lord, R. Paul, Language and communication in autism.
- [19] H. Tager-Flusberg, K. Sullivan, Attributing mental states to story characters: a comparison of narratives produced by autistic and mentally retarded individuals, *Applied Psycholinguistics* 16 (1995) 241–256.
- [20] R.P. Hobson, A. Lee, Emotion-related and abstract concepts in autistic people: evidence from the British Picture Vocabulary Scale, *Journal of Autism and Developmental Disorders* 19 (1989) 601–623.
- [21] M. Kjølgaard, H. Tager-Flusberg, An investigation of language impairment in autism: implications for genetic subgroups, *Language and Cognitive Processes* 16 (2001) 287–308.
- [22] S. Dobbins, Repetitiveness and productivity in the language of adults with autism. Unpublished PhD thesis, University of Sheffield, 2000.
- [23] U. Rosenhall, V. Nordin, M. Sandstroem, G. Ahlsen, C. Gillberg, Autism and hearing loss, *Journal of Autism and Developmental Disorders* 29 (1999) 349–357.
- [24] T. Peeters, C. Gillberg, *Autism: Medical and Educational Aspects*, 2nd ed., Whurr Press, London, 1999.
- [25] J. Page, J. Boucher, Motor impairments in children with autistic disorder, *Child Language Teaching and Therapy* 14 (1998) 233–260.
- [26] D. Green, G. Baird, A. Barnett, L. Henderson, J. Huber, S. Henderson, The severity and nature of motor impairment in Asperger's syndrome: a comparison with specific developmental disorder of motor function, *Journal of Child Psychology and Psychiatry* 43 (2002) 655–668.
- [27] H. Tager-Flusberg, Language and understanding minds: connections in autism, in: S. Baron-Cohen, H. Tager-Flusberg, D. Cohen (Eds.), *Understanding Other Minds: Perspectives from Developmental Cognitive Neuroscience*, 2nd ed., OUP, Oxford, 2000, pp. 124–149.
- [28] R.P. Hobson, *Autism and the Development of Mind*, Erlbaum, Hove, 1993.
- [29] H. Werner, B. Kaplan, *Symbol Formation*, Lawrence Erlbaum, Hillsdale, NJ, 1984, Original work published in 1963.
- [30] M. Carpenter, B. Pennington, S. Rogers, Interrelations among social-cognitive skills in young children with autism, *Journal of Autism and Developmental Disorders* 32 (2002) 91–106.
- [31] D. Ricks, L. Wing, Language, communication, and the use of symbols in normal and autistic children, *Journal of Autism and Childhood Schizophrenia* 5 (1975) 191–221.
- [32] P. Tanguay, Towards a new classification of serious psychopathology in children, *Journal of the American Academy of Child Psychiatry* 23 (1984) 373–384.
- [33] J. Boucher, Time-parsing, normal language acquisition, and language-related developmental disorders, in: M. Perkins, S. Howard (Eds.), *Kluwer Academic Publishing/Plenum*, London, 1999, pp. 13–23.
- [34] J. Boucher, 'Lost in a sea of time': time parsing and autism, in: C. Hoerl, T. McCormack (Eds.), *Time and Memory*, Clarendon Press, Oxford, 2001, pp. 110–135.

- [35] A. Bailey, S. Palferman, L. Heavey, A. LeCouteur, Autism: the phenotype in relatives, *Journal of Autism and Developmental Disorders* 28 (1998) 369–392.
- [36] J. Spencer, J. O'Brien, K. Riggs, O. Braddick, J. Atkinson, J. Wattam-Bell, Motion-processing in autism: evidence for a dorsal stream deficiency, *NeuroReport* 11 (2000) 2765–2767.
- [37] A.G. Gordon, Ear disorders in autistic children (letter), *Journal of Autism and Developmental Disorders* 19 (1989) 470–472.
- [38] M. Brown, Auditory integration training and autism: two case studies, *British Journal of Occupational Therapy* 62 (1999) 12–18.
- [39] H. Link, Auditory integration therapy: sound therapy? *British Journal of Learning Disabilities* 25 (1997) 106–110.
- [40] M. O'Neill, R. Jones, Sensory–perceptual abnormalities in autism: a case for more research? *Journal of Autism and Developmental Disorders* 27 (1997) 283–294.
- [41] R. Jure, I. Rapin, R. Tuchman, Hearing impaired autistic children, *Developmental Medicine and Child Neurology* 33 (1991) 1062–1072.