Differentiation of Infantile Autistic, Child-onset Pervasive Developmental Disorder, and Mentally Retarded Children, With the Personality Inventory for Children

REX B. KLINE, PH.D., ANDREW MALTZ, PH.D., DAVID LACHAR, PH.D., STEVE SPECTOR, PH.D., AND JOSEPH FISCHHOFF M.D.

Abstract. The accurate assessment of children with developmental disabilities is very challenging. This is particularly true when clinicians must differentiate pervasive developmental disorder (PDD) from mentally retarded (MR) children, and among the various types of PDD syndromes. This study was conducted to evaluate the usefulness of a multidimensional, parent-informant child behavior rating scale—the Personality Inventory for Children (PIC)—in the discrimination of children who met DSM-III diagnostic criteria for infantile autism (IA), child-onset PDD (COPDD), or MR. These three samples differed significantly across 10 of 16 PIC profile scales. Discriminant function analyses with the PIC scales indicated correct classification of over 90% of the cases from the IA, COPDD, and MR samples. These findings suggest that the PIC may be a valuable aid in the psychiatric evaluation of children with severe developmental disorders. Implications of these results regarding the external validity of DSM-III PDD diagnoses are also discussed. J. Amer. Acad. Child Adolesc. Psychiat., 1987, 26, 6839–843.

Key Words: autism, retardation, assessment, DSM-III.

The differential diagnosis of children with developmental disorders is a challenging clinical task. This problem has historically been complicated by lack of universal diagnostic nomenclature for these disorders. Although mental retardation (MR) has long been recognized as a distinct collection of disorders, it wasn’t until the 1940s (Kanner, 1943; Lourie et al., 1943) that children with impaired social and language functioning (pervasive developmental disorders (PDD)) were recognized as distinct from MR cases. Before the publication of DSM-III diagnostic criteria for PDD, a variety of conflicting diagnoses were applied to such children, including infantile autism (IA), childhood schizophrenia, and interactional or symbiotic psychosis (Achenbach, 1982; Cohen et al., 1986b).

DSM-III offers three diagnoses under its PDD section: infantile autism (IA), child-onset PDD (COPDD), and atypical PDD (APDD). IA and COPDD diagnostic criteria differ primarily with regard to symptom severity and age of onset (before 30 months for IA, between 30 months and 12 years for COPDD). The APDD category serves as a none-of-the-above diagnosis for children who show language or social skill dysfunction but do not meet IA or COPDD criteria.

The DSM-III PDD section has been criticized because several of its diagnostic criteria are not operationally defined (Cohen et al., 1986a), and because it does not clarify whether age of symptom onset should be used as a basis for differential diagnosis among types of PDD disorders (Dahl et al., 1986; Rescorla, 1986). Debate about the adequacy of the DSM-III PDD section highlights the need for research to address two issues of differential diagnosis for these children (Denckla, 1986). First, can children who are assigned DSM-III PDD labels be differentiated from children who receive other types of diagnoses (e.g., schizophrenic disorder, MR) using independent indices of their adjustment? Second, do children who receive various types of PDD diagnoses (IA, COPDD, or APDD) differ from each other on such measures?

The results of a number of recent studies on the first classification question suggest that the social and cognitive functioning of children given DSM-III PDD diagnoses are qualitatively different from that of children diagnosed as schizophrenic (Green et al., 1984) or MR (Dahl et al., 1986). Results from studies designed to examine the second issue have not been as supportive of the validity of DSM-III PDD diagnoses. For example, Sherman et al. (1983) and Dahl et al. (1986) used cluster analysis to statistically identify groups of preschool children who exhibited similar patterns of demographic, cognitive, and behavioral characteristics. Cases in both studies diagnosed as IA, APDD, COPDD, and MR were classified heterogeneously in several empirical clusters. Also, there is other evidence to suggest that preschool IA and COPDD cases differ with regard to symptom severity (the former showing poorer adjustment), but they show generally parallel patterns of behavior and cognitive dysfunction (Dahl et al., 1986; Rescorla, 1986).

The purpose of this report was to examine both classification issues using samples of children who were given DSM-III PDD and MR diagnoses. IA, COPDD, and MR children were compared on a multidimensional child rating scale, the Personality Inventory for Children (PIC) (Wirt et al., 1984). The PIC is a parent-informant, true-false format inventory of child cognitive, emotional, and conduct status. Several studies have established the external validity of the PIC profile scales with several clinical child populations (Goh et al., 1984; Kline et al., 1985; Lachar and Gdowski, 1979; Lachar et al., 1984). Although parent-informant scales may be subject to distortion, recent findings suggest that the predictive validity of PIC profile scales are unaffected by maternal psychopathology (Lachar et al., 1987).

This study addressed three questions relevant to the validity:

1. How do children with IA, COPDD, and MR differ on the PIC profile scales?
2. Can children be correctly classified into the three PDD categories using the PIC profiles?
3. Do the PIC profile scales discriminate between children with IA, COPDD, and MR diagnoses?
of DSM-III PDD diagnoses and the efficacy of the PIC in the evaluation of developmentally impaired children. First, would IA, COPDD, and MR cases attain unique behavioral profiles on the PIC? Second, would the PIC profiles of the PDD samples (IA and COPDD) differ primarily in terms of symptom severity (and thus have parallel profiles), or would they show different patterns of scale elevations? Third, how accurately could the PIC scales classify individual IA, COPDD, and MR cases?

Method

Subjects

A total of 99 children who received DSM-III diagnoses of either IA, COPDD, or MR were studied in this investigation. The IA sample was comprised of 34 children who were evaluated at a large, urban child medical facility in the midwestern United States. IA cases were diagnosed by a clinical team comprised of four of the authors (R. K., A. M., S. S., and J. F.). Diagnoses were made without knowledge of each IA child's PIC profile. All IA sample children were also attending public school classrooms for the autistically impaired at the time of their evaluations. The average age was 9.9 years; 88% were male and 12% were female; 61% were white and 39% were black; and 63% were functioning in the cognitively impaired range (estimated IQ < 70) as indicated by results of recent intellectual assessment, whereas 37% were functioning in the borderline range (estimated IQ between 70 and 80). The average age of symptom onset was 1.4 years.

As part of the clinical evaluation of the IA children, each patient's mother completed the Childhood Autism Rating Scale (CARS) (Schopler et al., 1980). Schopler et al. developed a classification strategy for the CARS based on the total inventory score and number of items rated as "3" or "4": children who obtained a total score < 30 are classified as normal; children who receive a total score > 36 and who are rated "3" or higher on any five items are considered severely autistic; and children who obtain a total score > 29 but fail to meet either of the above two classifications are considered mild-moderately autistic. A total of 93% of the IA cases were classified as either mildly or severely autistic according to these rules.

The 18 children from the COPDD sample were evaluated at mental health facilities across the country as part of a larger study of childhood psychosis (Wirt et al., 1984). The 18 COPDD children were selected from a larger sample of 66 children who all received a diagnosis of childhood schizophrenia. The clinical records of all 66 children (which contained parent and clinician reports of presenting problems and current behavioral status) were reviewed by the authors (without knowledge of each child's PIC profile) to determine that they met the DSM-III criteria for PDD. A total of 48 case protocols were rejected because their records indicated the presence of hallucinations, delusions, or thought disorder, or because age of symptom onset was < 30 months or > 12 years. The average age of the remaining 18 cases was 9.1 years; 78% were male; 22% were female; 85% were white and 15% were black; and 66% obtained IQ scores within the impaired range, whereas 34% obtained estimated IQ scores in the low average to average range (80 to 109). Average age of symptom onset was 4.7 years; this value was significantly higher than for the IA sample.

The 47 children from the MR group were enrolled in public school classrooms for either the educable (62%) or trainable (38%) mentally impaired. MR sample cases were evaluated by school psychologists, and all of these children attained IQ scores < 70. Also, as part of their school evaluations, these children were screened for the presence of severe social impairment or peculiar behavioral features that may have necessitated alternative classroom placements (e.g., AI or emotionally impaired (EI) classrooms). The mean age was 9.9 years; 80% were male, 20% were female; 73% were white and 27% were black.

Comparability of demographic and cognitive functioning characteristics of the IA, COPDD, and MR samples was evaluated with univariate comparisons (one-way analysis of variance for age; chi-square for race, sex, and level of cognitive functioning). These three samples did not differ significantly with regard to age, race, sex, and the proportion of children functioning in the borderline range of cognitive functioning or below.

Measures

The mothers of all children completed the PIC. PIC profile scales include three that measure informant response set, Lie (L: obvious denial of child problems), Frequency (F: endorsement of infrequent child problems), and Defensiveness (DEF: subtle denial of child problems), and a general screening scale for the presence of child or adolescent emotional problems, Adjustment (ADJ). Twelve substantive clinical scales are part of the PIC profile, including three reflecting child intellectual and academic functioning, Achievement (ACH), Intellectual Screening (IS), and Development (DVL); externalizing behav- ior, Delinquency (DLQ), and Hyperactivity (HPR); internalizing symptomatology, Somatic Concern (SOM), Depression (D), Withdrawal (WDL), and Anxiety (ANX); Social Skills (SSK); behavioral disorganization, Psychosis (PSY); and two screening scales for family conflict, Family Relations (FAM).

PIC scales were constructed using empirical-keying or content/rational methods (Wirt et al., 1984). Scale scores are reported in T score units (mean, 50; S.D., 10), and high scores suggest pathological adjustment. PIC scales were normed on a sample of 2,582 (192 ages 3 to 5; 2,390 ages 6 to 16) children with no previous referrals to mental health facilities, and norms are available separately by sex for ages 3 to 5 and 6 to 16; Intellectual Screening is normed for ages 3 to 5, 6, 7, 8, 9, and 10 to 16 for both sexes. Test-retest reliability coefficients for the PIC profile scales are satisfactory: Wirt et al. (1984) report 2-week test-retest coefficients ranging from 0.46 to 0.94 (average, 0.86) for an outpatient sample, and 2-month test-retest coefficients ranging from 0.39 to 0.89 (average, 0.71) for a normal control group. Interpretative guidelines for: the PIC are outlined in Lachar and Gdowski (1979) and Wirt et al. (1984).

Procedure

As reported, the proportion of children who attained estimated IQ scores at or below the borderline range was not statistically different across the IA, COPDD, and MR samples.
Nevertheless, some sample differences in cognitive functioning were present: one third of the COPDD sample attained estimated IQ scores within the normal range, whereas none of the remaining children did. In order to ensure that PIC discrimination of these groups was not confounded with sample intellectual functioning differences (Yule, 1978), child cognitive level was statistically partialled out of all PIC scores. Child cognitive status (classified as either normal (IQ > 79) or below normal (IQ < 80)) was used as a predictor of PIC scores in bivariate regression analyses. Predicted PIC scale scores were then subtracted from each child's actual PIC scores. Thus these residual scores were "corrected" for child intellectual level (Pedhazur, 1982). All analyses involving the PIC were performed with these adjusted scores.

Results
Relation of CARS Classification to PIC

Mean PIC scores of the IA sample cases classified as mildly-moderately autistic, according to the CARS, were compared with those classified as severely autistic using the Mann-Whitney procedure (a nonparametric test used because of the small sizes of these groups). CARS severely autistic children obtained significantly higher scores on three PIC scales, suggesting that they were more withdrawn, isolated, and anxious than mildly-moderately autistic cases (D means: severe = 72.9, mild-mod = 62.2; WDL: severe = 81.4, mild-mod = 67.8; ANX: severe = 67.2, mild-mod = 48.8).

Mean PIC Profiles

Mean PIC profiles of the IA, COPDD, and MR samples are presented in Table 1. Multivariate analysis of variance indicated that these samples varied significantly across all PIC clinical scales (Wilks Lambda = 0.222, F (24, 170) = 7.93, p < 0.001). In addition, all three possible multivariate pairwise Hotellings T² comparisons among these groups across all PIC clinical scales were significant at p < 0.001, indicating that the mean profiles for all samples were distinctly different. Results of univariate analyses of variance (also presented in Table 1) show that these three samples differ significantly across 11 of 16 PIC scales. Post hoc comparisons (Newman-Keuls at p < 0.05) indicated that most of these mean differences were consistent with the behavioral characteristics expected of these samples. For example, the IA and COPDD cases obtained significantly higher scores than the MR children on PIC scales reflective of infrequent or unusual problems (F), withdrawal and isolation (WDL), bizarre and disorganized behavior (PSY), and poor social skills (SSK). The IA children obtained significantly greater elevations on the PSY scale than the COPDD cases, whereas the COPDD cases obtained significantly higher scores on the SOM scale, which reflects worry or concern about somatic status. As expected, the MR cases were distinguished by having the highest scores on PIC cognitive functioning scales (ACH and IS), and these mean values were significantly greater than the average scores of the IA children.

Presented in Figure 1 are the mean PIC profiles (clinical scales ACH through SSK) for all three samples. The mean

![Figure 1: Mean PIC profiles of the IA, COPDD, and MR samples.](image)

**Table 1. Mean PIC Profiles for IA, COPDD, and MR Children**

<table>
<thead>
<tr>
<th>PIC Scale</th>
<th>IA* (N = 34)</th>
<th>COPDD (N = 18)</th>
<th>MR (N = 47)</th>
<th>F (2, 96)</th>
<th>Post Hoc Comparisons§</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>52.2</td>
<td>51.6</td>
<td>46.2</td>
<td>4.30*</td>
<td>IA &gt; MR</td>
</tr>
<tr>
<td>F</td>
<td>90.9</td>
<td>84.9</td>
<td>71.5</td>
<td>12.40**</td>
<td>IA, COPDD &gt; MR</td>
</tr>
<tr>
<td>DEF</td>
<td>41.4</td>
<td>47.0</td>
<td>46.4</td>
<td>2.54</td>
<td>-</td>
</tr>
<tr>
<td>ADJ</td>
<td>75.1</td>
<td>89.0</td>
<td>70.5</td>
<td>8.23**</td>
<td>COPDD &gt; IA, MR</td>
</tr>
<tr>
<td>ACH</td>
<td>67.2</td>
<td>70.9</td>
<td>74.0</td>
<td>5.29**</td>
<td>MR &gt; IA</td>
</tr>
<tr>
<td>IS</td>
<td>87.7</td>
<td>92.9</td>
<td>103.6</td>
<td>3.52*</td>
<td>MR &gt; IA</td>
</tr>
<tr>
<td>DVL</td>
<td>81.8</td>
<td>78.8</td>
<td>79.8</td>
<td>0.38</td>
<td>-</td>
</tr>
<tr>
<td>SOM</td>
<td>48.2</td>
<td>61.3</td>
<td>52.9</td>
<td>3.89*</td>
<td>COPDD &gt; IA</td>
</tr>
<tr>
<td>D</td>
<td>68.3</td>
<td>66.9</td>
<td>59.5</td>
<td>3.68**</td>
<td>IA &gt; MR</td>
</tr>
<tr>
<td>FAM</td>
<td>58.7</td>
<td>57.6</td>
<td>51.6</td>
<td>4.21*</td>
<td>IA &gt; MR</td>
</tr>
<tr>
<td>DLQ</td>
<td>63.3</td>
<td>68.9</td>
<td>58.1</td>
<td>3.42</td>
<td>IA &gt; MR</td>
</tr>
<tr>
<td>WDL</td>
<td>75.8</td>
<td>68.1</td>
<td>56.5</td>
<td>21.00**</td>
<td>IA, COPDD &gt; MR</td>
</tr>
<tr>
<td>ANX</td>
<td>56.4</td>
<td>62.4</td>
<td>56.3</td>
<td>0.85</td>
<td>-</td>
</tr>
<tr>
<td>PSY</td>
<td>129.1</td>
<td>111.2</td>
<td>77.5</td>
<td>47.10**</td>
<td>IA &gt; COPDD &gt; MR</td>
</tr>
<tr>
<td>HPR</td>
<td>50.1</td>
<td>53.7</td>
<td>52.3</td>
<td>0.34</td>
<td>-</td>
</tr>
<tr>
<td>SSK</td>
<td>78.0</td>
<td>73.7</td>
<td>63.4</td>
<td>16.80**</td>
<td>IA, COPDD &gt; MR</td>
</tr>
</tbody>
</table>

* p < 0.05; ** p < 0.01.

IA, infantile autism; COPDD, child-onset pervasive developmental disorder; MR, mentally retarded.

§ Results of Newman-Keuls at p < 0.05.
profiles of the IA and COPDD samples were essentially parallel. The Pearson correlation of the mean PIC profiles of these two groups was 0.96 ($p < 0.01$), indicating that profile shapes were almost identical. On the other hand, the correlation of the mean PIC profiles of the IA and MR samples was lower (0.60, $p < 0.05$), whereas the correlation of the COPDD and MR PIC profiles was 0.74 ($p < 0.01$).

**Classification of IA, COPDD, and MR Samples**

In order to determine the proportion of the IA, COPDD, and MR cases that could be correctly classified by the PIC clinical scales, two separate discriminant function analyses (DFA) (Cooley and Lohnes, 1971) were performed. DFA is a procedure that can determine the proportion of individual cases that can be correctly classified into diagnostic groups using profile data. In this study, the DFA algorithm assigned the PIC profiles of individual cases to the group whose mean profile they most closely resembled. Incorrect classification occurred when a child's PIC profile was assigned to the wrong diagnostic sample. DFA analyses were performed in two steps. The first analysis evaluated how accurately the PIC could discriminate the MR cases from the PDD cases (IA and COPDD samples combined). The second DFA classification analysis determined how accurately the PIC could differentiate between the two PDD groups (MR cases omitted).

The results of both DFA analyses are reported in Table 2. Presented in this table are cross-tabulations of the actual and predicted (by PIC profile) group membership. In the first analysis (MR versus PDD), PIC clinical scales correctly classified 97.9% of the MR sample and 89.73% of the PDD sample. Low proportions of both samples were misclassified (MR: 2.1%; PDD: 7.7%). In the second DFA analysis (IA versus COPDD; MR omitted), 100.0% of the IA cases and 91.7% of the COPDD cases were correctly classified by the PIC; low proportions of the COPDD (8.3%) and IA (0%) cases were misclassified.

**Discussion**

The objective of this study was to determine whether children who obtained DSM-III diagnoses of IA, COPDD, or MR would show distinctive behavior profiles on the PIC. This study has limitations that may restrict generalizability of its findings, and these will be reviewed before patterns of results are discussed. The samples used in this study were small and our findings, of course, need to be replicated. All of the cases in our COPDD and MR samples were collected by chart review and were not directly evaluated by the authors. Our COPDD cases may not be representative of most children who are assigned this diagnosis—there is evidence that the typical level of functioning of non-IA PDD children may be within the low average to average ranges (Kolvin et al., 1971; Sparrow et al., 1986). Finally, the results of this study do not directly lend themselves to clinical practice in that specific classification rules for PIC profiles of individual children were not constructed. Much larger samples of children would be necessary to cross-validate such rules before they could be used with confidence.

The average PIC profiles of IA and COPDD children were clearly different from those obtained for the MR children; more specifically, PDD cases in this study were distinguished from their MR counterparts by extreme scores on PIC scales that measure social functioning and behavioral disorganization. These findings are consistent with other evidence that PDD and MR may be distinct disorders (Dahl et al., 1986; Tanguay, 1980). Because the majority of cases in all three samples were cognitively impaired, these results also suggest that intellectual dysfunction may be a component of PDD that is secondary to more basic social/language deficits.

The two PDD samples were also differentiated with a high level of accuracy by the PIC, and this seems to support a clinical distinction between these diagnostic groups. The mean behavioral profiles of these two groups, however, were essentially parallel, with the IA cases attaining more pathological scores on most PIC scales. These results are consistent with findings by Dahl et al. (1986) and Rescorla (1986) and argue that the DSM-III diagnoses of IA and COPDD may identify children who differ quantitatively but not qualitatively in their symptom constellation.

Our findings lend support to the validity of the DSM-III distinction between intellectual and social/language impairments in the diagnosis of developmentally impaired children. The MR-PDD distinction in DSM-III may reflect genuine qualitative differences in adjustment. The high congruence of problem behavior patterns exhibited by our IA and COPDD samples, however, emphasizes the need for continued refinement of the diagnostic criteria for the various PDD syndromes. This seems especially true with regard to the COPDD diagnostic category (Cohen et al., 1986a), and more research regarding whether children who show social/language impairment later than age 30 months are exhibiting a milder form of IA or a distinct disorder is necessary.

**Table 2. DFA Classification Analysis of IA, COPDD, and MR Cases With the PIC**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Actual Group</th>
<th>N</th>
<th>MR</th>
<th>PDD</th>
<th>IA</th>
<th>COPDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: MR vs. PDD (IA + COPDD) predicted group*</td>
<td>MR</td>
<td>47</td>
<td>46</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PPD</td>
<td>39</td>
<td>4</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(97.9%)</td>
<td>(2.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(10.3%)</td>
<td>(89.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: IA vs. COPDD (MR omitted) predicted group*</td>
<td>IA</td>
<td>27</td>
<td>27</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>COPDD</td>
<td>12</td>
<td>27</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(100.0%)</td>
<td>(0.0%)</td>
<td>(8.3%)</td>
<td>(91.7%)</td>
</tr>
</tbody>
</table>

*Overall correct classification, 94.2%.

*Overall correct classification, 97.4%.
References


