Journal of Autism and Developmental Disorders, Vol. 26, No. 5, 1996

Changing Criteria of Autistic Disorders: A Comparison of the ICD-10 Research Criteria and DSM-IV with DSM-III-R, CARS, and ABC

Eili Sponheim[1]
National Centre for Child and Adolescent Psychiatry, Oslo

Revised versions of diagnostic manuals, the International Classification of Diseases (ICD-10), and the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) all operate with several subgroups in the autistic spectrum. Five of the subgroups are identical in the two manuals, but ICD-10 contains five in addition. 132 children were diagnosed using ICD-10, DSM-IV, DSM-III-R, the Childhood Autism Rating Scale (CARS), and the Autistic Behavior Checklist (ABC). Five out of ten alternative subgroups of Pervasive Developmental Disorders (PDD) were identified in a population of developmentally impaired children. These subgroups were the same in the two manuals; the additional ones in ICD-10 were not identified. With the exception of the groups Disintegrative Disorder and Rett syndrome, significant differences were found between all the subgroups within the PDD spectrum and between the PDD group and the non-PDD group. Some problems connected with the guidelines in the ICD-10 manual are discussed.

It is argued that autism is the best validated diagnosis in child psychiatry (Rutter & Schopler, 1988). Ever since Kanner's first description in 1943 (Kanner, 1943), there has been agreement on the core symptoms. Since then the concept has been broadened (Gillberg, 1992). Similarities between autism and other developmental disturbances in mentally retarded children have been demonstrated (Wing & Gould, 1979), as well as between autism and those fitting the description of Asperger syndrome (Wing, 1981).

[1]Address all correspondence to Eili Sponheim, National Centre for Child and Adolescent Psychiatry, Sognsvannsvn. 53-67, Pb. 26, Vinderen, 0319 Oslo, Norway.

0162-3257/96/1000-0513$09.50/0

There has been a need for better differentiation within this spectrum of autistic disorders. Since 1980, autism has been classified in DSM-III (American Psychiatric Association [APA], 1980) under Pervasive Developmental Disorder (PDD), but as the only specified category in that spectrum. This definition turned out to be more restricted than the next version, DSM-III-R (APA, 1987), which tended to overdiagnose the condition compared to clinical diagnosis (Volkmar, Cicchetti, Bregman, & Cohen, 1992).

DSM-IV (APA, 1994), ICD-10 Clinical Descriptions (World Health Organization [WHO], 1992), and ICD-10 Diagnostic Criteria for Research (WHO, 1993) have divided PDD into several subgroups. The manuals differ regarding the atypical groups. Both versions of ICD-10 divide atypical autism into several groups while DSM-IV operates with only one group (Table I). These classification systems will form the basis for the diagnostic practice in research and clinical use for the years to come. It is therefore important to evaluate the newly operationalized subgroups. This can be done by comparing the new classification systems with other well-established instruments used to diagnose autism and related disorders in the PDD spectrum.

The aim of this study is to compare childhood autism/autistic disorder as it is defined by ICD-10 and DSM-IV with other well-established diagnostic instruments, and to see if new groups in the PDD spectrum can be confirmed by other diagnostic instruments. The study took place in 1990–1992.

MATERIAL AND METHODS

Subjects

The children were collected from two sources: (a) All children admitted to three different pediatric wards[2] in the Oslo region were referred consecutively when autism was suspected (n = 62). (b) Children from a prevalence study on autism in a county surrounding Oslo (Akershus) in the same period (n = 70). The children were identified through the health care system. The two groups were similar as regards age, sex ratio, and level of intelligence, and are therefore dealt with as a single group (Table II). The age range was 0.9–16.6 years (M = 7.1, Mdn = 6.4).

[2]National Hospital, National Centre for Child and Adolescent Psychiatry, and Norwegian Centre for Epilepsy.

Table I. Pervasive Developmental Disorders

ICD-10 research	ICD-10 clinical	DSM-III-R	DSM-IV
F84.0 Childhood autism	Same	299.00 Autistic disorder	299.00 Autistic disorder
F84.1 Atypical autism	Same	299.80 Pervasive Developmental Disorder-NOS	299.80 Pervasive Developmental Disorder-NOS
.10 Atypical in age of onset	Included in F84.1	Not specified	Included in PDDNOS
.11 Atypicality in symptomatlogy	Included in F84.1	Not specified	Included in PDDNOS
.12 Atypicality in both age of onset and symptomatology	Included in F84.1	Not specified	Included in PDDNOS
F84.2 Rett syndrome	Same	Not included	299.80 Rett Disorder
F84.3 Other childhood disintegrative disorder	Same	Not specified	299.10 Childhood Disintegrative Disorder
F84.4 Overactive disorder associated with mental retardation and stereotyped movements	Same	Not included	Not included
F84.5 Asperger syndrome	Same	Not included	299.80 Asperger Disorder
F84.8 Other pervasive developmental disorder	Same	Not specified	Not specified
F84.9 Pervasive developmental disorder, unspecified	Same	Not specified	Not specified

Table II. Subject Characteristics[a]

			Age				IQ level (%)		
	n	%[b]	*M*	*SD*	Boy/girl (ratio)		Norm	50–70	<50
PDD	82	62.1	7.8	4.0	52/30	1.7	28	20	52
Autism	56	42.4	7.2	3.8	38/18	2.1	16	20	64
Aitypical	10	7.6	6.0	3.5	4/6	0.7	10	40	50
Dsint.	2	1.5	9.1	1.6	1/1	1.0		50	50
Rett	1	0.8	2.7		0/1				100
Asperger[c]	13	9.8	11.7	3.3	9/4	2.3	100		
Non-PDD[d]	50	37.9	5.9	3.9	31/19	1.6	50	34	16

[a]ICD-10 diagnoses.
[b]% of the total population (N = 132 = 100%).
[c]Significantly different from all the other subgroups according to level of IQ ($p < .001$).
[d]Specific developmental disorder of speech and language (10), Reactive attachment disorder (7), Hyperkinetic disorder (3), Emotional disorders (15), Conduct disorder (1), Obsessive-compulsive disorder (1).

Procedure

In this study, a draft of the ICD-10 version of research criteria (WHO, 1989) has been used systematically in the diagnostic assessment of 132 children, all suspected of autism. The draft was recoded into the last version of ICD-10 (WHO, 1993) and into DSM-IV. The children were also assessed by DSM-III-R, the Childhood Autism Rating Scale (CARS; Schopler, Reichler, De Vellis, & Daly, 1980), and the Autistic Behavior Checklist (ABC; Krug, Arick, & Almond, 1980). Each child was observed for 1 to 3 hours by the author, who also interviewed the parents thoroughly, covering the developmental history of the child. A study of interrater reliability of the diagnostic ratings was performed on 20% of the children. The overall agreement between the raters was satisfactory (kappa = .7). The highest agreement was obtained by ICD-10 (kappa = .88).

The author (first rater) and the second rater in the reliability study were experienced clinicians in general child and adolescent psychiatry. Both clinicians had been working especially with developmentally disturbed children and children with autism. They were familiar with both classification systems and the instruments used. Assessments were completed in the following order: ICD-10, DSM-III-R, the ABC, and the CARS.

Instruments

Estimates of level of intelligence were based on all available information (Leiter, WISC-R, Vineland score, or clinical evaluation when no formal assessment was made).

ICD-10, Diagnostic Criteria for Research, April 1989 Draft. Except for some minor differences, this draft can easily be recoded into the final version of ICD-10 and into DSM-IV. One subgroup, Overactive Disorder Associated with Mental Retardation and Stereotyped Movements, was not operationalized in the draft version. Two additional groups, Other Pervasive Developmental Disorders and Pervasive Developmental Disorder, Unspecified, are only included in the final version of ICD, but not operationalized.

ICD-10 Diagnostic Criteria for Research. The final version of ICD-10 deviates from the 1989 draft by fewer numbers of subitems in each of the three main areas of symptomatology (social interaction, communication, and restricted behavior). The phrasing of the remaining items are identical in the draft and in the final version. The exclusion criteria and the developmental dimension are also the same. Rett syndrome is the only specified subgroup within the PDD spectrum that rules out childhood autism. In this study, Asperger syndrome and Disintegrative Disorder are also dealt with in the same way as Rett syndrome: If the criteria for these subgroups were fulfilled, other subgroups of PDD are not coded. Children who fulfilled all the criteria except for mental retardation as a possible exclusion criterion, are coded as childhood autism in this study. However, those with IQ levels lower than 20 are looked at separately.

DSM-IV divides PDD into five subgroups (Autistic Disorder, Rett Disorder, Childhood Disintegrative Disorder, Asperger Disorder, and PDDNOS). Apart from PDDNOS, these subgroups are identical to corresponding subgroups in ICD-10. PDDNOS includes all the five existing atypical forms in the ICD-10 research version (only three in the clinical version). Overactive Disorder associated with mental retardation and stereotyped movements in the ICD-10 is not included in DSM-IV.

DSM-III-R divides PDD into two separate categories, Autistic Disorder (AD) and PDDNOS. The description of the latter category is arbitrary, and includes all atypical forms without precise guidelines for the boundaries.

CARS is a well-established instrument for assessment for autism. Reliability and validity have been documented as satisfying in several studies (Garfin, McCallon, & Cox, 1988; Schopler et al., 1980; Sevin et al., 1991).

The instrument defines 15 areas, and the child is rated in each of these from 1.0 (*normal*) to 4.0 (*severely impaired*). The score classifies the child as not autistic (below 30), mildly to moderately autistic (30–36), or severely autistic (above 36). In this study a score of 30 or higher was used as threshold for classifying the children as having autism. The child was rated by the author after 1–3 hours of observation.

ABC is another well-established questionnaire for assessment of autism. The instrument consists of 57 statements each given a predetermined weight. All statements that are applicable to the child are added and a score is obtained. In this study the ABC was filled out at the end of the parent interview by the author. A score of 67 or above was used as the threshold for a diagnosis of autism. Studies of reliability and validity have been performed (Krug et al., 1980; Volkmar et al., 1988; Yirmiya, Sigman, & Freeman, 1994). The outcome seemed to depend on the procedure. If parents were informants and positive symptoms recollected from earlier years were rated and added, the validity of this instrument was documented to be satisfactory. In this study this procedure was followed.

Statistics

In comparing groups on continuous scales, one-way analysis of variance (Bonferroni) was used. Groups consisting of only one or two cases were excluded in this procedure. In comparing groups by ordinal variables (categories of IQ levels) Kruskal-Wallis and Wilcoxon Rank Sum Test (Mann Whitney U Test) were used.

Ethics

Informed consent was obtained from the families. The procedures were approved by the Regional Committee of Ethics and by the Norwegian Data Inspectorate.

RESULTS

The overall agreement between the diagnostic instruments ICD-10 and DSM-III-R was high (Table III). Classification into the two main categories PDD and non-PDD had a kappa agreement of .84, and in classifying into childhood autism/autistic disorder and other forms of developmental disorders, a kappa of .81. ICD-10 classified fewer patients as childhood autism compared with DSM-III-R, but a higher number of cases as PDD

Table III. Classification of Childhood Autism and PDD According to ICD-10, DSM-III-R, CARS, and ABC

	Childhood autism			PDD		
	n	%[a]	Kappa[b]	*n*	%[a]	Kappa
ICD-10	56	42.4	1.0	82	62.1	1.0
DSM-III-R	58	43.9	0.81	78	59.1	0.84
CARS[c]	54	40.9	0.83			
ABC[d]	46	34.8	0.69			

[a]$N = 132$.
[b]Agreement with ICD-10 classification.
[c]Threshold = 30.
[d]Threshold = 67.

than DSM-III-R. Disintegrative disorder was classified as an AD in DSM-III-R. Both Asperger syndrome and atypical autism according to ICD-10 were unsystematically classified by DSM-III-R, either as AD or as PDDNOS or as non-PDD. Three cases were classified as non-PDD according to ICD-10, while DSM-III-R classified these as PDDNOS. The reason for this was the specific exclusion criterion in ICD-10. None were classified as atypical in age of onset with or without atypicality in symptomatology (F84.10 and F84.12). Nor were any cases identified as overactive disorder (F84.3), other PDD (F84.8) or PDD unspecified (F84.9). Thus, the number of subgroups in this study was identical to DSM-IV, operating with only one atypical group (PDDNOS). Consequently, all the data from the ICD-10 codings could be recoded to the DSM-IV with a 100% agreement.

When comparing subgroups in ICD-10 with the CARS ratings, only childhood autism and disintegrative disorder were rated in the autistic range above 30 (Table IV). There were significant differences ($p < .05$) between childhood autism and all the other subgroups in the PDD range (except Rett syndrome) and the non-PDD group. The Rett syndrome consisted of 1 case only and the level of significance could not be rated (no variance), but this case fell below the CARS cutoff score of 30 and was rated as not autistic. Significant differences were found between the atypical autism and non-PDD, but not between non-PDD and Asperger syndrome, nor between Asperger syndrome, nor between Asperger syndrome and atypical autism. This indicates that Asperger syndrome falls between these two groups.

When comparing subgroups of ICD-10 with ABC scores, almost the same was demonstrated as with CARS. Using ABC, significant difference was also documented between Asperger syndrome and non-PDD. ABC did

Table IV. Comparisons Between ICD-10 PDD Subgroups and Non-PDD by CARS and ABC[a]

	Childhood autism (A)	Atypical autism (atA)	Disintegrative disorder (dis)	Rett syndrome (RS)	Asperger syndrome (AS)	Non-PDD (non)	Group comparisons ($p < .05$)
CARS							
M	35.6	29.4	39.5	29.0	25.8	22.9	A > atA & AS & non; atA > non
SD	4.6	6.7	3.5		4.2	4.3	
ABC							
M	75.0	52.9	71.0	12.0	50.4	32.8	A > atA & AS & non; atA > non; AS > non
SD	18.6	13.0			22.0	17.8	

[a]One-way analysis of variance (Bonferroni) between childhood autism, atypical autism, Asperger syndrome, and non-PDD.

not distinguish between cases with and without childhood autism as well as CARS (see Tables III and IV). Use of 67 as cutoff for autism resulted in a high number of false negatives. The same is documented in other studies (Volkmar et al., 1988). Childhood autism and disintegrative disorder were however both rated in the same range with mean values above 67 (Disintegrative Disorder consisted of only 1 case, but this case was rated above 67). Disintegrative Disorder and Rett syndrome consisted of only 1 rated case by ABC and therefore no level of significance could be rated with these subgroups using ABC.

When comparing levels of intelligence (see Table II), Asperger syndrome differed significantly from the other subgroups including non-PDD. Exclusion of the autistic children with IQ 20 did not alter these findings, either by comparing the ICD-10 with DSM-III-R, or by comparing ICD-10 with CARS or ABC.

Only one subgroup, Rett syndrome, could be validated by a somatic clinical procedure. In addition to the 1 girl diagnosed as Rett syndrome by ICD-10, there were 2 other girls in the study population who were given this diagnosis by a pediatric neurologist. The 2 additional girls fulfilled the criteria of Childhood Autism by ICD-10, and AD and PDDNOS, respectively, by DSM-III-R. The age range of these three girls was 2.5–6 years.

DISCUSSION

Childhood Autism is the main subgroup in the PDD spectrum. The overall agreement between ICD-10, DSM-IV, DSM-III-R, CARS, and ABC on the characteristics of this group is high. Other well-established diagnostic instruments can demonstrate significant differences between Childhood Autism and Non-PDD Disorders in Childhood and the other subgroups in the PDD spectrum apart from Disintegrative Disorder and Rett syndrome. Because of the small numbers in the disintegrative and Rett groups, only tentative conclusions can be drawn here. The developmental history of the disintegrative group clearly separates this group from childhood autism. However, using these instruments, the groups could not be separated by current status description alone.

With regard to a somatic diagnosis of Rett syndrome, the findings in this study indicate that the sensitivity of the ICD-10 (Classification of Mental and Behavioral Disorders) is low as a diagnostic instrument for this subgroup. Another explanation could be the fact that Rett syndrome can appear with and without autism, a well-known finding in other neurological disorders such as tuberous sclerosis. Rett syndrome is a disorder with varying behavioral and phenomenological symptomatology at different stages

of the disorder, and autism is often diagnosed in the early years (Gillberg, 1987; Hagberg & Skjeldal, 1994). Rett syndrome results in severe impairment, both physical and behavioral. When arguing that Rett syndrome is a subgroup of PDD (Rutter & Schopler, 1992; Tsai, 1992), the physical problems in this group seem to be underestimated. These children are probably in need of the service of both neurology and psychiatry and the classification system ought to reflect this reality. To code Rett syndrome as a neurological disorder would permit an additional classification of the specific behavioral characteristics and the possibility of describing a more precise behavioral phenotype associated with this disorder. (The same argumentation could be applied to disintegrative disorder.)

Those fulfilling the criteria of Asperger syndrome according to ICD-10 could also be coded either as atypical in symptomatology and in age of onset or, in some cases, as childhood autism, because Asperger syndrome is not mentioned as one of the exclusion criteria for these groups. This might lead to varying diagnostic practices and to problems, especially in research. Asperger syndrome fell into the same range as atypical autism using CARS and ABC. ABC rated Asperger syndrome within the PDD spectrum significantly different from non-PDD, whereas CARS did not differentiate Asperger syndrome from non-PDD. Both CARS and ABC were developed before the concept of Asperger syndrome was introduced as part of the PDD spectrum. Consequently, these instruments would not be expected to differentiate Asperger syndrome clearly from non-PDD. Level of intelligence distinguished this syndrome from all the other groups including non-PDD.

In the ICD-10 research version, atypical autism is subdivided into three specified groups and two unspecified groups (Other PDD and PDD unspecified). In this study, the group, "atypicality in symptomatology," was the only one identified. "Atypicality in age of onset" and "atypicality in age of onset and in symptomatology" were not coded because the patients who might have fitted were classified into other subgroups (disintegrative and Asperger). Nor was Overactive disorder associated with mental retardation and stereotyped movements identified in this population. This study is therefore in favor of the DSM-IV classification according to number of subgroups operating with only one atypical group, PDDNOS, which includes all the atypical forms. On the other hand, only children and adolescents were included in this study. Residual states of autism are more probably seen among adults. These might have been missed in this study and it can be argued that this group should be differentiated from the atypical forms.

The overall proportion of girls is high in this population compared to other studies. The proportion of severely retarded is also high. This in-

dicates a population skew towards the more severely affected and in this population "overactive disorder associated with mental retardation and stereotyped movements" would be expected to be found. The fact that it is not might be an artifact due to the method: The draft did not include precise descriptions of this subgroup resulting in incomplete case histories that did not allow coding of this group retrospectively. Another explanation is that this group is poorly defined and in fact does not reflect a well-defined group within the spectrum.

The findings can only be tentative as regards the relative numbers of cases within the individual subgroups. Approximately half the population was clinical and therefore probably not representative of the total PDD spectrum. The other half of the prevalence study might have missed cases with Asperger syndrome because the health care system only identified children. Children with Asperger syndrome are more likely to be identified within the school system.

Only one clinician performed all the diagnostic ratings in this study. This might have led to a higher degree of agreement between the different instruments, especially between the ICD-10 and the DSM-III-R because of the similarities between the two. However, the high interrater agreements support the reliability of the diagnostic ratings. The trends in the study are the same as findings from previous studies. PDD as defined by ICD-10 has been expected to include more cases than other classification systems because of the broadening of the concept by including Asperger syndrome (Rutter & Schopler, 1992). DSM-III-R is documented to overinclude cases as autistic disorder compared to clinical judgment, whereas ICD-10 is closer to the general clinical view of autism (Volkmar et al., 1992).

CONCLUSION

This study demonstrates that ICD-10 and DSM-IV have a high overall agreement with other well-established instruments both in differentiating the PDD group from the non-PDD group and in differentiating childhood autism/autistic disorder from other subgroups in the PDD spectrum. ICD-10 tends to classify less cases as childhood autism than DSM-III-R as it is more precise in the differentiation between childhood autism, disintegrative disorder, Asperger syndrome, and atypical autism. On the other hand, ICD-10 tends to include a higher number within the range of PDD. Apart from disintegrative disorder and Rett syndrome, significant differences between the identified subgroups could be estimated by the means of other well-established instruments and by levels of intelligence. Disintegrative disorder can only be differentiated from childhood autism by the developmental his-

tory. There is a need for more precise guidelines in the use of the exclusion criteria to prevent variability in diagnostic practice. The findings suggest that Rett syndrome should be coded as a neurological disorder, thus allowing more precise additional coding of the specific behavioral characteristics. Only five subgroups were identified. The findings give support to the DSM-IV and the clinical version of ICD-10 in operating with more restrictive numbers of groups for atypical forms.

REFERENCES

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Garfin, D., McCallon, D., & Cox, R. (1988). Validity and reliability of Childhood Autism Rating Scale with autistic adolescents. *Journal of Autism and Developmental Disorders, 18,* 367-378.

Gillberg, C. (1987). Autistic syndrome in Rett syndrome: The first two years according to mother reports. *Brain Development, 9,* 499-501.

Gillberg, C. L. (1992). Autism and autistic-like conditions: Sub-classes among disorders of empathy. *Journal of Child Psychology and Psychiatry, 33,* 813-842.

Hagberg, B. A., & Skjeldal, O. H. (1994). Rett variants: A suggested model for inclusion criteria. *Paediatric Neurology, 11,* 5-11.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child, 2,* 217-230.

Krug, D. A., Arick, J., & Almond, P. (1980). Behavior checklist for identifying severely handicapped individuals with high levels of autistic behavior. *Journal of Child Psychology and Psychiatry, 21,* 221-229.

Rutter, M., & Schopler, E. (1988). Autism and pervasive developmental disorders. In M. Rutter, A. H. Tuma, & I. S. Lann (Eds.), *Assessment and diagnosis in child psychopathology* (pp. 408-434). New York: Guilford.

Rutter, M., & Schopler, E. (1992). Classification of pervasive developmental disorders: Some concepts and practical considerations. *Journal of Autism and Developmental Disorders, 22,* 459-481.

Schopler, E., Reichler, R. J., DeVellis, R., & Daly, K. (1980). Toward objective classification of childhood autism: Childhood Autism Rating Scale (CARS). *Journal of Autism and Developmental Disorders, 10,* 91-102.

Sevin, J. A., Matson, J. L., Coe, D. A., Fee, V. E., & Sevin, B. M. (1991). A comparison and evaluation of three commonly used autism scales. *Journal of Autism and Developmental Disorders, 21,* 417-432.

Tsai, L. Y. (1992). Is Rett syndrome a subtype of Pervasive Developmental Disorders? *Journal of Autism and Developmental Disorders, 22,* 551-561.

Volkmar, F. R., Cicchetti, D. V., Dykens, E., Sparrow, S. S., Leckman, J. F., & Cohen, D. J. (1988). An evaluation of the Autism Behavior Checklist. *Journal of Autism and Developmental Disorders, 18,* 81-97.

Volkmar, F. R., Cicchetti, D. V., Bregman, J., & Cohen, D. J. (1992). Three diagnostic systems for Autism: DSM-III, DSM-III-R, and ICD-10. *Journal of Autism and Developmental Disorders, 22,* 483-492.

Wing, L. (1981). Asperger's syndrome: A clinical account. *Psychological Medicine, 11,* 115-129.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: Epidemiology and classification. *Journal of Autism and Developmental Disorders, 9,* 11-29.

World Health Organization. (1989). *International classification of diseases* (10th ed., draft of Chap. 5: Mental and behavioral disorders). *Diagnostic criteria for research.* Geneva: Author.

World Health Organization. (1992). *The ICD-10 classification of mental and behavioral disorders: Clinical descriptions and diagnostic guidelines.* Geneva: Author.

World Health Organization. (1993). *The ICD-10 classification of mental and behavioral disorders: Diagnostic criteria for research.* Geneva: Author.

Yrmiya, N., Sigman, M., & Freeman, B. J. (1994). Comparison between diagnostic instruments for identifying high-functioning children with autism. *Journal of Autism and Developmental Disorders, 24,* 281-291.