

T. Clark
C. Feehan
C. Tinline
P. Vostanis

Autistic symptoms in children with attention deficit-hyperactivity disorder

Accepted: 30 April 1998

T. Clark · C. Tinline · P. Vostanis (✉)
Parkview Clinic
60 Queensbridge Road
Moseley, Birmingham B13 8QE
United Kingdom

C. Feehan
Oaklands Child and Adolescent Centre
Raddlebarn Road
Selly Oak, Birmingham B29
United Kingdom

Abstract Children with the syndrome of disorders of attention, motor control and perception (DAMP) invariably fill diagnostic criteria for attention deficit hyperactivity disorder (ADHD) and commonly have symptoms of autistic spectrum disorders. This study estimates the rate of autistic symptoms in a sample of children with ADHD by using the parent-rated Autism Criteria Checklist. A high proportion of parents (between 65–80%) reported significant difficulties in

social interaction (particularly in empathy and peer relationships), and communication (particularly in imaginative ability, nonverbal communication and maintaining conversation). The nature and relationship between ADHD and pervasive developmental disorders is considered, as well as implications for assessment, diagnosis and treatment.

Key words ADHD-autism-pervasive-DAMP

Introduction

Attention Deficit-Hyperactivity Disorder (ADHD) is described by the American Psychiatric Association (1) as 'a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and/or severe than is typically observed in individuals at a comparable level of development.' It should pervade more than one situation, some symptoms should have been present before the age of seven years, and there should be clear evidence of clinically significant impairment of social, academic or occupational functioning. ICD-10 (23) carries a similar description of Hyperactivity Disorders, distinguishing a diagnosis of Hyperkinetic Conduct Disorder where appropriate (23).

The dimensional, heterogeneous and age-dependent nature of ADHD is implicit in these descriptions, as well as doubt over its syndromal validity. For these and other reasons (13), particularly methodological inconsistencies (15), epidemiological studies have shown prevalence rates varying from 1–19% (20), while symptomatic hyperactivity has been reported in over 40% of 7–8 year old children (13). Conduct disorders are commonly

comorbid (18), especially in referred samples, such that most children with conduct disorder are hyperactive (13), and to a lesser extent most children with hyperactivity are conduct disordered (16, 17, 21). Hyperactivity is common in Tourette's syndrome (7) and many learning disability syndromes (14, 19).

Learning difficulties, in particular specific reading difficulties, are common in children with ADHD (2, 12). In a study of seven-year-old Swedish schoolchildren, 1.2% were found to present with a combination of severe pervasive hyperactivity and various motor control and perceptual dysfunction (10). All these children with disorders of attention, motor control and perception (DAMP- a definition adopted by researchers and clinicians in certain countries, although not an official ICD-10 or DSM-IV diagnosis) fulfill criteria for ADHD, although the reverse is not necessarily the case. In addition, Gillberg states that not only do most children diagnosed with Asperger's syndrome meet criteria for DAMP (9), but children with attention disorders often have mild autistic symptoms (6), and autistic features are present in at least half the cases of severe DAMP (7, 8). This contrasts with previous assertions that, although

hyperactive behaviour is certainly common in autism, autistic symptoms are rare in children with hyperactivity (14). It has been suggested that DAMP lies on the same disorder spectrum as autism and Asperger's syndrome (5, 8).

The aim of this study was to estimate the rate of autistic symptoms within a sample of children with ADHD, i.e., a group on the 'mild' end of this proposed spectrum. Consideration was given to identifying a sample of autistic children and estimating the rates of hyperactivity, but this would have been likely to yield very high rates of hyperactivity because, as already described, symptomatic hyperactivity is known to be common in autism.

Method

Sample

Subjects were identified from three general child and adolescent psychiatry clinics and one specialist ADHD clinic. The inclusion criterion was that they had received a clinical diagnosis of ADHD. There were interclinic variations in the assessment tools used, but all diagnoses were based upon DSM-IV criteria. Any such children who would meet diagnostic criteria for autistic disorder as well as ADHD would therefore be excluded, as these classifications give a hierarchical precedence to the former diagnosis.

The case notes of all subjects identified were then reviewed by an independent clinician (TC) to validate the diagnosis of ADHD according to DSM-IV criteria, and also to elicit whether criteria for oppositional defiant disorder or conduct disorder were fulfilled. In addition, demographic information was obtained. Those subjects who had case notes from which the diagnosis of ADHD was doubtful or difficult to confirm were subsequently excluded from further participation in the study. The parents of the remaining children were contacted by mail and asked to complete two questionnaires relating to their child's behaviour. If the child was taking prescribed medication for their difficulties, the parents were asked to give an approximate rating of their child's symptoms and functioning prior to pharmacological treatment. It was beyond the remit of this study to examine the nature and dosage of medication.

Instruments

The ADHD Rating Scale (Du Paul, 4)

This is a 14-item questionnaire derived directly from the DSM-III-R diagnostic criteria for ADHD. Each item is

scored 0 (not at all), 1 (a little), 2 (pretty much), or 3 (very much), giving a minimum score of 0 and a maximum score of 42. It has been standardized in a large community population and demonstrated to be highly reliable with adequate criterion-related validity, good internal consistency and good test-retest and inter-rater reliability (3, 4).

The Autism Criteria Checklist (Howlin, personal communication, 1998)

This is a parental questionnaire currently undergoing standardization, which is intended for use as a screening instrument. The Autism Criteria Checklist follows the behaviours listed under DSM-IV criteria. The wording has been changed somewhat to make it more accessible to parents, and more examples are provided to clarify what actually is meant by the question. It consists of three subscales addressing difficulties in social interaction (4 questions), problems in verbal and nonverbal communication (4 questions) and restricted repertoire of activities and interests (4 questions). There are four options for answering each question - e.g., frequent problem; sometimes a problem; rarely a problem; problem in the past, not a problem now. It generates a score for the answer to each question. As the instrument is still being tested to establish a cut-off score that predicts the presence of pervasive developmental disorders, only the descriptive items were used in this study.

Results

Out of the three ADHD clinics, 78 active cases were identified. In 64 (82.1%) of these cases, the case notes fulfilled DSM-IV criteria for ADHD, leaving 14 (17.9%) in which the diagnosis was doubtful or difficult to confirm. Of these 64, 49 (76.6%) parents returned questionnaires, which compares well with questionnaire surveys. All were answered sufficiently well to be included in the analysis.

The mean age of the sample was 9.5 years (range 5–15 yrs). There were 47 boys (95.9%) and 2 girls (4.1%). Forty-four (89.7%) were white/Caucasian and the remaining 5 (10.2%) were black/Afro-Caribbean. In 3 (6.1%) cases, ADHD symptoms were described in the notes as more common at school than at home, and in the remaining 46 (93.9%), symptoms were reported equally at home and at school. As well as fulfilling criteria for ADHD, 31 (63.6%) of the subjects also had case notes which fulfilled DSM-IV criteria for either oppositional defiant disorder or conduct disorder.

Frequency of ADHD rating scale items

The mean total score on the ADHD rating scale was 34.9 with a range of 23 to 42 (SD 6.43). Scores were dichotomized into 'not at all or just a little' (i.e., scores 0 or 1) and 'pretty much or very much' (i.e., scores 2 or 3). In addition, DSM-IV symptoms for ADHD were rated as present or absent from the medical notes (see below - Table 2).

Frequency of Autism Criteria Checklist items

Table 1 shows the frequencies of scores for each of the questions in the three subscales of the Autism Criteria Checklist. In accordance with the scoring system, the four possible answers to each question have been reduced to a dichotomy ('frequent problem' and 'sometimes a problem' being reduced to 'YES' in Table 1 and a score of 1 on the questionnaire, and 'rarely/never a problem' and 'problem only in past' being reduced to 'NO' in Table 1 and a score of 0 on the questionnaire).

The usual type of verbal communication used by the child had five possible answers: sentences, mostly simple phrases, single words, echoes others and no speech. Only a response of 'no speech' scored positively on the questionnaire. There were no children who scored positively on this question. There was no difference on presence of any autism symptoms or score of the three scales between children with ADHD and children with comorbid ADHD and conduct disorders (chi square and Mann-Whitney U nonparametric test were used respectively; all differences were non significant at $P < 0.05$).

The previous analysis referred to the total ADHD sample. Another way of analysing the data is by studying the distribution of autism features according to ADHD DSM-IV symptoms to test whether certain social or communication deficits are over-represented in children with particular ADHD symptoms. As the frequencies were evenly distributed for each ADHD symptom, there was no indication of such a pattern. The relationship between representative ADHD and autism symptoms is presented in Table 2.

Table 1 Reported frequency of autistic spectrum symptoms (DSM-IV)

	YES	NO
Difficulties in social interaction		
Does he show a lack of awareness for the feelings of others?	42 (85.7%)	7 (14.3%)
Does he have difficulties in making relationships with others of the same age group?	40 (81.6%)	9 (18.4%)
Does he show problems in nonverbal communication?	35 (71.4%)	14 (28.6%)
Does he seem to lack the desire to share enjoyment?	27 (55.1%)	22 (44.9%)
Restricted repertoire of activities and interests		
Does he show stereotyped hand or body movements?	35 (71.4%)	14 (28.6%)
Does he have an intense attachment to specific objects?	22 (44.9%)	27 (55.1%)
Does he show any odd preoccupations with parts of objects?	17 (34.7%)	32 (65.3%)
Does he show an unreasonable insistence on following routines in detail?	20 (40.8%)	29 (59.2%)
Problems in verbal and nonverbal communication		
Does he show problems in verbal communication?	0	49 (100%)
Does he have difficulties in knowing how to begin or sustain a conversation, despite having adequate speech?	38 (77.5%)	11 (22.5%)
Does he show a lack of imaginative ability?	32 (65.3%)	17 (34.7%)
Does he show any odd forms of speech?	37 (75.5%)	12 (24.5%)

Table 2 ADHD (DSM-IV) symptoms and frequency (%) of Autism symptoms

	Aobject	Aroutine	Cimag	Cconvers	Sempathy	Snonverbal	Srelationships
Often fidgets	35	42	67	82	87	72	76
Often leaves seat	39	49	67	80	86	71	86
No sense of danger	41	50	69	87	89	72	84
Talks excessively	40	43	67	78	86	76	81
Poor attention	37	43	64	84	85	74	83
Does not seem to listen	37	41	64	80	85	76	83
Easily distracted	35	42	65	81	86	73	81
Difficulty awaiting turn	37	42	67	80	87	73	80
Often interrupts	37	43	66	78	87	74	82

Autism Criteria Checklist: Activities scale: Achange = distress over or resistance to change; Aobject = odd preoccupations with parts of objects Aroutine: insistence on following routines. Communication scale: Cimagination = lack of imaginative ability; Cconvers = problems in beginning or sustaining conversation. Social interaction scale: Sempathy = lack of awareness for the feelings of others; Srelationships = difficulties in making close relationships; Snonverbal = problems with nonverbal communication

Factor analysis of ADHD and autism items

A factor analysis of the ADHD Rating Scale for eigenvalues greater than 1 extracted three factors. The factors could be described as Overactivity/Restlessness (37.5% of variance: items of interrupting, difficulty in playing quietly, not remaining seated, talking excessively, not waiting turn in groups), Social Immaturity (14.1% of variance: items of losing things, not listening, engaged in dangerous activities, difficulty following instructions), and Attention Deficit (10.3% of variance: items of impaired attention, being distracted and fidgeting).

In contrast, a similar factor analysis of the Autism Criteria Checklist extracted 6 factors. The 6 factors explained 68.5% of the variance. Factor 1 (could be defined as Resistance to Change) included the items preoccupation with and attachment to parts of objects, and insistence on following routines: 21.5% of variance). The remaining factors consisted of items from different scales of the Checklist. This overlap between functions of social interaction, communication and activities has been found in other screening or rating scales for autism (22).

Discussion

This research involved a retrospective case note study to determine diagnoses of potential subjects and a parental questionnaire to determine the presence or absence of symptoms of autistic disorders. The children were not directly assessed by the investigator. However, all subjects had been diagnosed as suffering from ADHD by a consultant child and adolescent psychiatrist and, in 17.9% of these cases, the child was not included in the study because the case notes were not sufficiently clear for the diagnosis to be made reliably. It should be emphasized that the Autism Criteria Checklist questionnaire was not then used to diagnose autistic disorders but to look for the presence of the symptoms of autistic disorder. This is in accordance with the intended use of the checklist as a screening instrument. Limitations of this study include the lack of a control group of children without ADHD (e.g., with specific language delay or conduct disorder) and the attrition rate.

This sample consisted of 47 boys and two girls, which produces a much higher ratio than that reported in the epidemiological literature. Szatmari et al. in their review show male to female ratios ranging from 1.6:1 to 8.3 :1 (20). This sample was a referred sample, which would be expected to represent the severe end of the spectrum. The male to female ratio is highest at this end of the spectrum (13). 93.9% of the sample had symptoms of hyperactivity which were reported equally at home and at school. The DSM-IV diagnosis of ADHD requires

symptoms to be pervasive across more than one situation, so this would be expected in a sample defined according to DSM-IV criteria. In addition, children with pervasive hyperactivity are more likely to be referred, as pervasiveness is associated with antisocial behaviour, conduct disorder and cognitive and developmental vulnerability (13). About two thirds (63.6%) of this sample were also diagnosed as displaying conduct disorder or oppositional defiant disorder. This is consistent with rates of conduct problems previously described (17, 20).

The syndrome of ADHD encompasses a broad range of symptoms, most of which may be expected to impair aspects of a child's social functioning and development. The subscale of the Autism Criteria Checklist which produced the highest mean score was 'difficulties in social interaction'. Greene et al. (11) investigated the rate of 'social disability' in children with ADHD and described 22% of their sample as 'socially disabled'. They suggested that most children with ADHD had some social disability and that there was a subgroup in whom these problems were particularly severe.

A 'lack of awareness of the feelings of others' was the most commonly reported autistic spectrum symptom in our sample. Core symptoms of ADHD, such as having difficulty waiting turn in groups, being easily distracted, having difficulty playing quietly and interrupting or intruding on others, as well as other recognized deficits (e.g., difficulty in recognizing social cues) would be expected to produce this. These and other symptoms of ADHD would also produce the second most common reported autistic characteristic, which was 'having difficulty forming relationships'. 'Difficulty in knowing how to begin or sustain conversation' can also be readily explained by the symptoms of ADHD. A 'lack of desire to interact with others', which also occurred frequently, may reflect difficulties the parents had in distinguishing between a lack of desire and a lack of ability to interact. On the other hand, it may represent a distinct symptom of autism, which occurs commonly in ADHD.

The remaining symptoms of the Autism Criteria Checklist would not be expected to occur in subjects with ADHD as a direct consequence of the symptoms of the latter. However, high frequencies of 'stereotyped hand and body movements', 'problems in nonverbal communication' (such as poor eye contact, placing others' hands on things the child wants, failure to greet others, problems in observing others' personal space), and 'odd forms of speech' (such as repetitions of own phrases or others' speech, frequent use of irrelevant remarks, pronoun reversal, and made up words or phrases), were also reported in our sample.

In describing the DAMP syndrome (7), Gillberg has commented that the autistic spectrum symptoms which are often present are motor stereotypies, peculiarities of language (pronoun reversal, immaturities of grammar,

and abnormalities in the production of speech), and problems with nonverbal communication. He also comments on preoccupation with certain topics, objects, or parts of objects. This was not reported so commonly in our sample, but was still present in between a third to a half of our children with ADHD. This study has shown that symptoms of autistic spectrum disorders occur commonly among referred children diagnosed as suffering from ADHD. Those symptoms which occur most frequently can either be explained by the core symptoms of ADHD itself, or are the same as those which Gillberg has observed in children with DAMP.

This has implications for the assessment and treatment of children with these disorders. Children who are recognized as suffering from ADHD should also be assessed for the presence of symptoms of the autistic spectrum and, when appropriate, should receive a dual diagnosis and appropriate treatment. The findings, for example, raise questions whether clinicians often adopt a hierarchical diagnostic model or do not consider the diagnosis of pervasive developmental disorders in the presence of longstanding behavioural problems or

symptoms of hyperactivity-attention deficit. Instruments which are intended to be used to assess these disorders should take account of the features which they have in common and those that perhaps distinguish them. It may also have implications for the classification of these disorders, as Gillberg has suggested (8). The relationship between autistic spectrum disorders, particularly Asperger's syndrome, DAMP and ADHD needs further investigation. These findings need to be replicated and compared with control groups such as children without ADHD, conduct disorder without ADHD, and specific language delay. Population studies of the rates of hyperactivity and autistic symptoms would also be instructive. Longitudinal research could investigate whether certain 'autistic' features in ADHD improve following pharmacological or other types of treatment.

Acknowledgements We are grateful to all parents who participated in this study, to Dr. Patricia Howlin for her permission and information on the Autism Criteria Checklist, and to Dr. L. Winkley for her permission to contact her patients.

References

1. American Psychiatric Association (1994) *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. Washington DC: APA
2. Cantwell D, Satterfield J (1973) The prevalence of academic underachievement in hyperactive children. *Journal of Paediatric Psychology* 3:163-171
3. Danforth JS, Du Paul GJ (1996) Interrater reliability of teacher rating scales for children with attention deficit hyperactivity disorder. *Journal of Psychopathology and Behavioural Assessment* 18:227-237
4. Du Paul G (1991) Parent and teacher ratings of ADHD symptoms: Psychometric properties in a community-based sample. *Journal of Clinical Child Psychology* 20:245-253
5. Ehlers S, Nyden A, Gillberg C, Dahlgren Sandberg A, Dahlgren S, Hjelmquist E, Oden A (1997) Asperger syndrome, autism and attention disorders: A comparative study of the cognitive profiles of 120 children. *Journal of Child Psychology and Psychiatry* 38:207-217
6. Gillberg C (1992) Autism and autistic-like conditions: Subclasses among disorders of empathy. *Journal of Child Psychology and Psychiatry* 33:813-842
7. Gillberg C (1995) *Clinical Child Neuropsychiatry*. Cambridge: Cambridge University Press
8. Gillberg IC, Gillberg C (1989a) Asperger syndrome: Some epidemiological considerations. *Journal of Child Psychology and Psychiatry* 30:631-638
9. Gillberg IC, Gillberg C (1989b) Children with preschool minor neurodevelopmental disorders: IV. Behaviour and school achievement at age 13. *Developmental Medicine and Child Neurology* 31:3-13
10. Gillberg C, Rasmussen P, Carlstrom G, Svenson B, Waldenstrom E (1982) Perceptual, motor and attentional deficits in six year old children: Epidemiological aspects. *Journal of Child Psychology and Psychiatry* 23:131-144
11. Greene RW, Biederman J, Faraone SV, Ouellette CA, Penn C, Griffin SM (1996) Toward a new psychometric definition of social disability in children with attention-deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry* 35:571-578
12. Lambert N, Sandoval J (1980) The prevalence of learning disabilities in a sample of children considered hyperactive. *Journal of Abnormal Child Psychology* 8:33-50
13. McArdle P, O'Brien G, Kolvin I (1995) Hyperactivity: Prevalence and relationship with conduct disorder. *Journal of Child Psychology and Psychiatry* 36:279-303
14. Rutter M, Yule W (1994) Reading Difficulties. In: Rutter M, Taylor E, Hersov L (Eds.) *Child and Adolescent Psychiatry: Modern Approaches*, Third Edition. Oxford: Blackwell Scientific Publications
15. Sandberg S (1996) Hyperkinetic or attention deficit disorder. *British Journal of Psychiatry* 169:10-17
16. Sandberg S, Rutter M, Taylor E (1978) Hyperkinetic disorder in psychiatric clinic attenders. *Developmental Medicine and Child Neurology* 20:279-299
17. Sandberg S, Wieselberg M, Schaffer D (1980) Hyperkinetic and conduct problem children in a primary school population: Some epidemiological considerations. *Journal of Child Psychology and Psychiatry* 21:293-311
18. Schacher R, Tannock R (1995) Test of four hypotheses for the comorbidity of attention deficit hyperactivity disorder and conduct disorder. *Journal of the American Academy of Child and Adolescent Psychiatry* 34:639-648
19. Semrud-Clikeman M, Biederman J, Sprich-Buckminster S, Lehman B, Faraone S, Norman D (1992) Comorbidity between ADDH and learning disability: A review and report in a clinically referred sample. *Journal of the American Academy of Child and Adolescent Psychiatry* 31:439-448
20. Szatmari P, Offord D, Boyle M (1989) Ontario Health Study: prevalence of attention disorder with hyperactivity. *Journal of Child Psychology and Psychiatry* 30:219-230

21. Taylor E, Schachar R, Thorley G, Wieselberg M (1986) Conduct disorder and hyperactivity: I. Separation of hyperactivity and antisocial conduct in British child psychiatric patients. *British Journal of Psychiatry* 149:760–777
22. Vostanis P, Smith B, Corbett J, Sungum-Paliwal R, Edwards A, Gingell K, Golding R, Moore A, Williams J. Parental concerns of early development in children with autism and related disorders. *Autism*, in press (✉)
23. World Health Organization (1992) *The ICD 10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organization