A PIC Profile Typology of Children and Adolescents:  
1. Empirically Derived Alternative to Traditional Diagnosis

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This study investigated the utility of a multidimensional instrument, the Personality Inventory for Children (PIC), to serve as the data base for an empirically derived typology of child and adolescent psychopathology. A cluster-analytic technique was applied to T-score ranges of the 12 PIC full-length substantive profile scales for two independent samples of emotionally and behaviorally disturbed children and adolescents that included six criterion marker samples (hyperactive, psychotic, retarded, cerebral dysfunction, somatic, delinquent), for a total sample of N = 1,782. Eleven profile clusters replicated across samples and classified 82% of these profiles. Further analyses indicated that these replicated clusters differed in age, sex, and criterion marker sample composition, as well as on 18 of the 19 ratings of pathology dimensions obtained from parents, teachers, and clinicians. These results support the conclusion that the PIC may be valuable in the development of an empirically based classification system.

Even a cursory review of the Diagnostic and Statistical Manual: Mental Disorders (DSM-I, American Psychiatric Association [APA], 1952) and the Diagnostic and Statistical Manual of Mental Disorders, 2nd and 3rd editions (DSM-II, APA, 1968; DSM-III, APA, 1980) reveals the increasing professional attention paid to child and adolescent psychopathology. The three manuals, in part, include the changing conceptualizations of maladaptive behavior for these age groups. DSM-I and DSM-II, for example, list childhood psychosis as a subtype of adult schizophrenia, whereas DSM-III devotes an entire section to the Pervasive Developmental Disorders. The three manuals, in part, include the changing conceptualizations of maladaptive behavior for these age groups. DSM-I and DSM-II, for example, list childhood psychosis as a subtype of adult schizophrenia, whereas DSM-III devotes an entire section to the Pervasive Developmental Disorders. This classification permits even greater specification (e.g., infantile autism, atypical pervasive developmental disorder) and reflects research that indicates that severe childhood disturbances are not simply variants of adult disorders. Furthermore, this review indicates significant changes in diagnoses specific to these age groups from DSM-I, which reflects primarily adjustment disorders, to the inclusion of the Behavior Disorder of Childhood and Adolescence section in DSM-II (e.g., hyperkinetic reaction), to a series of classifications within DSM-III (e.g., Attention Deficit Disorder, with or without hyperactivity, or residual type). These developments also reflect new knowledge extracted from the research literature and serve to reinforce the concept that expressions of psychopathology in children and adolescents are qualitatively different from those of adults and, therefore, require separate specification.

The only major alternative to the manuals for child and adolescent psychopathology is a classification system offered by the Group for the Advancement of Psychiatry (GAP, 1966). This diagnostic system permits classification of 58 types or syndromes. To date, there has been little published research using this system. These traditional diagnostic systems (DSM, GAP) have been challenged on the basis of reliability and validity of the clinical syndromes offered. Although DSM-III, in contrast to earlier versions, requires that specific criteria be present before a diagnosis can be made, field studies demonstrate reasonable interrater reliability for only broad diagnostic groupings. The more specific di-
agnostic categories that are used in clinical practice obtained limited evidence of such reliability (Mattison, Cantwell, Russell, & Will, 1979; Werry, Methven, Fitzpatrick, & Dixon, 1983). In addition, questions have been raised as to whether sufficient evidence exists to justify the inclusion of certain diagnoses (Garmezy, 1978). Rutter (1978) concluded that few diagnostic categories had been adequately validated.

Alternative approaches to the identification of effective classifications have been proposed, in part due to the serious questions raised concerning the adequacy of these traditional diagnostic systems. The most promising efforts have been attempts to develop empirically based typologies of child and adolescent psychopathology. Consistent findings in empirical studies have provided the impetus for this approach. Two recent comprehensive reviews (Achenbach & Edelbrock, 1978; Quay, 1979) indicated relatively consistent factor-analytically derived dimensions of psychopathology. Variance among studies in terms of number and content of the factors relate to behaviors assessed, populations studied, factor algorithm, and the investigator's conceptual framework. Overall, similar factor dimensions are extracted across populations, methods of data collection, and source of this data (e.g., parent, clinician, teacher). The relative invariance of these dimensions has led to investigations in which they are used in the development of empirically derived classification schemes.

One of the central issues within this literature has been the number of dimensions necessary to both describe and discriminate psychopathological syndromes. Quay (1979) typified the approach in which several broad-band dimensions are considered to be sufficient. Dreger (1981), on the other hand, argued that numerous narrow, and narrow—narrow-band dimensions are required to provide adequate sensitivity to variations in psychopathology. Based on their analysis of the empirical data, Achenbach and Edelbrock (1978) concluded that two broad-band dimensions, overcontrolled and undercontrolled, and the narrow-band dimensions of aggressive, delinquent, hyperactive, and schizoid had considerable generalizability across studies. Furthermore, these authors found substantial evidence for other narrow-band dimensions labeled anxious, depressed, social withdrawal, and somatic complaints. These results would propose an intermediate approach, which assumes that a number of narrow-band dimensions are necessary to delineate child and adolescent psychopathology.

Attempts to develop an empirically derived typology have relied on the cluster-analytic technique. This technique permits the identification of similar patterns of problem behaviors. These patterns or profiles represent statistically derived diagnostic categories or syndromes. The power of this model is reflected in the fact that a quantitative score is assigned to each dimension. Thus, for example, aggression is no longer viewed as an all-or-none descriptor for a given child, but is evaluated in the context of the variety and intensity of other maladaptive behavior. Information is communicated that is not contained in traditional psychiatric diagnosis and more clearly reflects actual clinical experience. For example, the presenting complaint of separation anxiety need not exclude the presence of problematic aggressive behavior. The value of any diagnostic or classification system must ultimately be judged by its ability to predict several criteria, including objective child or adolescent behavior, possible etiological mechanisms, and treatment response and prognosis. The all-or-none nature of psychiatric diagnostic systems and their problematic reliability severely handicap their usefulness according to these considerations. The more quantitative and multidimensional nature of objective classification systems may better avail themselves of the process of empirical bootstrapping to identify relations with the above criteria than traditional psychiatric nosologies.

A major attempt to develop a useful typology of child psychopathology is presented by Edelbrock and Achenbach (1980). These investigators used the Child Behavior Profile (CBP), which includes 118 behavior problems and 20 social-competence items to which parents respond. Factor analysis of the responses of parents to these behavior problem items obtained during the evaluation of their children by mental health professionals was conducted separately for boys and for girls at three age levels: 4–5, 6–11, and 12–16. Sep-
arate analyses by age level were conducted, as investigators felt that children in these age ranges reflect important developmental changes (Achenbach, 1978). Results of the factor analyses of boys and of girls in the 6–11 and 12–16 age groups are presented elsewhere (Achenbach, 1978; Achenbach & Edelbrock, 1979). Edelbrock and Achenbach (1980) used a hierarchical centroid clustering algorithm with the intraclass correlation as the measure of profile similarity to identify six subsequently replicated profile types for boys aged 6–11 and 12–16, and seven profile types for girls aged 6–11 and 12–16.

Lessing, Williams, and Gill (1982) presented another attempt at developing a cluster-analytically based typology. The data base for this investigation was the IJR Behavior Checklist Parent Form (Lessing, Beiser, Krause, Dolinko, & Zagorin, 1973). This 183-item checklist was completed by parents of various subsamples of children and adolescents aged 4–17, including inpatients, outpatients, and normal control subjects. Lessing et al. (1982) separately cluster-analyzed 15 previously identified symptom clusters (Lessing, Williams, & Revelle, 1981) in three subsamples, using a hierarchical reciprocal pairs algorithm with the correlation coefficient as the index of similarity. Seven profile types were replicated in at least two subsamples, and one replicated across all three samples.

Although these studies offered promising starts toward the development of empirical typologies with their respective inventories, they did not validate their systems against independent, external behavioral criteria. For example, Edelbrock and Achenbach (1980) used three social skills scales of the CBP to demonstrate cluster differences, whereas Lessing et al. (1982) used psychiatric diagnosis and type of treatment recommended as external criteria. As mentioned earlier, an empirical typology cannot be considered as a viable alternative to traditional diagnostic labels unless it relates to independent ratings or measures of child affect, cognition, or conduct.

The present study sought to investigate the ability of the 12 substantive scales of the Personality Inventory for Children profile (PIC; Lachar, 1982; Wirt, Lachar, Klinedinst, & Seat, 1984) to generate an empirically derived typology of child and adolescent psychopathology in a large sample of disturbed children and adolescents. The PIC is an objectively scored, multidimensional measure of child and adolescent behavior, affect, and cognitive ability. The administration booklet provides 600 true–false items that can be completed in lengths of 131, 280, and 420 items by child guardians, who are usually mothers, to provide sets of profile scales and critical items. All PIC scales are normed separately by sex for ages 3 to 5 years and 6 to 16 years. The Intellectual Screening (IS) and Cognitive Development (IV) scales are scored using separate norms for 6- , 7- , 8- , 9- , and 10+-year-olds. The original scales, constructed using either an empirical or rational/content scale construction strategy, include three scales that measure informant response set, Lie (L), Frequency (F), and Defensiveness (DEF); a general screening scale, Adjustment (ADJ); and 12 substantive scales, Achievement (ACH), Intellectual Screening (IS), Development (DVL), Somatic Concern (SOM), Depression (D), Family Relations (FAM), Delinquency (DLQ), Withdrawal (WDL), Anxiety (ANX), Psychosis (PSY), Hyperactivity (HPR), and Social Skills (SSK). Factor-derived broad-band and shortened profile scales are also available (Lachar, 1982; Lachar, Gdowski, & Snyder, 1982).

Several studies have established the empirical validity of the profile scales through identification of external correlates (Lachar, Butkus, & Hryhorczuk, 1978; Lachar & Gdowski, 1979a, 1979b; Lachar, Gdowski, & Snyder, 1984, 1985). Other studies have applied the PIC with relative success to the study of hyperactivity (Breen & Barkley, 1983; Voelker, Lachar, & Gdowski, 1983), depression (Leon, Kendall, & Garber, 1980; Lobovits & Handal, in press), the effects of divorce (Kurdek, Blisk, & Siesky, 1981; Schrieber, 1982), and the evaluation of cognitive impairment (cf. Clark, 1982; DeKrey, 1982/1983; DeKrey & Ehly, 1981; Kline, Lachar, & Sprague, in press; Lachar, Kline, & Boersma, in press; Porter & Rourke, in press; Schnel, 1982). These and additional studies are summarized in some detail in the second edition of the PIC manual (Wirt et al., 1984).

A cluster-analytic technique was applied to the 12 PIC clinical scales within two large,
independent samples of children and adolescents referred for mental health services to form groups of children based upon their profile similarity. PIC clusters that replicated across these independent samples were retained for further analyses. The external validity of these replicated clusters were evaluated with several objective behavior rating forms completed by parent, classroom teacher, and clinician informants. Implications of these results regarding the viability of the PIC as the basis for a useful empirical classification typology are discussed.

Method

Subjects

The total sample consisted of 1,782 children and adolescents referred for a wide variety of emotional and behavioral problems. This sample included 1,226 evaluations conducted at one midwest urban child guidance facility and 6 homogeneous groups of criterion children who had been evaluated at mental health facilities throughout the country. The 1,226 general clinic cases were composed of 816 boys (56% white, 44% black; 67.5% < 13-years-old, 32.5% > 12-years-old) and 410 girls (35% white, 45% black, 51% < 13-years-old, 49% > 12-years-old). These children were referred for mental health services by parents, other psychiatric agencies, teachers, and private practice clinicians. Evaluation by Hollingshead (1957) socioeconomic levels placed the majority of these households (74%) in the lowest two categories of this classification system. (I = 4%; II = 6%; III = 16%; IV = 29%; V = 45%). The six relatively homogeneous criterion samples were used in the scale construction efforts of PIC scales and are fully described elsewhere (Wirt et al., 1984). These samples, selected using criteria independent of PIC response, consisted of 151 adjudicated delinquents (119 male, 32 female), 80 hyperactive children (63 male, 17 female), 73 children who received diagnoses of cerebral dysfunction based upon neurological assessments (63 male, 10 female), 35 somatizing males as rated by physicians, 138 children placed in educational facilities for the mentally retarded (85 male, 53 female), and 79 children ages 5 to 12 who displayed clear-cut psychotic symptomatology before adolescence (56 male, 23 female). These six samples of children were included as marker samples to assist in the construction and interpretation of an empirical classification typology based upon the PIC profile.

The total sample of 1,782 subjects was randomly partitioned into two independent samples, Split 1 (n = 889) and Split 2 (n = 893), for replication analyses. Comparable proportions of general clinic, delinquent, hyperactive, cerebral dysfunction, somatizing, mentally retarded, and psychotic children were assigned to each split sample. Subsequent univariate comparisons revealed that the Split 1 and Split 2 samples did not differ significantly across any demographic variables or PIC scales.

Measures

The 16 PIC full-length profile scale T scores, generated from the responses of female informants, usually the child's mother, were available for all 1,782 subjects. Three separate objective behavior rating forms provided external criteria for this study. One behavior checklist was completed by each child's parents or other guardian as part of a clinic application process, another checklist was completed by each child's classroom teachers, and the final form was completed by a psychiatric resident or psychology intern who conducted the clinical evaluation. These three checklists are reproduced in Lachar and Gdowski (1979a). These checklist data were available for a total of 872 general clinic cases (436 each from Split 1 and Split 2) and were not available for any of the marker sample cases. Rating form content was selected for source specificity to maximize accuracy and brevity. The items of each form were subjected separately to iterative common factor analysis by Lachar, Gdowski, and Snyder (1984) within a sample of 691 children and adolescents that was demographically similar to the current sample.

For each rating form, 4, 6, 8, and 10 factors were extracted by Lachar et al. (1984) and all factors obtaining eigenvalues > 1 were subjected to varimax rotation and retained for further review if five or more items on each factor obtained a factor weight > .29. The most parsimonious solution was selected to represent the content of each form based on the stability and representativeness of the dimensions derived. Rating dimension scores were then developed by assigning a weight of 1.0 to all items that obtained a factor weight > .29 on a given factor. Unit weighting systems generally perform well relative to more complex weighting schemes (Lessing & Clarke, 1982; Wainer, 1976, 1978) and offer inherent simplicity of application.

The Lachar et al. (1984) factor analysis of the parent form yielded five dimensions that incorporated 52 of 64 checklist items, the teacher form yielded seven dimensions including 74 of 78 checklist items, and the clinician form yielded seven dimensions incorporating 69 of 95 checklist items. The five parent, seven teacher, and seven clinician dimensions obtained average intercorrelations of .27, .30, and .13, respectively, in the Lachar et al. sample. The specific item composition of these 19 rating form dimensions is entirely presented in Lachar et al. (1984). These dimensions, number of items, and internal consistency coefficients (alpha) for each form are presented below: parent dimensions—hostility/dyscontrol (16/.81), depressive/somatic symptoms (16/.78), antisocial behavior (11/.81), developmental delay (12/.72), and cognitive/attentional deficits (9/.72); teacher dimensions—hostility/impulsivity (24/.94), poor study skills (12/.89), academic delay (11/.89), poor classroom adjustment (12/.87), poor self-concept/depressive symptoms (11/.80), social withdrawal (8/.77), and distractible/motor restlessness (9/.77); and clinician dimensions—hostility/dyscontrol (14/.87), language/motor deficits (11/.79), emotional liability/impulsivity (13/.79), disinhibition/limited reality testing (8/.72), depressive/somatic symptoms (11/.66), antisocial behavior (7/.66), and social withdrawal (8/.66). Larger factor scores reflect greater pathology in the areas measured by these dimensions.
Statistical Analyses

Ward’s (1963) minimum variance cluster analytic technique was selected for use in this study. This method is a hierarchical algorithm that yields a series of cluster solutions, $c_1, c_2, \ldots, c_{n-1}, c_n$, in which $c_1$ represents the initial solution where all cases are distinct, separate clusters, and $c_n$ is the final solution where all cases are classified into a single group. Ward’s algorithm uses a pooled, within-cluster error sum of squares as its similarity measure, and the method classifies individual cases into groups such that this sum is mathematically minimized. Because this index of profile similarity is basically a form of simple Euclidean distance, all basic characteristics of profile data—shape, elevation, and scatter—may be preserved. However, because profile shape, elevation, and scatter are in part properties of individual data sets, their relative influence upon a given cluster solution may vary (Skinner, 1978; Skinner & Blashfield, 1982). Ward’s model has been favorably compared to alternative algorithms in so-called mixture model tests of its ability to classify individuals from known populations (cf. Blashfield, 1976; Edelbrock, 1979).

As a further improvement on Ward’s basic model, an iterative cluster-improvement algorithm was executed following each step of cluster fusion (Wishart, 1978). One limitation of a purely hierarchical model is that once an individual case is assigned to a cluster, it cannot later be reassigned to another group if it subsequently becomes more similar to a nonparent cluster. Briefly, the iterative improvement program reassigns subjects whose PIC profiles are more similar to a nonparent cluster and adjusts all cluster means affected by each correction; this process terminates when no further improvements are made, thereby yielding the statistically optimal solution at each cluster stage.

Several pilot analyses were performed on the Split 1 sample in order to determine which type of PIC scores—$T$ scores or other scalings of the PIC scales—to use in cluster analyses. It was determined that recoding the $T$ scores of all 12 substantive scales (ACH through SSK) and using these coded scores in the cluster-analysis program (rather than $T$ scores) yielded the most distinct cluster solutions. The PIC clinical scales were recoded to reflect the actual meaning of these scales in terms of their behavioral correlates. For example, Lachar and Gdowski (1979a) determined that frequencies of parent, teacher, and clinician reports of antisocial behaviors did not differ significantly from base rate levels among children with DLQ $T$ scores below 80. Increasing $T$ scores above 80 yielded varying classes and types of delinquent behavior that differed from base rate levels of occurrence. In contrast, $T$ scores above 60 on HPR were sufficient to predict the presence of overactive and disruptive behaviors occurring above base rates.

The coded score equivalents of the PIC substantive scales are presented in Table 1; the $T$ score ranges established for each scale correspond exactly to the interpretive ranges recommended by Lachar and Gdowski (1979a) for these scales. For example, suppose that an individual child’s PIC profile had DLQ and HPR $T$ scores equal to 75. Although these scores are numerically equivalent, the DLQ score falls within the “normal” range for this scale, whereas the HPR score clearly falls within the “abnormal” or “clinically significant” range. Using Table 1 to convert DLQ and HPR $T$ scores into their coded score values reveals that this child would obtain a DLQ-coded score of 1 and an HPR-coded score of 12. This difference in coded score more accurately portrays the interpretive meaning of this child’s DLQ and HPR results than would be represented by the original $T$ scores. The values of the coded scores were chosen so that the relative values of the variances of the coded scores for each scale almost exactly matched those of the original $T$ score units. The values of the coded scores were chosen so that the relative values of the variances of the coded scores for each scale almost exactly matched those of the original $T$ score units.

Because cluster analysis is capable of constructing groups using random data, a number of precautions were undertaken to ensure the stability and generalizability of these results (Blashfield, 1981; Morris, Blashfield, & Satz, 1981). First, separate cluster analyses were performed within the Split 1 and Split 2 samples to identify PIC clusters. A cluster solution was selected for the Split 1 sample, and then the same number of clusters were specified for the Split 2 sample. If PIC clusters were formed mainly due to random fluctuations in the data, they would not be likely to replicate across these independent samples. Second, several criteria were utilized for the selection of a final solution in the Split 1 sample. These included the appropriateness of cluster size ($n$) and the distinctiveness of cluster mean PIC profiles. Profile
"distinctiveness" of the optimal solution was objectively defined by significant pairwise Hotelling's $T^2$ comparisons among all PIC cluster pairs within a given cluster solution.

In addition to these considerations, a third criterion for determining the appropriateness of a Split 1 solution was used. The six diagnostic samples described above were employed as marker samples to aid in the selection of a cluster solution. A related method in factor analysis is the inclusion of marker variables in a data set to aid in cross-study comparisons (Rummel, 1970). The inclusion of subjects who vary along known clinically relevant dimensions independent of the variables to be clustered can serve a similar function. An adequate solution should place dissimilar subjects into different clusters and, additionally, provide some indication of the number of clusters required to provide reasonable differentiation. For example, it would have been conceptually inconsistent for a given cluster solution to classify numerous psychosomatic and psychotic children together in the same cluster.

Once a cluster solution was selected for the Split 1 sample and applied to the Split 2 sample, several criteria were employed to determine replication of PIC clusters. First, intraclass correlation coefficients were calculated between all Split 1 and Split 2 cluster mean profile pairs (Edelbrock & Achenbach, 1980; Edelbrock & McLaughlin, 1980) to objectively match similar profiles across these samples. This procedure allowed a quantitative alternative to visual matching of cluster mean profiles across these two samples. Split 1 and Split 2 clusters thus matched by intraclass correlations were also compared in terms of their similarities on the demographic characteristics of the children contained within them. Also, the proportions of the marker sample cases classified by matched Split 1-Split 2 clusters were examined to determine whether the internal composition of these clusters was similar. For example, if a particular Split 1-Split 2 cluster pair both contained high proportions of psychotic subjects and differentially low proportions of other criterion sample children, this would have suggested that the internal composition of these paired clusters was comparable.

Results

Description of Replicated PIC Clusters

Fifteen clusters was selected as the final solution for the Split 1 sample. All pairwise Hotelling's $T^2$ comparisons among clusters were significant ($p < .05$) across the 12 PIC scales. A 15-cluster solution was also derived from the Split 2 sample. All pairwise Hotelling's $T^2$ comparisons were significant ($p < .05$) within this sample. A total of 11 significant intraclass correlation coefficients were obtained between the 15 Split 1 and 15 Split 2 cluster centroids, identifying 11 cluster types that were selected for further analyses. The mean PIC profiles and demographic characteristics of these 11 cluster pairs are reported in Table 2, whereas Table 3 presents the proportions of marker sample cases classified by these clusters. Inspection of Tables 2 and 3 reveals very close replication of the mean PIC profiles, demographic characteristics (mean age and proportion of males), distributions of marker sample cases, and even cluster size ($n$) across the split samples. These 11 PIC clusters were considered replicated according to the criteria previously outlined. (These cluster types have been assigned numbers that are consistent with subsequently developed profile classification procedures [cf. Lachar, Kline, & Boersma, in press].)

The 11 replicated PIC clusters classified 82% of the Split 1 sample and 82% of the Split 2 sample. Within each sample, these 11 profile types classified between 75% and 100% of the six criterion group members (or 91% of all 556 criterion group profiles) and more than three fourths (76% within Split 1, 78% within Split 2) of the general clinic profiles. Age and sex differences among the 11 PIC clusters were the only demographic characteristics that differentiated among clusters for both samples; differences in racial and socioeconomic composition between clusters either failed to replicate or were inconsistent across these samples. Each profile scale significantly varied across the 11 clusters in both Split 1 and Split 2 samples.

An analysis of the distribution of protocols from the six criterion marker samples across the 11 PIC profile clusters, as well as the cluster-type classification of general clinic cases, is presented in Table 3. This table provides the criterion sample composition within each cluster and also reports the proportion of general clinic profiles classified within each cluster. Goodness-of-fit chi-square analyses are presented for each cluster that classified more than 10 criterion marker protocols, to test whether the composition of each cluster differed significantly from sample base rates. Inspection of Table 3 quickly reveals that criterion marker protocols were not randomly assigned to cluster membership by the cluster analysis technique. Instead, criterion group members were disproportionately assigned to certain clusters and were
Table 2
Mean PIC Profiles for Replicated Clusters

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Note. PIC = Personality Inventory for Children; L = Lie; F = Frequency; DEF = Defensiveness; ADJ = Adjustment; ACH = Achievement; IS = Intellectual Screening; DVL = Development; SOM = Somatic Concern; D = Depression; FAM = Family Relations; DLQ = Delinquency; WDL = Withdrawal; ANX = Anxiety; PSY = Psychosis; HPR = Hyperactivity; SSK = Social Skills.
## Table 3

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Note: PIC = Personality Inventory for Children. 
\( n \) = Percentage of total marker profiles within each cluster. 
\( n < 10 \).
significant by their relative absence from others.

Univariate significance tests were performed that compared the sex and age composition of each individual cluster with a sample of the remaining protocols to identify those clusters that differed from age and sex base rates (M age, Split 1 = 11.2, Split 2 = 11.0; % male, Split 1 = 68%, Split 2 = 70%). Quite distinct patterns of mean PIC profile configurations, age and sex distribution, and criterion marker protocol composition were demonstrated among the 11 replicated PIC clusters. The characteristic patterns associated with each cluster type are discussed below.

Both Split 1 and Split 2 cluster pairs included samples with mean profiles below clinically meaningful elevations on all of the 12 substantive scales (cf. Lachar & Gdowski, 1979a). Cluster 1 contained the largest number of both general clinic and criterion marker protocols out of the 15 clusters for both Split 1 and Split 2. The criterion group composition for this cluster was relatively heterogeneous. Because the proportion of children who actually obtain within-normal-limits PIC profiles within a child guidance population is about 4% (DeHorn, Lachar, & Gdowski, 1979), it seemed likely that Cluster 1 contained a considerable number of at least minimally elevated profiles. In fact, 34% of Split 1 and 40% of Split 2, Cluster 1 protocols obtained spike profiles, in which only 1 of the 12 substantive scales was elevated beyond the normal range.

Among the cluster types characterized by elevated mean profile scales, four (Clusters 3-6) included high mean elevations on the scales of the cognitive triad (ACH, IS, DVL). Cluster 3 also included significant elevations on a number of additional scales, including D, WDL, PSY, and SSK. Cluster 3 included a significantly high proportion of psychotic marker protocols among cases assigned to this cluster. Relatively few or no delinquent, hyperactive, cerebral dysfunction, or somatic protocols were found within this cluster. These patterns suggested the presence of intellectual and cognitive impairment, emotional lability, internalizing symptomatology, and social incompetence among these children.

Although Cluster 4 also featured elevations on the cognitive triad, mean elevations among the remaining substantive scales were quite different from Cluster 3. Cluster 4 was characterized by significant elevations on PIC externalizing scales (DLQ, HPR) and SSK. Criterion marker composition of this cluster was relatively inconsistent in that the Split 1 cluster contained proportionately more retarded and cerebral dysfunction protocols, whereas the corresponding Split 2 cluster included differentially higher assignment of delinquent marker protocols. These elevations suggest impaired cognitive functioning, externalizing symptomatology, and poorly developed social skills.

Cluster 5 was characterized by an extremely high elevation of IS (T > 110 in each sample) within a generally elevated cognitive triad as well as elevations on PSY and SSK. Criterion marker composition was almost exclusively drawn from retarded and psychotic samples. Cluster members were also significantly younger than were sample base rates. Mean scale elevations and criterion marker assignment suggested severe intellectual and cognitive impairment, thought peculiarities, and poor socialization and reality testing abilities. Cluster 5, in comparison to Clusters 3 and 4, also suggested relatively fewer problems with either behavioral control or internalizing symptomatology.

Cluster 6 included mean PIC scale elevations on only the cognitive triad. The absence of other scale elevations suggested minimal behavioral or emotional difficulties apart from those associated with cognitive impairment. Retardation marker protocols predominated in this cluster and the mean age of Cluster 6 members in both samples was significantly younger than were base rates.

Six replicated profile types were characterized by an absence of elevations on the cognitive triad and predict a higher level of intellectual functioning than is reflected by protocol membership in Clusters 3-6. Cluster 7 presented the largest number of mean scale T scores within the clinical range; elevated PIC profile scales reflected externalizing (DLQ, HPR) and internalizing (D, WDL, ANX) symptomatology, problematic social skills (SSK), and the possibility of unusual thought processes and/or emotional lability (PSY). Although relatively few criterion marker protocols were classified within this
cluster pair, they were drawn exclusively from the delinquent sample. Cluster 7 members were significantly older and were more often female, in comparison to base rates. In addition, the majority of Cluster 7 members had a significant elevation of FAM, reflecting the presence of family conflict and/or instability. The extreme DLQ mean elevation and older age associated with Cluster 7 suggests the presence of serious violations of social convention, including involvement with law enforcement agencies or problematic substance misuse.

Cluster 8 was characterized by isolated elevations on PSY and SSK, and a great majority of classified marker protocols were drawn from the psychotic sample. Cluster 8 members were significantly younger and more likely to be male than were base rates. Mean scale elevations and criterion protocol assignment suggested dysfunction in thought processes, reality testing, and social functioning.

Cluster 9 included elevations on D and ANX clearly indicative of internalizing symptomatology. No clear pattern of criterion group assignment was obtained, although this finding was not unexpected given the absence of marker protocols specifically selected to reflect depression or anxiety.

Cluster 10 was characterized by an isolated extreme clinical elevation on only DLQ, suggesting pervasive aggressive/acting out behaviors. Marker protocol assignment supported this impression in that over 97% of the criterion cases classified by this pair were composed of delinquent protocols. Cluster 10 members were significantly older than were sample base rates. Although Cluster 10 members would be similar to Cluster 7 members in the incidence of serious violations of social norms, they would also be expected to demonstrate less emotional distress. Three fourths of Cluster 10 profiles included FAM elevations in the clinical range \((T > 59;\) Lachar & Gdowski, 1979a), suggesting family conflict, marital instability, and/or the application of inconsistent and ineffective child management techniques.

Cluster 11 included the clinical elevation of only HPR. Previous research has documented this scale's effectiveness in assessing overactivity, impulsivity, and limited attention span (Breen & Barkley, 1983; Lachar & Gdowski, 1979a). Two thirds of the criterion marker protocols assigned to this cluster were from the hyperactive sample, and significant representation was also obtained from the cerebral dysfunction sample. Cluster 11 members were younger and included a greater proportion of males compared to sample base rates. These cluster demographic characteristics are consistent with the observations that overactive and distractible children come to the attention of mental health professionals in educational, guidance, and hospital settings relatively earlier than do children with other types of problems and are much more likely to be boys (e.g., APA, 1980). Mean scale configuration and criterion group composition suggested that Cluster 11 reflects behavioral and cognitive dyscontrol.

Cluster 12, the last replicated profile type, presented with only two mean scale elevations within the clinically meaningful range: ACH and DVL. These elevations suggested academic difficulties in the absence of significant overall intellectual retardation. As with Cluster 11, a significant proportion of criterion marker protocols were obtained from the hyperactive sample. Although these children would be expected to be less behaviorally disruptive than would Cluster 11 children, the members of Cluster 12 may also have attentional deficits that impair their academic performance. It was interesting to note that the mean elevation of HPR for Cluster 12 was near the interpretive range \((T > 59;\) Lachar & Gdowski, 1979a).

**Relation to External Criteria**

Because about 50% of the cases of the Split 1 and Split 2 samples had parent, teacher, and clinician rating form information available, these two samples were collapsed to form a single validation sample \((n = 872)\). A total of 671 (77%) were classified by the 11 PIC clusters identified above. Separate multivariate analyses of variance comparisons of the 11 PIC clusters across the 5 parent, 7 teacher, and 7 clinician rating dimensions were all significant (parent dimensions—Wilk's Lambda = 0.350, \(F(50, 2822) = 14.62, p < .01;\) teacher dimensions—Wilk's Lambda = 0.571, \(F(70, 3260) = 4.71, p < .01;\) and clinician dimensions—Wilk's Lambda = 0.350, \(F(50, 2822) = 14.62, p < .01;\) teacher dimensions—Wilk's Lambda = 0.571, \(F(70, 3260) = 4.71, p < .01;\) and clinician dimensions—Wilk's Lambda = 0.571, \(F(70, 3260) = 4.71, p < .01;\)
Lambda = 0.377, $F(70, 3797) = 9.88, p < .01$. The behavior rating form dimension means and results of univariate analysis of variance comparisons among all PIC clusters are presented in Table 4. A total of 18 of 19 analysis of variance comparisons achieved significance ($p < .05$). PIC clusters failed to differ significantly only with regard to the teacher rating dimension labeled poor classroom adjustment. Significant ($p < .05$) Newman-Keuls post hoc comparisons among the PIC clusters for these 18 rating dimensions are detailed in Table 4.

These intergroup comparisons revealed a wealth of differences among these 11 PIC clusters. For example, relatively less symptomatology according to all informant sources was associated with the within-normal-limits Cluster 1, and parents attributed significantly less cognitive/attentional deficits to these children than to all other clusters. The four PIC clusters with elevations on the PIC cognitive triad scales of ACH, IS, and DVL (Clusters 3, 4, 5, and 6) generally obtained higher ratings of academic and developmental delay and cognitive/attentional deficits by all sources. In fact, clinicians attributed significantly more language/motor deficits to Clusters 3, 5, and 6 cases than to all other cluster members.

PIC clusters characterized by extreme DLQ elevations (Clusters 4, 7, and 10) generally received the highest ratings reflective of hostility and aggression. Clinician raters described higher levels of the antisocial dimension for Clusters 4, 7, and 10 children than for all other cluster members. Cluster 11, characterized by elevations on another PIC scale reflective of externalizing behavior (HPR), obtained relatively high ratings of hostility and impulsivity from all sources. However, teachers did not describe these children as being differentially more distractible/restless than other cluster members.

PIC Clusters 3, 7, and 9, which all shared Depression scale elevations, generally obtained the highest ratings of depression/somatic symptoms from parents and clinicians, but not from teachers. Clusters with extreme elevations on Psychosis (Clusters 3, 5, and 8) received the greatest mean scores from teachers reflecting distractibility/motor restlessness, as well as parental ratings documenting developmental delay. Also, clinicians rated Cluster 5 and 8 cases as exhibiting significantly more disorganization and poor reality testing than all other cluster members.

**Discussion**

Application of a cluster-analytic technique identified 11 PIC profile types that replicated across two large independent samples and classified 82% of all protocols. These replicated clusters contained conceptually meaningful proportions of hyperactive, delinquent, somatic, cerebral dysfunction, retarded, and psychotic criterion sample children. Demographic differences among the PIC clusters were limited to age and sex, and these demographic differences were consistent with the behavior problem dimensions suggested by mean scale elevations and criterion marker protocol composition of each cluster. The PIC clusters differed significantly across several behavior-rating dimensions, which were independently obtained from parents, classroom teachers, and the interviewing clinicians. There was generally an excellent conceptual fit between these behavior ratings and the type of problems predicted by the mean PIC profiles of these clusters. Also, there was a fair degree of cross-situational agreement among the parent, teacher, and clinician raters in their descriptions of the children in each PIC cluster.

It is difficult to compare the current PIC profile types with empirical types constructed using other parent-informant inventories, such as those of Edelbrock and Achenbach (1980) and Lessing et al. (1982). Edelbrock and Achenbach partitioned their age- and sex-specific CBP clusters into internalizing, externalizing, and mixed profile types. The CBP, however, does not include scales that were specifically constructed to reflect level of intellectual or academic functioning, and thus no distinction was made among the Edelbrock and Achenbach types regarding the cognitive characteristics of CBP cluster members. Because the CBP does not include scales that measure child cognitive or academic ability, no direct comparison between PIC and CBP clusters can be made. For example, Edelbrock and Achenbach identified a replicated delinquent CBP cluster in all
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four age- and sex-specific samples. Two PIC clusters identified in our study (Clusters 4 and 10) appeared to reflect primarily externalizing symptomatology: Cluster 4 members would also be expected to evidence cognitive impairment, whereas Cluster 10 members would not.

Edelbrock and Achenbach's hyperactive cluster, identified for both male and the 6–11-year-old female samples, may be similar to our Cluster 11, and the CBP schizoid cluster may parallel PIC Cluster 8. In addition, a CBP cluster identified within adolescent females labeled depressed-withdrawal-delinquent may correspond to the multiple-problems/ internalizing-and-externalizing Cluster 7, which was characterized by members who were older and more often female than were the base rates.

Comparison of PIC clusters to the IJR Behavior Checklist profile types is more straightforward because this checklist includes a measure of academic functioning. The Lessing et al. (1982) high-assets, flat-symptom-profile type most closely corresponds to Cluster 1, whereas their aggressive- overactive cluster is most similar to Clusters 10 and 11. Of the two Lessing et al. profile types featuring likely academic dysfunction, the sociopathic-academic profile resembles Cluster 4 (elevation of cognitive triad and DLQ).

Efforts to develop empirical child and adolescent typologies, including the current study, have been limited by their failure to develop clear classification rules that could be used subsequently to classify individual inventory protocols. For example, Edelbrock and Achenbach used a series of intraclass correlations to determine the most similar mean profile for an individual protocol. Lessing et al. (1982) classified individuals into IJR Behavior Checklist clusters by equations generated from discriminant function analyses. Both classification procedures are probably too cumbersome for individual clinicians to use without mechanical or computer assistance.

As was mentioned earlier, previous investigations have also been limited by their failure to validate cluster types against even a small number of external criteria. This study was distinguished by its use of several rating forms completed independently by three sources of child behavior observations. These current results also illustrated the limitations of the use of psychiatric diagnostic labels as an external criterion variable (such as used by Lessing et al., 1982). That is, although children who have all received the same global diagnostic label may share some important behavioral features, they may still differ on a wide variety of other dimensions also correlated with their overall adjustment and prognosis. Use of objective inventories such as the PIC that generate multidimensional profiles may better reflect the variance on these other dimensions (e.g., social competence, intellectual ability) than can a summary diagnosis. Indeed, this state of affairs was demonstrated by the distribution of the protocols from the six criterion marker samples across the 11 cluster types. For example, psychotic criterion protocols were classified into three clusters suggesting that, although these profiles reflect a common core of impaired reality testing and deficient social skills, they differ along other dimensions not reflected by this shared diagnostic label.

Evidence that empirical types constructed from objective profile data may classify children with a diversity of diagnostic labels has been suggested by other investigators. For example, Sherman, Shapiro, and Glassman (1983) constructed a five-group empirical typology of developmentally delayed preschoolers using three objective checklists. Children diagnosed as infantile autism, atypical pervasive developmental disorder, and mentally retarded were found in all five empirical clusters.

The authors have developed a series of objective rules that classify individual PIC profiles into these replicated types. There have been basically four strategies used in development of classification rules for empirically derived profile types, including (a) discriminant function analysis (e.g., Cooley & Lohnes, 1971), (b) assignment to a group by the use of an index of individual-to-group centroid similarity (such as the intraclass correlation), (c) identification of particular profile characteristics that are uniquely descriptive of each type (e.g., Overall & Hollister, 1982), and (d) quantification of the classification judgments of an experimental clinician or content expert (e.g., Megargee & Bohn,
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The first two methods are rarely practical without a computer, whereas the latter method can often be surprisingly subjective and difficult to develop reliably. The third alternative has been used to develop classification rules for this PIC typology that take the form of sequentially presented simple patterns of PIC elevations that determine inclusion into each profile type.

Current research is also underway that will attempt to validate this proposed PIC typology against a wide range of external criteria, including individually administered tests of intelligence and academic achievement and placement into various special education classrooms (e.g., learning disabled, emotionally impaired, educable and trainable mentally impaired) in the public schools. The results of our first study support the efficacy of the PIC as a data base for the development of an empirical typology of child and adolescent psychopathology.

References


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