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AN EVALUATION OF THE VALIDITY OF THE DIAGNOSTIC CATEGORY OF ATTENTION DEFICIT DISORDER

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Attention Deficit Disorder (ADD) replaced Hyperkinetic Reaction of Childhood as a category in DSM-III. *This study evaluates the validity of the new terminology by determining whether clinical diagnoses of ADD could be predicted from scores on a number of widely used psychometric and behavioral instruments. Results suggest that ADD is an inadequately specified category. Some implications of this finding are considered.*

The 1980 revision of the American Psychiatric Association's *Diagnostic and Statistical Manual (DSM-III)*[1] was intended to improve the precision with which psychiatric diagnoses could be made by clinicians. Involved in this revision was the rethinking and redesign of the nosological system used by American psychiatrists and other clinicians concerned with mental health and illness. The redesign was based on a number of practical and theoretical considerations. The status of a number of syndromes and forms of behavior recognized as disorders in earlier editions of the *DSM* was reconsidered. Some were reclassified, others were no longer considered to be psychiatric illnesses. In addition, some types of behavior that had not previously been defined as hallmarks of psychiatric disorders were formally included in *DSM-III*-defined illnesses.[1]

Perhaps the most frequently diagnosed childhood psychiatric disorder during the past two decades has been hyperactivity. For a number of reasons the disorder formerly called Hyperkinetic Reaction of Childhood in *DSM-II* was redefined in *DSM-III* as Attention Deficit Disorder. This disorder has two types: ADD with hyperactivity (ADDH), and ADD without hyperactivity (ADD). The adequacy of this refinement has not been widely or rigorously evaluated.[40,51]

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sometimes underemphasized in clinical research).

Patients who commit suicide are usually not in ongoing treatment with mental health professionals. These patients, however, have frequently been seen by someone in the health care system, at which point an opportunity for intervention existed.[10] Family history of illness is part of the routine examination carried out by health workers who are likely to have contacts with patients in the community. Our data suggest that the routine evaluation of the family history of adolescents who are at risk for suicide attempts should give special attention to a history of psychiatric illness generally, and particularly to chronic depression occurring in a parent during specific phases of a patient's childhood. Moreover, in the evaluation of adults, the children of those found to suffer from chronic depression would appear to be a population for whom early intervention might help to diminish the likelihood of attempted suicide.

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The purpose of this research was to determine if clinicians' diagnostic determinations of whether children were ADD or ADDH could be predicted reliably by a combination of children's scores on a number of standard psychometric tests, measures of achievement, ratings of behavior by parents and teachers, all of which had been widely used to distinguish hyperactive from normal children, and parents' responses to questionnaires about family life and their own mental health.

Hyperactivity is a significant focus of study not only because it is a fairly widely diagnosed condition, but also because children so diagnosed often experience other significant problems.[3] Thus, these children are more often characterized as "difficult" because they are frequently more aggressive than nonhyperactive children, or "disruptive" because they engage in "excessive vocal noises" that disrupt ongoing social activities. Risk-taking behavior of hyperactive children appears to exceed that of nonhyperactive children and is often associated with an increase in physical mishaps (like scrapes and bruises, broken bones, and general accidents). Although generally not scoring significantly lower on intelligence tests, especially individually administered tests,[22] than matched controls, hyperactive children tend to be academic underachievers;[11] the risk of school failure is two to three times greater for hyperactive than nonhyperative children.

In general, hyperactive children are thought to exhibit three types of problems which result in referral for treatment.[44] They tend to have problems in academic learning which result in school failure. They have difficulty relating to their peers. They have difficulty complying with adult requests and commands.[4,48]

Although clinicians and researchers view hyperactivity as consisting of behavior characteristic of a relatively large group of troubled children, the etiology of the disorder is not well known. In fact, the changes in the diagnostic labels applied to these children (for example, from Minimal Brain Damaged, to Hyperactive, and now to Attention Deficit Disorder with hyperactivity) reflect the shifting consensus about etiology.

That multiple etiologies might lead to the same behavioral syndrome in different children, and that children labeled hyperactive might therefore be a very heterogeneous group, has been recognized in the last decade.[6,15,22,56] In fact, the predominant clinical and research premise had been that hyperactive children form a homogeneous group, and that this group could better be understood when systematic and consistent differences between it and normal children were detailed.[41,54,55]

In the tradition of research that seeks to characterize the differences between normal and hyperactive children is the work of Homatidis and Konstantreas.[32] They sought to discriminate normal from hyperactive children by applying discriminant analysis to the scores of 13 diagnosed hyperactive and 13 normal boys on a number of measures used extensively in research and clinical decision-making. The results of their study demonstrated that only nine of the 27 well-used measures they considered had the potential to discriminate between the groups. Accurate classification into hyperactive or normal groups

could be made using only three of these measures. These results were consistent with those reported in earlier research. Homatidis and Konstantreas cautioned that because their sample of hyperactives came from a very special population (children excluded from the school system), because they excluded parent and teacher rating scales, and because the three best discriminating measures they described may not be specific for hyperactivity, their results should be treated as tentative. As they further suggested in their study, finding the set of best discriminators among normal, hyperactive, and other problem children (such as learning disabled, delinquent, or schizophrenic children) would help reduce the heterogeneity of samples used in research, and might help account for earlier contradictory findings.

Recognizing the heterogeneity of the class of children diagnosed as hyperactive, Douglas[22,23,26] argued that common to these children was not only or mainly that they displayed an activity level greater than other children, but that

> . . . hyperactivity is only one of a constellation of critical symptoms [and that] it may be just as important to consider the quality of the hyperactive child's behavior as its quantity.[22] (p. 260)

The qualities of these children's behavior that Douglas[22–25] identified as important were the inability to sustain attention and to control impulsivity. It followed that the lack of agreement about the etiology of such behavior and about the appropriate intervention with these children might be resolved if this class of children were partitioned into more homogeneous subclasses: better sorting of these children would be valuable for research purposes and also for purposes of differential diagnosis and intervention.

DSM-III incorporates this view in its revision of the *DSM-II* category of Hyperkinetic Reaction of Childhood into the category of Attention Deficit Disorder. Attention Deficit Disorder is characterized as a syndrome in which children display developmentally inappropriate behavior in the control of attention, impulsivity, and, sometimes, activity level. The syndrome is characterized as involving four core symptoms: *1)* distractibility; *2)* excitability; *3)* impulsivity; and *4)* excessive activity in settings where such behavior is inappropriate. The category of Attention Deficit Disorder thus incorporates within it those disorders previously labeled at various times "minimal brain dysfunction," "minimal brain damage," "specific learning disability," "hyperkinetic syndrome," "hyperkinetic reaction of childhood," and "hyperactivity."[10,54]

The ADD label thus serves to partition the global diagnostic category into two more homogeneous subclasses (ADD and ADDH), and to bring clinical criteria more in line with the generally accepted research conclusion that the global category includes within it children with a number of etiologies and syndromes.[17,31,56]

During the development and field-testing of the revised diagnostic categories that make up *DSM-III*, Mattison and associates[39] conducted studies of the interrater agreement of clinicians in the diagnosis of childhood psychiatric disorders. They reported that, in cases where children showed the behavioral syndrome characterizing ADD, raters showed slightly better agreement in diagnosis using the *DSM-III* system

than using the *DSM-II* system. Overall, they reported that interrater agreement on clinical childhood psychiatric syndromes was 54%. For ADD and ADDH specifically, interrater agreement was 30% and 75%, respectively.[12] It is important to note that these reports of interrater agreement are made in crude percentage of agreement.

A later study by Russell *et al*[47] assessed the usefulness of *DSM-III* for clinical practice in child psychiatry. The results indicated

> . . . the usefulness of the new system in general clinical situations and suggest that the DSM-III will be accepted by a majority of practicing child psychiatrists. (p. 89)

If Russell and his colleagues are correct about the likelihood of the widespread adoption of *DSM-III* as a standard clinical tool, it is especially important to assess whether the ADD versus ADDH distinction introduced in *DSM-III* is actually an improvement for clinical purposes. Does this distinction allow clinicians to improve the validity and reliability of their differential diagnosis and treatment of children?

This general question was addressed in two recent studies. Maurer and Stewart,[40] in a study of 297 children consecutively admitted to their child psychiatric clinic, found that 166 met the criteria for attention deficit. One hundred and fourteen of those children were rated as "much more active than average" by their mothers. Of the remaining 52 children, 31 met the *DSM-III* criteria for other primary diagnoses. Twenty-two children remained who possibly fit the diagnostic category of ADD. A review of clinic and hospital charts for those patients determined that 11 had other specific psychiatric disorders, one was a social isolate, and another was judged to have no clinically significant problems at home or school. Review of the records of the remaining nine children showed that they had either definite delays in development or neither developmental delay nor evidence of a diagnosable psychiatric disorder. Maurer and Stewart concluded that their

> . . . data do not support the idea of attention deficit disorder without hyperactivity as being an independent syndrome at least as defined in DSM-III. (p. 233)

The second study, conducted by Sleator and Ullman,[51] examined school achievement, teachers' ratings, amounts of stimulant medication prescribed, and duration of drug treatment for 20 children judged by a physician to be obviously hyperactive during the child's first visit to the doctor's office and for 75 children judged by the physician to be not obviously hyperactive, who were included in the study primarily because of their history and teacher ratings. Both upon entering the study and leaving treatment, the two groups were not significantly different on any of the variables examined.

Neither of these two studies used methods which allowed the estimation of interrater agreement about diagnosis, and neither examined whether clinical judgments about ADD and ADDH could be predicted using standard psychometric instruments and ratings. The research reported in this paper does this; it thus builds upon and extends the work conducted by Maurer and Stewart[40] and by Sleator and Ullman,[51] by using explicit procedures for assessing interrater agreement about diagnosis and evaluating how well these judgments

can be predicted using instruments widely used in the study of hyperactivity. Because it does not rely on the judgment of individual clinicians for the diagnosis of ADD and ADDH, and because the diagnosis is made upon the children's entry to the project (not post hoc as in the earlier two studies) it is an improvement upon the earlier work.

This study intended to assess, through the use of discriminant analysis, the degree to which children diagnosed as having Attention Deficit Disorder without hyperactivity (ADD) differ from children diagnosed as having Attention Deficit Disorder with hyperactivity (ADDH) on: *1)* a number of factors that previous research had shown to distinguish normal children from hyperactive children; and *2)* a number of additional factors which provide information about the families and parents of these children that the literature on hyperactivity[8,9] suggests may be helpful for distinguishing ADD from ADDH children. The present study had three goals: *1)* to determine the ability of each measure to classify correctly a child as ADD or ADDH; *2)* to discover the subset of all the measures considered which would be sufficient for best classifying children as ADD or ADDH; and *3)* to determine the cutoff scores for those measures for deciding on group membership.

METHOD

Data for this study were collected from audits of records and from questionnaires sent to parents of all children who participated in a therapeutic research program in a large metropolitan area. All were referred to the program by teachers, psychologists, or physicians. Before admission to the program each child was given a thorough physical examination. Those children who showed evidence of gross neurological, sensory, or motor impairment, obvious physical defects, or major disease were referred for appropriate treatment elsewhere, and were not entered into the program. Based on a subsequent interview with the staff of the program, children who had recently experienced an emotional trauma—such as the death of a parent or sibling, or the divorce of their parents—which appeared to be correlated with the onset of the behavior that originally caused them to be sent to the program, also were referred elsewhere for treatment.

Those children who remained after the physical examination and recent emotional trauma interview were entered into the program for treatment for ADD after this diagnosis was confirmed by the program staff using *DSM-III* criteria. A total of 51 children were treated in the program during the year. All 51 of these children, then, had preliminary diagnoses of ADD as defined by *DSM-III*.

Shortly after entering the program, but before treatment was begun, each child was reclassified as ADD or ADDH. This reclassification was based on the independent judgment of two clinical members of the program staff who were trained in the *DSM-III* criteria for ADDH. Raters were aware that, in order to be seen at the clinic, children had to have histories that suggested they be diagnosed as ADD. However, ratings were made in the absence of knowledge of each child's individual history. Each rater observed through a one-way mirror the behavior of each child as the child interacted with a third project staff member in a structured, classroom-like,

task-oriented setting. Raters then independently assigned the child to one of five categories indicating their judgment as to whether the child was ADD or ADDH. For diagnostic purposes assignment to *Category 4* or *5* indicated a clear judgment of ADDH, while assignment to *Category 1* or *2* indicated a clear diagnosis of ADD. For those cases in which the rater had difficulty deciding between a diagnosis of ADD and a diagnosis of ADDH assignment was made to *Category 3*. For this study, the children were sorted into three groups on the basis of their average rating ($\bar{X}$=1–2.5, ADD; $\bar{X}$=3.5–5, ADDH; $\bar{X}$=3, Undecided).

The interrater agreement of this classification was empirically determined. An indication of the upper limit of the accuracy present in ratings of a number of subjects by a number of raters into several categories can be derived from the Kappa statistic.[29] Two forms of Kappa may be derived: *1)* Kappa may be computed as a measure of specific agreement (k) between raters that a subject is a member of a particular category; and *2)* an overall Kappa ($\bar{k}$) which measures the general agreement of classification of subjects into k categories. The models from which kappa statistics are derived provide a correction for chance-expected agreement. They are thus interpretable in terms of the strength of agreement beyond chance between raters. (Kappa is realtively easily interpreted. Values $k>.75$ indicate excellent agreement beyond chance; values between $k=.40$ and $k=.75$ represent fair to good agreement beyond chance; and values $k<.40$ indicate fair to poor agreement beyond chance.) TABLE 1 displays the results of the analysis of interrater agreement for the classification of the 51 children who participated in the program. Each of these is statistically highly significant. The reliability of interrater agreement beyond chance for these judgments is fair for both the specific and overall Kappas.

It is important to note that the analysis of interrater agreement using Kappa is a conservative procedure. In order to compare these results with those obtained during the development of the *DSM-III* it is further necessary to state the interrater agreement in terms of crude percentage of agreement. The average interrater agreement found by Mattison *et al*[39] was 54%. For ADD and ADDH specifically, the percentages of agreement were 30% and 75%, respectively. By comparison, the average crude percentage of interrater agreement in the present study was 61%. The percentages of agreement for ADD and ADDH were 60% and 62.5%, respectively. *Thus, the strength of interrater*

Table 1

INTERRATER AGREEMENT: DIAGNOSIS OF ADD AND ADDH CHILDREN (N=51)

GROUP	CRUDE % AGREEMENT	κ	S.E.	z	$\bar{\kappa}$	S.E.	z
ADD	60.0	.504	.134	3.76*	—	—	—
ADDH	62.5	.374	.134	2.79*	—	—	—
Overall	61.0	—	—	—	.423	.099	4.27*

*$p<.01$.

agreement in this study falls well within the range of interrater agreement accepted as adequate during the development of the DSM-III.

The samples used in this research study were based on the results of these assignments. Five children had mean ratings of *3*. Together, they formed a group of uncertain diagnostic type. Because of its small size, this group was excluded from the statistical analysis. The remaining 46 children divided between those clearly diagnosed as ADD ($N=23$) and those clearly diagnosed as ADDH ($N=23$).

A comparison of these two samples on a number of factors that might confound the comparison of the groups was carried out. The ADD and ADDH samples did not differ significantly on any of these dimensions. The ADD sample consisted of 20 boys and three girls; the ADDH sample consisted of 19 boys and four girls. Statistical comparison of these samples showed no significant difference as a function of sex, $\chi^2=.168$, $df=1$, $p>.05$. The ADD sample contained children ranging from 62 to 147 months of age, with a mean of 106.4 months; the ADDH sample had children ranging in age from 65 to 104 months, with a mean age of 99.2 months. Statistical comparison of these data showed no significant differences between the samples: $t=1.18$, $df=44$, $p>.05$.

Medical records completed at the time of birth for each child were requested by the program from the appropriate hospitals. The relevant records for 12 ADD children and 15ADDH children were returned and available for review in the program's clinical files. All 12 ADD children and 13 of the ADDH children were classified as normal births. In each sample six children lived in single-parent households and 17 in dual-parent households.

Children's scores on two intelligence tests, the Peabody Picture Vocabulary Test (PPVT) and the Slosson Intelligence Test (SIT), were compared. On neither test did the ADD and ADDH samples differ significantly from one another. Thus, for the PPVT, ADD $\bar{X}=104.08$ and ADDH $\bar{X}=109.17$, $t=1.1193$, $df=44$, $p>.05$. For the SIT, ADD $\bar{X}=102.35$ and ADDH $\bar{X}=106.78$, $t=1.1472$, $df=44$, $p>.05$.

Instruments

The factors of interest in this study were of two general sorts. First, comparisons between ADD and ADDH samples were made on a number of variables that previous research has shown to distinguish normal children from hyperactive children. These factors are grouped in three sets of measures: attention and impulsivity measures; achievement tests; and rating scales of behavior. Second, in order to investigate the relation of hyperactivity to family context suggested by the recent research literature, a fourth set of variables was included which assessed parental mental health and family life. The four sets of measures are described in the following paragraphs. Means and standard deviations for each of the measures are presented in TABLE 2.

Attention and Impulsivity

Matching Familiar Figures Test (MFF). This test was developed to measure impulsivity. It is a visual matching task consisting of 12 items. A standard and six alternatives are presented simultaneously and the child is asked to select the item identical to the standard. Measures scored are latency to the first

Table 2

MEANS, STANDARD DEVIATIONS AND *t* TESTS FOR STUDY MEASURES

	ADD (*N*=23)		ADDH (*N*=23)		
MEASURE	$\bar{X}$	SD	$\bar{X}$	SD	*t**
Matching Familiar Figures Test					
Errors	13.26	7.51	16.17	7.73	1.30
Latency	126.83	50.09	135.39	89.09	.40
Children's Checking Task					
Omissions	29.23	20.75	33.05	20.51	.61
Commissions	10.77	15.75	15.76	29.47	.69
Total	40.00	31.15	48.81	39.29	.82
Embedded Figures Test	13.00	5.48	12.57	5.24	.27
WISC-R-Attention Concentration					
Arithmetic Subtest	8.30	1.66	8.30	3.63	0.00
Coding Subtest	35.43	11.68	37.61	15.43	.54
Digits Span Subtest	8.09	2.19	7.96	3.15	.16
Total	51.83	12.93	53.81	19.46	.42
Wide Range Achievement Test					
Arithmetic	27.62	6.06	25.22	7.47	1.16
Reading	54.62	16.68	51.96	17.65	.52
Detroit Tests					
Related Words	34.55	7.90	34.73	10.30	.07
Unrelated Words	43.41	15.13	43.26	15.73	.03
Letters	10.54	.86	10.04	1.00	.38
Durrell Analysis	22.50	9.67	22.26	6.55	.09
Conners Teacher Rating Scale	16.91	7.34	17.05	4.98	.07
Conners Parent Rating Scale	19.18	4.97	20.65	4.31	.06
Teacher Rating of Attention	52.68	12.26	55.90	11.28	.86
Teacher Rating of Impulsivity	65.23	10.00	71.00	10.86	.07
Family Life Questionnaire	63.04	10.56	58.23	13.04	1.38
Health Opinion Survey	30.16	5.01	28.53	5.83	.92
CES-Depression Scale	13.31	7.84	11.16	10.66	.71

* Nonsignificant for all measures.

response and total number of errors. The MFF has been identified as the primary index of impulsivity[34] and has been shown to differentiate hyperactive and normal children.[27,42]

Children's Checking Task (CCT). The CCT was developed as a technique for measuring ability to sustain attention and effort to a task over time. It includes a five-page booklet with rows of printed numbers. The child is required to listen to the numbers randomly recorded on a tape recording at the rate of one number per second while checking them against an almost identical series in the booklet. The test is scored on two types of errors, omissions (missed discrepancies) and commissions (correct numbers marked as incorrect).[13,35]

Embedded Figures Test (EFT). Taken as a measure of the ability to focus attention and to organize a perceptual field,[35,57] this test involves a series of 27 chromatic test items, 13 with a tent as the standard stimulus and 14 with a house as the standard stimulus. The subject's task is to find a previously seen sample figure (tent or house) embedded within a larger one.[19]

Attention-concentration factor of the

WISC-R. The attention-concentration factor of the WISC-R (obtained by summing the scaled scores of the Arithmetic, Digit Span, and Coding subtests) has been employed since early factor analysis of the Wechsler Scales[49] and discriminates hyperactive from normal children.[7,36] To obtain the attention-concentration factor score, the individual subtests were administered according to standardized procedures.

Academic Achievement

Wide Range Achievement Test (WRAT). This widely used achievement test measures arithmetic and reading ability. The scores used for the present study were total raw scores, as described in the test manual. The WRAT was included in the test battery because of its relevance to academic achievement.[27,33]

Detroit Tests of Learning Aptitude. Three subtests, one measuring auditory attention span for related words, one measuring auditory attention span for unrelated words, and another measuring visual attention to letters, were administered to each child. These tests assess characteristics relevant to academic achievement.[2,27]

Durrell Analysis of Reading Difficulty. The Durrell subtest for listening comprehension was administered to each child. Raw scores for this subtest were utilized in the data analysis.[27,28]

Behavioral Rating Scales

Conners Rating Scales for Parents and Teachers. These are short, 10-item scales on which parents (CPRS) or teachers (CTRS) rate a child's behavior. Each teacher or parent rates the child on a four-point continuum (from "not at all" to "very much") for each of the ten items of behavior described in the scale (*e.g.*, "restless and overactive," "sits fidgeting with small objects"). Developed by Conners,[16] this rating scale has been widely used as a diagnostic instrument for hyperactivity.[7,27,53]

Teacher Rating Scale of Attention (TRSA). Teachers rated each child's attentional behavior on a scale developed by Domascus.[21] This scale consists of 19 descriptive statements which have been related to laboratory tasks of attention in hyperactive children. Teachers responded using a five-point Likert-type scale ranging from "never describes this child" to "always describes this child."

Teacher Rating Scale of Impulsivity (TRSI). Teachers rated each child's impulsivity based on measures consisting of a series of descriptive statements which have been demonstrated to measure impulsivity in normal children.[5] Teachers responded using a five-point Likert-type scale ranging from "never describes this child" (scored *1*), to "always describes this child" (scored *5*). There were a total of 20 items on this scale (*e.g.*, "This child takes part in risky stunts," "This child likes work involving competition," "This child makes up his mind easily.").

Parent and Family Measures

Family Life Questionnaire (FLQ). Sent to the mother of each child in the program, the FLQ is a 24-item questionnaire which asks that the person completing it evaluate on a five-point scale (ranging from "strongly agree" to "strongly disagree") each statement about the quality of his or her relationship to another specified family member—in this study, her child. Developed by Guerney,[30] the FLQ has been widely used to assess perceived

satisfaction with communication for specific familial relationships.

Health Opinion Survey (HOS). Also completed by the mother of each child in the program was the HOS, developed by Macmillan.[38] This 20-item instrument asks respondents to answer "often," "sometimes," or "never" to a series of statements about their health. Widely used and recognized as providing a good global assessment of the state of an individual's mental health,[20] the HOS was used to assess the mother's general mental health.

Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D is a 20-item set of statements. A self-report instrument, the CES-D asks the respondent to evaluate each statement and indicate on a four-point scale how frequently he or she experiences the feelings described in each statement. (Choices range from "never" to "most or all of the time.") Developed for research use in the general population, the CES-D has shown good correlations with clinical judgments of depression.[43]

RESULTS

Available in the files of the clinic program was information on many variables of potential interest. The number of variables available for use in the building of a discriminant function model was rather large in relation to the samples available for this study. Hence a variable selection procedure was deemed necessary in order that the number of variables entered into the model not exceed that which could be reliably estimated on the basis of the sample size. In order to select the empirically most promising subset of the variables, step-wise discriminant analysis was used.[37] Four separate step-wise discriminant function procedures, one for each class of variables (attention and impulsivity measures, achievement measures, rating scales of behavior, and parent and family measures) were carried out. TABLE 3 presents the results of this analysis.

The results of the four step-wise discriminant analyses carried out to select the measures that might be sufficient for best classifying children as ADD or ADDH were that only one of the measures (TRSI) was retained (Wilk's $\lambda=.9153$, $F(1, 38)=3.517$, $p=.0684$). While significant for entry into the step-wise discriminant analysis, the TRSI would likely not be very powerful by itself in classifying children in this study as ADD or ADDH. (This is because the Wilk's λ value of .9153 approaches the maximum possible value of Wilk's λ of 1.0, thus indicating that the TRSI has a low ability to discriminate between the two groups.) In order to check this, the Teacher Rating Scale of Impulsivity was used for a discriminant analysis.

TABLE 4 shows the success with which children from each sample were sorted into ADD or ADDH categories on the basis of the discriminant function model containing only the TRSI. This model classified children into ADD or ADDH only slightly more accurately than if the assignment was made randomly.

DISCUSSION

According to Spitzer,[52] among the reasons for undertaking the work that led to *DSM-III* was a desire to improve the accuracy and reliability of psychiatric diagnostic assessment so as to improve its "clinical usefulness for making treatment and management decisions in

Table 3

RESULTS OF DISCRIMINANT ANALYSES

MEASURES OF ATTENTION AND IMPULSIVITY	R^2	F	P
Matching Familiar Figures Test			
Errors	.0350	1.499	.2278
Latency	.0101	0.417	.5221
Children's Checking Task			
Omission Errors	.0089	0.368	.5474
Commission Errors	.0117	0.485	.4899
Total Errors	.0160	0.667	.4188
Embedded Figures Test	.0000	0.000	.9845
Attention-Concentration Factor of WISC-R			
Arithmetic Subtest	.0202	0.846	.3630
Coding Subtest	.0263	1.106	.2992
Digit Span Subtest	.0022	0.089	.7668
Total	.0289	1.221	.2756
MEASURES OF ACADEMIC ACHIEVEMENT			
Wide Range Achievement Test			
Arithmetic Subtest	.0312	1.355	.2510
Reading Subtest	.0065	0.273	.6043
Detroit Tests			
Related Words Recalled	.0013	0.054	.8177
Unrelated Words Recalled	.0013	0.055	.8154
Letters Recalled	.0011	0.046	.8308
Durrell Analysis of Reading	.0022	0.007	.9321
BEHAVIORAL RATINGS			
Conners Teacher Rating Scale	.0024	0.093	.7625
Conners Parent Rating Scale	.0091	0.294	.5914
Teacher Rating of Attention	.0193	0.748	.3924
Teacher Rating of Impulsivity	.0847	3.517	.0684*
PARENT AND FAMILY MEASURES			
Family Life Questionnaire	.0217	0.798	.3777
Health Opinion Survey	.0232	0.855	.3614
Center for Epidemiologic Studies Depression Scale	.0138	0.505	.4817

*$p<.10$.

varied clinical settings"[52] (p. 2). One of the goals involved in this was that the resulting nosological system be comprised of categories which were consistent with data from research that could be used to evaluate the validity of those diagnostic categories. The redefinition of the *DSM-II* category of Hyperkinetic Reaction of Childhood as comprised of Attention Deficit Disorder without Hyperactivity and Attention Deficit Disorder with Hyperactivity is a change thought to be consistent with these goals.

The redefinition of the category respected the important and consistent research finding that those children diagnosed as displaying Hyperkinetic Reaction of Childhood actually constituted a very heterogeneous group. It respected too the research-based view that this class of children was comprised of two subclasses such that members of both displayed difficulty in controlling their

Table 4

CLASSIFICATION OF CHILDREN INTO ADD OR ADDH DIAGNOSTIC CATEGORIES ON THE BASIS OF THE DISCRIMINANT FUNCTION MODEL WITH ONLY TRSI RETAINED[1]

	OBSERVATIONS CLASSIFIED INTO ADD OR ADDH		
CLASSIFIED FROM ADD OR ADDH	ADD (%)	ADDH (%)	TOTAL (%)
ADD	12 (54.55)	10 (45.45)	22 (100)
ADDH	10 (45.45)	12 (54.55)	22 (100)
Total	22 (50.00)	22 (50.00)	44 (100)

[1] TRSI Scores were unavailable for two children.

attention and impulses, and that one group displayed, in addition, overactive behavior that was often variable with the context in which the child was observed. If diagnosis could be made in a system which allowed referral to a category comprised of a more homogenous set of children, then more effective treatment and management modalities might be developed.

The assumption underlying this study was that knowledge of which of the standard assessment measures for hyperactivity have the power to discriminate between ADD and ADDH children would be useful for research and clinical purposes. Such knowledge would allow for more precise diagnosis, and research and treatment based on assignment to ADD or ADDH groups could then be carried out with greater confidence.

Because hyperactivity is thought to increase the inability to control attention and impulsive behavior, ADDH children were expected to score significantly lower than ADD children on measures of achievement, attention, and impulse control, and on the judgments of their behavior made by parents and teachers. Also, on the basis of research studies which suggest that mothers of hyperactive children interact differently with those children than do mothers of normal children, mothers of ADDH children were expected to report less satisfaction with their communication with their children than would mothers of ADD children. The results of this study fail to support these expectations. The reasons for these negative findings, and their implications, will be considered in the balance of this discussion.

The differences between ADD and ADDH behavior might be subtle enough that to detect and to predict them in a discriminant function analysis would require larger samples of children than were available for this study. If this is so, however, such differences may not be clinically useful. The rationale for revising the diagnostic category of Hyperkinetic Reaction of Childhood into those of ADD and ADDH rests on the desire to increase the precision of diagnosis. The finding that differences in ADD and ADDH behavior may be so subtle that they can be detected only in studies of large samples would undermine rather than bolster confidence in this revision. (In addition, estimates of the power of the test for the univariate statistics in this study are between .75 and .85.[14] Thus, the probability is relatively low that a Type II error is made in this study. In other words,we can be confident that differences between the samples do not exist.)

A second possibility is that the measures used in this study are inappropri-

ate for use in diagnosing ADDH. Certainly this must be considered in evaluating the use of the parent and family measures. None of these has previously been shown useful in distinguishing hyperactive from normal children. It may be that they are simply inappropriate for this task despite their each having been shown to assess reliably aspects of individuals or families in other contexts. Each of the instruments in the other three sets of measures, however, repeatedly has been shown to be useful for studying various aspects of hyperactivity. All have been used to distinguish normal from hyperactive children or to demonstrate, by showing changes in children's scores on these instruments, the effectiveness of drug therapy, attentional training, behavior modification programs, dietary adjustments, and the like. Further, the attention and impulsivity measures, and the achievement measures have all been shown in other research to assess reliably their target characteristic in the general population. It is reasonable to have a high degree of confidence in the appropriateness of their use in general and for the study of hyperactivity in particular.

If we are confident that these measures in fact assess the characteristics they are said to, and we assume that ADD and ADDH are distinguishable medical entities, a third possibility is that the measures do not assess the salient characteristics of ADD or ADDH. This alternative would be paradoxical. It would pose a fundamental problem about the diagnostic category. The categories ADD and ADDH are defined by the characteristics measured by the attention, impulsivity, and achievement instruments used in this study. If these instruments accurately measure those characteristics, but are not helpful in correctly assigning children to the ADD or ADDH categories, this would suggest that there is a fundamental difficulty with the diagnostic categories themselves.

A fourth possibility is that the children in this study diagnosed as ADD and those diagnosed as ADDH are in fact representatives of a single population of children, all of whom are hyperactive. This possibility depends upon the observation that the expression, severity, and frequency of hyperactive behavior in children varies in relation to the settings in which the children are observed.[3] Those settings in which hyperactive behavior is most likely to be displayed are structured, task-oriented, and involve interaction with a group.[15,22,23] Their behavior is regarded as conspicuous and intrusive; hyperactive children behave inappropriately.

The most frequent reports of hyperactive behavior in children come from their teachers. This is not surprising, since teachers see children in the classroom, a setting which incorporates the demand that children behave in ways that are structured by external rules, and that they attend to specific tasks at arbitrary times. In addition, the ecology of the classroom makes these demands on the child's behavior in a group context. Because of the inappropriate nature of their behavior, hyperactive children frequently have trouble in school.[56] Children who come to the attention of their teachers and parents, and who are most likely to be referred for clinical treatment, are those whose behavior is seen by the adults as too inappropriate to be tolerated.

This suggests the possibility that only or predominantly children who were hyperactive (ADDH) were seen at the clinic. In that case the ADD and ADDH samples in this study would be an artifact of the circumstance that hyperactive children often do not display inappropriate behavior during a one-to-one interview with a clinician.[51] Accounting in this manner for this study's failure to find differences between groups labeled ADD and ADDH in essence argues that there exist two groups of troubled children, those who have ADD and those who have ADDH, but that frequently only the behavior of the ADDH children is inappropriate enough to cause them to be referred for clinical treatment. Hence, separating those referred children into groups labeled ADD and ADDH is misleading.

This explanation of the negative results fails for at least two reasons. First, the impetus for the redefinition of Hyperkinetic Reaction of Childhood as Attention Deficit Disorder with and without hyperactivity was that the children who were disgnosed as having Hyperkinetic Reaction of Childhood formed a very heterogeneous group. The behavior of many of these children did not seem to involve elevated motor activity. Douglas's suggestion [22–25] that what was common to all of these children was an inability to control their attentional and impulse behavior was used to reconceptualize the diagnostic category. The hope was that this would make diagnosis more precise and that treatment could then be provided with greater confidence. (Put another way, the ADD and ADDH division was made precisely as a way of dealing with the variation in amount of motor behavior seen among children who came to clinical attention as possibly having Hyperkinetic Reaction of Childhood.) All of these referred children were thought to share common difficulties with the control of attention, distractability, and impulsivity. Secondly, there is no reason to suspect that children seen at the clinic where this study was done came to clinical attention for reasons systematically different than children who came to clinical attention previously for having Hyperkinetic Reaction of Childhood.

The ADD/ADDH distinction was introduced because it was thought useful for improving the treatment and management decisions that would be made about the group of children who came to clinicians' attention (and were formerly diagnosed as having Hyperkinetic Reaction of Childhood) but who showed great variation in when, where, and how severely they displayed overactive behavior. The ADD/ADDH distinction was *not* introduced to provide a way of differentiating those children who did poorly in school and other settings but did not come to clinical attention from those who did poorly in school and other settings and came to clinical attention.

Finally, the negative results of this study may be seen as supporting the view that hyperactivity (ADDH) is not a medical entity. This view holds that ADDH is not a stable psychiatric disorder, but the medicalization of behavior that is inappropriate in particular contexts, such as school. It would, therefore, not be surprising, in this view, to discover that measures of stable individual characteristics are not helpful for correctly classifying children as ADD or ADDH.

Critics of the diagnostic category of Hyperkinetic Reaction of Childhood (now the category of ADD/ADDH) have

argued that the extreme heterogeneity of behavior among the children classified as hyperactive, the apparent context-related nature of much behavior called hyperactive by adults, and the wide variance in estimates of hyperactivity among children all call into question the "entitivity" of the construct of hyperactivity.[15,50] The alternative they present is that, for some children who are diagnosed as hyperactive (and perhaps the majority of these children whose diagnosis does not have a clear organic basis), it is incorrect to suppose that it is a flaw in the child that is the source of the behavior. Rather, this view argues that behavior inappropriate to certain contexts, such as school, is labeled—and that children whose behavior is so labeled enter a system in which this deviant behavior has been increasingly medicalized as a mechanism of social control.[18] As a result, the discussion of problems of deviant behavior

> . . . is removed from the public realm where there can be discussion by ordinary people and put on a plane where only medical people can discuss it.[18] (p. 16).

Further, the fact that this behavior is deviant only in context and as the result of ongoing social processes fades in significance as the search is carried out for diagnostic criteria which treat the issue as a medical syndrome with entitivity. Once hyperactivity takes on this concreteness, attention is misdirected to the assumed correlates and measures of this entity rather than to the processes of interaction in social life through which the deviant behavior is created.[45,46]

This view would expect that measures of the stable supposed characteristics of this entity would fail to allow us accurately to classify children as hyperactive or not. This is the finding of the present study. We interpret these results as supporting the view that many hyperactive children are not "sick" in a medical sense, but rather are involved in a complex process of social interaction, the meaning and significance of which we have yet to understand fully.

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