

Outcome in High-Functioning Adults with Autism With and Without Early Language Delays: Implications for the Differentiation Between Autism and Asperger Syndrome

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The question of whether Asperger syndrome and high-functioning autism should be considered as the same or different conditions has been a source of debate and controversy over recent years. In the present study, 34 adults with autism who had shown early delays in language were compared with 42 individuals who were reported to have had no such delays, either in their use of words or phrases. All participants were at least 18 years of age, had a nonverbal IQ of 70 or above and met ADI-R criteria for age of onset, communication and social impairments, and stereotyped behaviors. Those in the language delay group were diagnosed as having high-functioning autism. The remainder were designated as having Asperger syndrome. The groups were matched for age, nonverbal IQ and gender. No significant differences were found between the groups either in their total ADI-R algorithm scores, or in their algorithm scores on individual domains. Social outcome ratings and ADI-R scores based on *current* functioning also failed to differentiate between the groups. Scores on tests of language comprehension and expression were also similar, but in both groups language abilities were well below chronological age level. The implications of these results with respect to the differences between Asperger syndrome and high-functioning autism are discussed. The poor performance on language tests also challenges the assumption that early language development in Asperger syndrome is essentially normal.

KEY WORDS: High-functioning autism; Asperger syndrome; long-term outcome.

INTRODUCTION

The issue of whether autism and Asperger syndrome are different conditions (albeit part of the same spectrum of disorders) has been a source of continuing debate over recent years (cf. Klin, Volkmar, & Sparrow, 2000; Schopler, Mesibov, & Kuncze, 1998). There is also considerable disagreement about the validity of the diagnostic criteria used in DSM-IV (APA, 1994) and ICD-10 (WHO, 1992) to distinguish between the two conditions, (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Kugler, 1998; Leekam, Libby, Wing, Gould, & Gillberg, 2000; Manjiviona & Prior, 1999). Indeed,

several studies now suggest that if strict DSM/ICD criteria are applied, a diagnosis of Asperger syndrome becomes unlikely, or even impossible (Eisenmajer *et al.*, 1996; Ghaziuddin, Tsai & Ghaziuddin, 1992; Manjiviona & Prior, 1995; Mayes & Calhoun, 2001; Miller & Ozonoff, 1997; Szatmari, Archer, Fisman, Streiner & Wilson, 1995).

Wing, having been responsible for first bringing Asperger's original writings to the attention of clinicians in 1981, now expresses her concern that she may have opened a "Pandora's box" (Wing, 2000). Her original intention, to emphasize the fact that there was no evidence for a distinction between Asperger syndrome and autism, has frequently been overlooked. Instead, her account led to widespread research into the possible differences between the two conditions. Inadequate group matchings, small samples, and, above all, lack of

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agreement on diagnostic criteria have meant that few of these studies have produced any conclusive results (c.f. Klin *et al.*, 2000). Despite this, the differential diagnosis can have implications for services, with individuals diagnosed as having Asperger syndrome or Asperger disorder sometimes being deprived of the level of support that is offered to those diagnosed as having autism (Klin & Volkmar, 2000; Department of Health, 2001).

Current Research Evidence

A systematic search of the literature over the past 15 years, using the major databases (MEDLINE, PsychINFO, etc.) was conducted together with an additional

trawl of journals with a focus on developmental disorders (*Journal of the American Academy of Child and Adolescent Psychiatry, Journal of Child Psychology and Psychiatry, Journal of Autism and Developmental Disorders, Autism*, etc.), and recent collections of chapters in edited volumes (Klin *et al.*, 2000; Schopler *et al.*, 1998). Twenty-six separate studies were identified in which a *direct* comparison between individuals with high-functioning autism (HFA) (IQ 70+) and Asperger syndrome had been conducted and in which diagnostic criteria and measures of IQ were adequately specified. Tables I and II summarize these studies, indicating the general areas investigated, the diagnostic systems used, the number and ages of participants, and the general conclusions of each.

Table I. Summary of Findings in Studies Comparing Individuals with Asperger Syndrome and High-Functioning Autism Matched for Full-Scale IQ

Principal area of study, Author (and criteria for AS)	Age Mean (range)	n HFA:AS	Conclusions
General clinical characteristics			
1. Szatmari <i>et al.</i> , 1990 (<i>Wing's criteria</i>)	HFA 23, AS14 yr	17:26	HFA > social impairments, language problems, stereotypies, and preoccupations
2. Mayes & Calhoun, 2000 (<i>modified DSM-IV</i>)	6.0 yr	23:24	No difference on any of 71 variables (IQ, language, symptomatology, motor coordination, emotion or behavior)
3. Ozonoff <i>et al.</i> , 2000 (<i>DSM-IV</i>)	13.5 yr	23:12	HFA > ADI scores at 4; few differences in current scores. No differences in social functioning. AS > special interests; HFA > insistence on sameness
Obstetric/early history and motor abnormalities			
4. Szatmari <i>et al.</i> , 1989 (<i>Wing's criteria</i>)	HFA 23 AS 14	25:28	HFA > early abnormalities in social, language, and behavior
5. Gillberg & Gillberg, 1989 (<i>Gillberg criteria</i>)	10 yr	23:23	AS > clumsy
Neuropsychological and language profiles			
6. Ozonoff <i>et al.</i> , 1991 (<i>modified ICD-10</i>)	11–12 yr	13:10	AS > VIQ, and > VIQ-PIQ difference. AS > verbal memory, executive function & TOM scores. HFA > CARS scores
7. Klin <i>et al.</i> , 1995 (<i>modified ICD-10</i>)	15–16 yr	19:21	HFA > PIQ and better motor skills; AS > VIQ and higher verbal ability
8. Ozonoff <i>et al.</i> , 2000 (<i>DSM-IV</i>)	13.5 yr	23:12	Few differences but AS > VIQ-PIQ differences; HFA > expressive problems. No differences on executive function/TOM tasks
9. Rinehart <i>et al.</i> , 2000 (<i>DSM-IV</i>)	10 yr	12:12	HFA > problems in shifting attention
10. Szatmari <i>et al.</i> , 1990 (<i>DSM-III</i>)	HFA 23, AS14	17:26	Few differences in IQ profiles, motor, or other test scores
11. Iwanaga <i>et al.</i> , 2000 (<i>DSM-IV</i>)	5–6 yr	15:10	No significant differences on gross or fine motor tasks, and most nonverbal tests. AS > HFA on some verbal tasks
12. Klin, 2000 (<i>DSM-IV</i>)	19–20 yr	20:20	No differences on social attribution task
Behavioural and psychiatric disturbance			
13. Szatmari, 1989 (<i>Wing's criteria</i>)	HFA 25 AS 14	25:28	HFA > bizarre preoccupations; AS? > psychiatric problems

Table II. Summary of Findings in Studies Comparing Individuals with Asperger Syndrome and High-Functioning Autism (AS Groups Higher IQ)

Principal area of study, Author (and criteria for AS)	Age Mean (range)	n HFA:AS	Conclusions
General clinical characteristics			
1. Szatmari <i>et al.</i> , 1995 (<i>modified ICD-10 criteria</i>)	5 yr	47:21	HFA > social and adaptive problems, rituals and early language delays. No differences in current nonverbal/communication/motor skills
2. Eisenmajer <i>et al.</i> , 1996 (<i>clinical diagnosis</i>)	10 yr	48:69	Few differences on any variables; delayed language only significant differences in HFA group
3. Kurita, 1997 (<i>ICD-10</i>)	5–6 yr	16:26	Few significant differences but HFA > on some CARS items
4. Gilchrist <i>et al.</i> , 2001 (<i>ICD-10</i>)	HFA 21 yr; AS 14 yr	13:20	HFA > ADI problems age 4–5 yrs. No difference in current functioning on ADI or ADOS
Obstetric/early history and motor skills			
5. Ghaziuddin <i>et al.</i> , 1994 (<i>ICD-10</i>)	12–13 yr	9:11	No significant differences in motor skills
6. Ghaziuddin <i>et al.</i> , 1995 (<i>ICD-10</i>)	13–14 yr	9:11	No significant differences in neonatal optimality scores
7. Ghaziuddin & Butler, 1998 (<i>DSM-IV/ICD-10</i>)	10–11 yr	12:12	No significant differences in motor skills when IQ controlled for
8. Manjiviona & Prior, 1999 (<i>modified ICD-10</i>)	11 yr	9:12	AS > PIQ but no differences in motor skills
Neuropsychological and language profiles			
9. Ghaziuddin & Gerstein, 1996 (<i>ICD-10</i>)	15–16 yr	13:17	AS > pedantic speech
10. Ehlers <i>et al.</i> , 1997 (<i>Gillberg criteria</i>)	10 yr	40:40	Diffs in cognitive profiles; AS higher scores on most subtests
11. Pomeroy, 1998 (<i>non-language impaired PDD</i>)	7–8 yr	13:15	AS > VIQ; also > language comprehension and expression
12. Manjiviona & Prior, 1999 (<i>Modified/strict DSM-IV</i>)	10–11 yr	21:35	AS > VIQ no difference on neuropsychological profiles
13. Miller & Ozonoff, 2000 (<i>DSM-IV</i>)	10 yr	26:14	No significant differences in motor skills, executive function or TOM when IQ co-varied
Behavioural and psychiatric problems			
14. Ghaziuddin <i>et al.</i> , 1995 (<i>ICD-10</i>)	12 yr	8:12	AS > disorganized thought; few other significant differences
15. Tonge <i>et al.</i> , 1999 (<i>DSM-IV</i>)	AS 9.9; HFA 7.4 yr	75:52	AS > psychopathology
16. Kim, 2000 (<i>modified DSM-IV</i>)	12 yr	40:19	No differences in depression/anxiety/mood

The majority of participants were children, with only three research groups including any adults (Gilchrist, Green, Cox, Rutter & Le Couteur, 2001; Klin, 2000; Szatmari *et al.*, 1989, 1990, 1995). In many cases strict DSM-IV criteria for Asperger disorder were *not* used, principally because, as noted above, if the hierarchical guidelines proposed by ICD-10 or DSM-IV/DSM-IV(TR) (APA, 1994, 2000) are followed, only a small proportion of cases then meet the necessary criteria. Instead, this label tended to be used for individuals who,

although often meeting criteria for autism, had not shown early language delays. Moreover, many of the studies reviewed failed to match participants with Asperger syndrome and those with HFA on the basis of IQ. Thus the reported differences between the groups could be due to cognitive disparities rather than a true diagnostic differentiation. Table I summarizes the findings of 10 separate investigations in which participants were matched for full-scale IQ (three studies cover several different areas and are listed more than once). The find-

ings are variable. Of five reports on early history and general clinical characteristics, three (studies 1, 3, and 4 in Table I) suggest higher rates of problems in HFA groups. However, these differences were not necessarily maintained as children grew older (study 3). There was greater evidence of special interests in the Asperger group, whereas insistence on sameness was more common in the autism group (study 3). Only one study (no. 5) found evidence of increased clumsiness in individuals with Asperger syndrome. Of seven studies examining neuropsychological or linguistic functioning, four (nos. 6, 7, 8, and 11) reported higher verbal skills in the Asperger groups. There were few differences in scores on tasks of social understanding, Theory of Mind or executive function (nos. 8 & 12) and those that were found may have been related to higher verbal skills in the Asperger group (no. 6). Rates of psychiatric disturbance did not differ markedly although individuals with HFA tended to show more bizarre pre-occupations (no. 13).

Table 2 summarises the findings of sixteen separate studies in which the Asperger syndrome groups were of higher overall IQ than the Autism groups. Of eight with a focus on early history, general clinical severity or motor problems, five reported few differences. Ghaziuddin and Butler (1998; no. 7) identified more motor difficulties in their HFA group, but the difference disappeared when IQ was controlled for and both groups were relatively impaired compared to population norms. The results of Szatmari *et al.* (1995, no. 1) suggested that early group differences in language abilities diminished over time. Similarly, Gilchrist *et al.* (2001, no. 4) found that initial differences in symptom severity tended to decline with age and although there were differences on ADI scores in early childhood (with the HFA group showing more difficulties) there were no significant differences in adolescence and early adulthood. Of five reports on neuropsychological and linguistic functioning, the Asperger groups generally showed superior verbal skills. However, such differences disappeared when IQ was controlled for (no. 13). In the area of behavioural/psychiatric disturbance two studies (14 and 15) found evidence of increased pathology in the Asperger groups but this was not found in study 16.

Overall, there appears to be no *consistent* evidence that there are any major differences in rates of social, emotional and psychiatric problems, current symptomatology, motor clumsiness or neuropsychological profiles between the two groups. Moreover, there are suggestions that group differences found in early childhood may decrease with age (Gilchrist *et al.*, 2001;

Ozonoff, South, & Miller, 2000; Szatmari *et al.*, 1995). Several studies do, however, suggest that even if children are matched on full-scale IQ, the Asperger groups have better developed verbal skills in certain areas. The fact that individuals with autism who, by definition, are significantly delayed in their language development continue to show poorer linguistic skills than those with Asperger syndrome (who, by definition, are not delayed) is perhaps not surprising (Szatmari, 2000). However, because few studies have examined differences in these groups beyond mid adolescence, it is possible that the apparent linguistic superiority of the Asperger groups might reduce with age. The present paper, therefore, focuses on differences in older individuals, all aged 18+, and all with a nonverbal IQ of at least 70.

The three main questions posed were:

1. Do high-functioning adults with autism (IQ 70+) who showed early language delays differ in their early symptomatology (as assessed by parental report) from those with no early language delays?
2. Do ADI-R scores (current and retrospective) for social, communication, and ritualistic/stereotyped behaviors indicate differences between the groups?
3. Are there other differences with respect to social and linguistic functioning between the two groups in adulthood?

METHOD

Participants

The participants in the study were selected from patients attending a specialist diagnostic and assessment clinic for adults with developmental disorders. All had been referred by their local services (family doctors, social or psychiatric services) because of indications that they had an autistic spectrum disorder. Some had been diagnosed with an autistic spectrum disorder when younger, but many had not and they or their parents were generally seeking a formal diagnosis or clarification of an earlier diagnosis. All individuals who met the following criteria were included in the study:

- Diagnosis of autism or Asperger confirmed on the basis of the ADI-R (conducted by the author), plus previous clinical records, contemporaneous reports, and assessment of current functioning

- 18 years or older
- Nonverbal IQ within the normal range (i.e., 70+)

Measures

Cognitive and Linguistic Tests

Nonverbal IQ scores were obtained either from the Raven's Matrices (Raven, 1956), the Wechsler Adult Intelligence Scale (WAIS-R or WAIS-III, Wechsler, 1981, 1997), or the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). Comprehension for single words was assessed using the British Picture Vocabulary Scale (Dunn, Dunn, Wetton, & Burley, 1997; Dunn, Dunn, Whetton, & Pintillie, 1982) and vocabulary by the Expressive One Word Picture Vocabulary Test (Gardner, 1982). Although these are among the very few tests that are available for assessing language beyond middle childhood, most individuals were, nevertheless, above the chronological age ceiling and hence a standard score could not be calculated. Age equivalent scores were therefore used as an alternative, and for those scoring above the maximum a randomized age equivalent was assigned (see Mawhood, Howlin, & Rutter, 2000). In addition, because of the problems inherent in deriving age-equivalent scores in this way, ratings of language level were used (0 = above test ceiling; 1 = 15 yr to ceiling; 2 = 12–14.9 yr; 3 = 10–11.9 yr; 4 = 8–9.9 yr; 5 = <8yr).

ADI-R Scores and Group Classification

A detailed developmental history was obtained for all participants by means of the ADI-R (Lord, Rutter, & Le Couteur, 1994). In the majority of cases the informants were parents (usually the mother), although in three cases siblings provided the information and one informant was a stepmother (she had also been the person's childminder when he was tiny). ADI-R algorithm scores for impairments in communication, reciprocal social interaction, and repetitive and stereotyped behaviors/interests, together with the total score for all three domains were calculated for each individual. Ratings of fine and gross motor coordination were also obtained from the ADI-R, because problems in these areas are often noted as being more frequent in people with Asperger syndrome (Volkmar & Klin, 2000).

Out of a total of 76 individuals meeting inclusion criteria, 34 (25 men, 9 women) were reported by the informant to have shown definite delays in language as defined by the ADI-R (i.e., no single word speech by 24 months age and/or no phrase speech by 3 years). All individuals in this group were diagnosed as having autism

in that they scored at or above the cut off for abnormalities on each of the domains (communication, social understanding, stereotyped behaviors, and age) assessed by the ADI-R. Forty-two individuals (35 men, 7 women) who also met full ADI-R criteria were reported to have had no delays, either in their use of words or phrases. Although individuals in this group would not meet current DSM-IV criteria for Asperger disorder, for the purpose of the present comparison, and in keeping with other recent studies (Kim *et al.*, 2000; Manjiviona & Prior, 1999; Szatmari *et al.*, 1995) they were designated as having Asperger syndrome. There was no significant difference in the age of individuals in the two groups (average age in the autism group, 27.6 yr, SD 10.0 yr; in the Asperger group, 26.1 yr, SD 5.9 yr; $t = 80, p = .43$). The ratio of males to females in the autism group was 1.0:2.8; in the Asperger group it was higher at 1.0:5.0 but the difference was not significant ($X^2 = 1.09; p = .29$).

Findings

Note that because of the number of comparisons conducted, only p levels $< .01$ were considered significant. Table III summarizes the characteristics of both groups with regard to age of first symptoms, early language development, and ADI-R algorithm scores.

The age at which parents first noted symptoms of abnormal development was somewhat earlier in the autism group but the level of significance was marginal (see Table III). However, there was a significant difference in parental reports of the *types* of symptoms that first gave rise to concern. In the autism group, the most commonly reported early signs were language problems (32%); problems or delays in motor development (23.5%); social abnormalities (23.5%), and general behavior difficulties (15%). Only one parent in this group cited repetitive and stereotyped behavior patterns as being the initial cause for concern. In the Asperger group, parents' initial concerns focused on general behavior problems (29%); repetitive and stereotyped behaviours/interests (21%); motor difficulties/delays (19%); social abnormalities (19%), and language (12%). ($X^2 = 11.82; p = .037$). Information on first symptoms was missing for one individual in the Autism group who had been adopted.

Although all informants were able to recollect whether or not the individual had shown language delays (i.e., words by 2 years and phrases by 3 years) not all were able to give the actual age of speech acquisition. For those on whom this information was available, the average age of first words in the autism group

Table III. Comparison Between Asperger and High-Functioning Autism Groups on Early Childhood Measures

Group	Autism (n = 34)		Asperger (n = 42)		t	p value
	Mean	SD	Mean	SD		
Age first signs	15.01 months	13.21	21.27 months	12.9	2.03	.046
Age first words ^a	37.82 months	14.01	14.63 months	6.16	6.77	p < .001
Age first phrases	52.07 months	16.04	26.21 months	11.53	5.98	p < .001
<i>ADI-R algorithm scores^b</i>						
ADI total	40.29	8.38	37.83	8.21	1.28	.20
ADI social	18.79	5.06	18.38	4.82	.36	.72
ADI communication	15.64	3.22	14.19	4.10	1.69	.09
ADI stereotypies	5.85	1.59	5.26	1.53	1.64	.11

^a Good estimates of age for first words/phrases available for 29 in the autism group, 19 in the Asperger group; t values given for unequal variances.

^b For all ADI ratings, the higher the score the more abnormal the behavior.

was 38 months compared to 15 months in the Asperger group. The average ages for first phrases were 52 and 26 months, respectively. (see Table III). All participants had some speech when assessed as adults, but in the autism group the latest age at which words were acquired was 72 months; for phrases, the latest age was 84 months. In the Asperger group the latest ages of acquisition were 24 months for words and 30 months for phrases.

ADI-R algorithm scores confirmed that, despite the late age at which the diagnostic assessment was conducted, all individuals met criteria for communication and social impairments and for ritualistic/stereotyped behaviors. There were no significant differences between the groups, either in their total ADI-R algorithm score or in their algorithm scores on the individual domains (see Table III). ADI (“ever”) ratings for problems in gross and fine motor skills did not differ between groups. (Median: autism group = 0; Asperger group = 1.0; Mann Whitney Z 1.43; $p = .15$).

Differences in present functioning were also examined, using standardized tests, “Current”¹ ratings from the ADI algorithm and information pertaining to jobs, relationships, and independent living. As is apparent from Table IV, there were no group differences in nonverbal IQ, and scores on the ADI-R domains were almost identical.

From Table IV it can also be seen that there were no significant group differences in the numbers of peo-

ple living independently, in ratings of current friendships, or in employment levels, although the proportion of individuals with Asperger syndrome in some form of employment (sheltered or independent) was higher than in the autism group (38% vs. 52%). The one social variable for which a significant difference was found was educational qualifications. Significantly more individuals in the Asperger group had obtained at least A level qualifications (i.e., the level required for university entry) than in the autism group (24% vs. 52%). Median scores for current ratings of clumsiness (fine and gross) did not differ.

Ten individuals in the autism group were described by their referring agency as having additional psychiatric problems (8 depression, one alcohol dependency, and one agoraphobia). No further mental state examination was conducted during the present assessment and hence psychiatric diagnoses could not be confirmed. However, for one of these individuals with a depressive disorder the “Current” section of the ADI-R could not be completed because his depression was so severe as to have significantly altered his typical pattern of functioning. In the Asperger group, 7 individuals were described as suffering from depression (one with co-morbid obsessive compulsive disorder [OCD] and one with co-morbid anorexia); one man had a diagnosis of OCD, and one had been treated for a psychotic illness in the past.

On tests of current linguistic functioning, age-equivalent scores for language comprehension and expression were slightly higher in the Asperger group but the difference was not significant. Only on ratings for language expression (based on overall age band reached) was there a marginally significant difference, in favor of the Asperger group (see Table IV).

¹ These are similar to the items included in the diagnostic algorithm but exclude items for which there are only childhood ratings, that is, direct gaze, spontaneous imitation, play (imaginative, imitative and group), interest in/response to other children.

Table IV. Comparison Between Asperger and High-Functioning Autism Groups on Measures of Adult Functioning

Group	Autism (n = 34)		Asperger (n = 42)		t	p value
	Mean	SD	Mean	SD		
Nonverbal IQ	100.06	16.79	101.50	18.38	-.11	.91
<i>Current ADI ratings</i>						
ADI total	24.68	7.25	23.58	5.91	1.29	.20
ADI social	11.09	3.71	11.51	3.75	.36	.72
ADI communication	8.77	3.47	7.98	2.62	1.69	.09
ADI stereotypies	4.81	1.82	4.09	1.48	1.64	.11
<i>Social functioning</i>						
Education: n with A level qualifications or above	8		22		6.55	.01
Jobs: n in employment (independent/sheltered) ^a	13		23		1.25	.26
Living: n semi/independent	11		15		.09	.76
Friendships: n with some friends	13		17		.04	.84
<i>Language scores</i>						
BPVS age equivalent ^b	15.16 yr	4.11	16.09 yr	4.17	-.91	.37
BPVS rating ^c	1.59	1.37	1.40	1.52	.51	.61
EOWPVT age equivalent	15.40 yr	3.52	16.60 yr	2.63	-1.54	.13
EOWPVT rating	1.38	1.24	.82	.79	2.15	.04

^a Excludes 6 individuals in the autism group and 4 in the Asperger group who were still at college.

^b BPVS/EOWPVT age scores based on 29 individuals in the autism group and 35 in the Asperger group.

^c BPVS/EOWPVT ratings based on age bands on tests; see text for details. Lower ratings = higher level.

DISCUSSION

The findings of this comparison between 34 adults with autism and 42 designated as having “Asperger syndrome,” matched for age and nonverbal IQ, indicate that parents do report certain differences between the groups when they are younger. Because participants were assigned to the two groups on the basis of their early language development, the fact that there were significant differences in the age at which they first used words or phrases is a consequence of group selection. This method of sample selection would also explain why parents of children with autism were more concerned about language delays initially. However, there were also several other differences.

Children with Asperger syndrome tended to be older when parents first noted abnormalities in their development (average age 21 months as compared to an average of 15 months in the autism group) and their parents’ first concerns were split fairly evenly between general behavior problems, ritualistic and stereotyped behaviors/interests, and motor delays/difficulties. In the autism group, social difficulties and motor delays were (after language delays) the problems most likely to give

rise to early concerns. Only one parent in this group remembered ritualistic/stereotyped behaviors as being the most prominent symptoms in the first 3 years (cf. Howlin & Asgharian, 1998).

However, ADI-R algorithm scores for social and communication difficulties, which are based largely (although not exclusively) on children’s difficulties in these areas when they are somewhat older (4–5 years) suggested that these early differences may have decreased over time. Thus, no significant group differences were found on the ADI-R algorithm scores for impairments in social or communication skills. Moreover, ratings for ritualistic/stereotyped patterns of behavior or interests (which are based on whether the behavior has ever occurred) did not differ between the groups. The suggestion that early differences may decrease with age is also supported by the findings of recent studies (Gilchrist *et al.*, 2001; Ozonoff *et al.*, 2000; Szatmari *et al.*, 1995). In the Gilchrist study, for example (although participants differed in age and full-scale IQ), the significant group differences in ADI scores at age 4–5 years had disappeared by adolescence or early adulthood.

Motor clumsiness (based on ADI “ever” and “cur-

rent” ratings) failed to show any difference between the groups in the present study, although this is one area that has frequently been claimed to characterize individuals with Asperger syndrome (cf. Volkmar & Klin, 2000).

Assessments of current functioning also failed to reveal major differences between the two groups. The number of individuals with an additional psychiatric diagnosis was similar in both groups, and although these diagnoses were not independently confirmed, depressive disorders appeared to be the most common. “Current” ADI-R ratings for social functioning, communication, and ritualistic/stereotyped behaviors were remarkably similar, and outcome in terms of friendships, employment, and independent living did not differ. Only two individuals in the Asperger group and three in the autism group were reported to have developed friendships that involved closeness and sharing of emotions, although a higher number (10 with autism, 15 with Asperger syndrome) did have acquaintances whom they met outside home or work. Three men (2 autistic, 1 Asperger) were married or living with a partner, and one of the married men in the autism group had children. One woman in the Asperger group was divorced. The majority in both groups (19 with autism, 26 with Asperger syndrome) still lived with their parents and of those who did live independently most (7/11 in the Autism group; 9/15 in the Asperger group) continued to require support either from their families or social services. Three people with autism and one with Asperger syndrome were in specialist residential provision, and one man with autism was in an extended-care psychiatric hospital. In terms of employment, 15 individuals in each group had never had a job, and only 2 in each group had relatively well-paid, permanent employment. Three individuals in each group were in sheltered placements or worked with a family firm; the remainder was in short-term, low-pay, or voluntary posts that did not provide them with sufficient money to live independently. The only area in which a significant group difference emerged was in academic attainments. Although the numbers without any formal qualifications were similar (8 in the Asperger group, 9 in the autism group) eight individuals in the Asperger group had a university degree (4 of these at postgraduate level) and a further 14 had obtained some formal qualifications at sixth form level (A levels or equivalent). In the autism group only 2 people had a degree (none at postgraduate level) and 6 others had A levels or equivalent. However, this advantage in terms of academic attainments did not seem to have resulted in higher levels of achievement in later life.

Adult assessments of language comprehension and expression also showed some superiority for the As-

perger group, although the differences were generally small and only (marginally) significant for the ratings based on their scores on the Expressive One Word Picture Vocabulary (EOWPVT). The marked delays in language experienced by those in the autism group as children (several of whom did not begin to use words until they were over 4 years or phrases until they were 5 or older) may mean that they remained at a disadvantage in their ability to “catch up” linguistically. Thus the small differences found here may not represent a true diagnostic “splitting” between the groups. Rather, they could be due principally to the initial severity of language problems, which then leads, as Szatmari (2000) suggests, to the individuals in each of the two groups following somewhat different trajectories over time.

The language test results also raise further problems in terms of the validity of the distinction between autism and Asperger syndrome. Thus, although the latter condition is, by definition, not associated with early language delays, the present study indicated that language skills in adulthood were often far from age appropriate. The low age ceilings of the EOWPVT (19 years) and the British Picture Vocabulary Scale (BPVS) (18 years) give rise to obvious problems when calculating the extent of the language delay in older individuals. Nevertheless, 57% of the Asperger group still scored below ceiling on the BPVS (a measure of receptive vocabulary) and 62% scored below ceiling on the EOWPVT (a measure of expressive vocabulary). In the autism group 76% were below the age ceiling on the expressive test and 69% on the comprehension test (X^2 non-significant for each comparison between groups). Amongst the 21 individuals with Asperger syndrome whose scores were below the ceiling age of the test (i.e., those for whom an exact language age score rather than an extrapolation was available), the average gap between chronological age and language comprehension age was 12.62 years (SD 6.29 years) and the gap between chronological age and expressive language age was 10.20 years (SD 6.10 years). In the autism group the gap between chronological age and comprehension and expressive ages for those scoring below the age ceiling ($n = 22$) was similar (difference between comprehension age and CA = 13.33 years, SD 9.53 years; difference between expressive age and CA = 11.67 years, SD 9.34 years). There were no significant group differences on either measure. Moreover, although as young children, individuals in the Asperger group were reported not to have shown clinically significant delays in language, in adulthood either their comprehension and/or vocabulary use remained well below

chronological age in the majority of cases.

The present study suffers from a number of limitations, which should be borne in mind when drawing conclusions about possible differences between these two diagnostic groups. First, and perhaps most important, the group designated as having Asperger syndrome would not meet this diagnosis using strict DSM-IV (TR) criteria. However, in common with other recent research (Eisenmajer *et al.*, 1996; Manjiviona & Prior, 1995; Mayes & Calhoun 2001; Miller & Ozonoff, 2000; Szatmari *et al.*, 1995) so few cases could be identified from the patient database who met strict criteria, that the modified criteria used in many of the studies cited in Tables I and II were applied instead. There is no indication that participants in either the autism or “Asperger” groups in this study were markedly different in terms of cognitive level than the participants in comparable investigations of autism versus Asperger syndrome (reported mean performance IQs in the studies reported in Tables I and II typically range from around the mid 80s to just over 100). Thus the groups appear to be fairly representative of the samples involved in similar research. Although these findings might not be replicated if individuals meeting strict DSM-IV criteria were to be included, a recent study by Manjiviona and Prior (1999) found that the results of group comparisons remained the same whether strict *or* modified DSM-IV criteria were used for classification.

Secondly, information on early development was based on retrospective accounts from parents rather than on contemporaneous data. In particular, the classification of individuals as having/not having early language delays was dependent on parental memory, not on formal assessments in childhood. IQ scores, too, were based on current performance and on nonverbal tests only; data on childhood IQ were generally not available. However, recent research (Howlin, Goode, Hulton & Rutter, in press) indicates that, particularly among high-functioning individuals with autism/Asperger syndrome, IQ scores remain remarkably stable from child to adulthood, and hence it is likely that childhood IQ scores would have been within a similar range.

Thirdly, because ADI and other data were obtained in the course of routine clinical assessments it was not possible to make audio or video recordings that would allow interviews to be coded by independent raters.

A further problem, and one affecting almost all studies of linguistic competence in adulthood, is the lack of standardized language measures that extend beyond the age of 18 or 19 years. Thus, assessments of functioning in this area tend to be limited in the range of language skills they measure and ceiling effects

mean that scoring is invariably prone to some degree of error.

Finally, assessments of clumsiness, a variable that has been said to distinguish between individuals with Asperger syndrome and those with autism, were limited to ADI-R ratings; no direct measures were used.

Nevertheless, the results of the study are based on considerably larger samples than those involved in most previous comparisons of matched IQ groups; age and gender ratios were similar in both groups, and outcome measures examined functioning across a range of different domains. Unlike most previous studies in this area, which have focused on children, the participants were all over 18 years of age, thus allowing an examination of differences amongst adults. Overall, the findings indicate that there may be some group differences in the early years (i.e., in the symptoms reported by parents by the age of 3). ADI-R algorithm scores, however, suggested that such differences may decrease with age, and in adulthood there were no marked differences between the groups on “Current” ADI-R scores, other ratings of social outcome or standardized tests.

SUMMARY

In summary, the findings of this study and of the accompanying literature review suggest that comparisons between high-functioning individuals with autism and Asperger syndrome can only produce meaningful conclusions if the two groups are appropriately matched for intellectual level. Moreover, the age at which data are collected may well influence results, with differences between the two groups probably becoming less evident as they grow older (Gilchrist *et al.*, 2001; Ozonoff *et al.*, 2000; Szatmari *et al.*, 1995). Other authors (Szatmari, 2000; Wing, 2000) have reported that young children with autism may “shift” to follow an “Asperger-type” pathway subsequently, especially if they develop fluent language skills. The slight superiority of individuals with Asperger syndrome with regard to language expression has been replicated in a number of previous comparative studies. However, the fact that individuals with a diagnosis of autism are so much further behind in their language development from the start may also be the prime reason for the relative severity of their language difficulties in later life (see also Eisenmajer *et al.*, 1996; Szatmari, *et al.*, 2000).

The present results do not support the view that HFA and Asperger syndrome (at least as defined by the modified criteria adopted here) are distinct conditions. They also indicate that it may be misleading to suggest

(as do DSM-IV/ICD-10) that children with Asperger syndrome do not have significantly delayed language skills, as in adulthood their level of language (as well as their social use of language) is in fact often markedly impaired. These findings are of clinical importance since they not only highlight the *lack* of any substantial difference between the two diagnostic groups in adulthood, but also illustrate the poor prognosis, even for high-functioning individuals within the autistic spectrum. Despite having IQ scores well within the normal range (and, sometimes, reaching quite high academic levels) the majority of individuals in both groups had no close friends, they remained highly dependent on their families for support, and employment status was low.

Larger-scale prospective studies are still required in order to clarify the extent and nature of the possible differences between these two relatively high-functioning groups. However, for the present, the weight of evidence seems to suggest that any distinctions that do exist in early childhood may become less marked with age. There is little to support the view that individuals with a diagnosis of Asperger syndrome should be deprived of the support and services that are available for those with a diagnosis of autism, or that educational and management programs should differ in any way. Instead, it should be recognized that for *all* high-functioning individuals with an autistic spectrum disorder there is a need for much improved services throughout childhood and adulthood, if the long-term outcome is to be significantly enhanced.

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