PERSON-ORIENTED METHODS IN THE DIAGNOSIS OF CHILD BEHAVIOR

by

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ABSTRACT

Dimensional, person-oriented classification methods have preliminary evidence of utility for the classification of child psychopathology. Using cluster analysis on scores from the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Teacher Rating Scales for Children (TRS-C) for a normative sample, Huberty, DiStefano, and Kamphaus (1997) developed a seven-cluster typology of child behavior in schools. They found these clusters to be internally valid; therefore, Kamphaus, Huberty, DiStefano, and Petoskey (1997) afforded them substantive interpretation. Similarly, Kamphaus, Petoskey, Cody, Rowe, Huberty, and Reynolds (1999) cluster analyzed scores on the BASC Parent Scales for Children (PRS-C) for a normative sample, resulting in a nine-cluster typology of child behavior. However, in order for dimensional classification systems such as these to be useful in psychological science, they must be able to reliably differentiate child characteristics and illustrate degrees of functional impairment. The purpose of this study was to externally validate the BASC TRS-C typology using a sample of 200 clinic-referred children. BASC TRS-C scores for this independent sample were cluster analyzed and cross-validated. A six-cluster typology was selected for further analysis and interpretation. Each cluster was characterized according to degree of functional impairment as represented by external indicators of behavioral adjustment, school performance, and cognitive development. Additionally, risk factors and outcomes for each cluster were identified. A cross-classification analysis using the BASC TRS-C normative solution was also

conducted. Suggestions for further research involving larger sample sizes consisting of varying demographic profiles are offered.

INDEX WORDS: Behavior, Classification, BASC, Person-Oriented, Cluster Analysis

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To my mother, P. Kathryn Jolly Nemeth

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CHAPTER 1

INTRODUCTION

Classification is a fundamental, continuously unfolding task that is germane to all sciences. The basic processes of psychological diagnosis have remained unchanged since the time of the Kraepilinian system, which classified mental illnesses according to symptoms, causes, and course (Kraepelin, 1883). In the science of psychology, efforts to classify mental disorders date back at least 2000 years; yet, numerous researchers continue to refine these efforts (Blashfield, 1998). In spite of various objections and its imperfect nature, the majority of mental health professionals concur that the basic purposes and inherent advantages of classification support its use and further development (Cantwell, 1996). Related to this assumption, Blashfield (1998), has described five primary purposes for classification in psychopathology that also serve to illustrate its utilitarian properties: (1) creation of a common professional nomenclature; (2) organization of information; (3) clinical description; (4) prediction of outcomes and treatment utility; and (5) the development of concepts upon which theories may be based. These goals, although sound and pragmatic, have yet to be obtained by any one classification system. The predominant diagnostic classification schemes do attempt to provide a common nomenclature, to organize information, and to clinically describe syndromes or patterns of behavior. Nevertheless, the reliability and validity of prevailing models have not been adequately assessed, nor has a clear line of research established expediency with regard to treatment and theory development (Edelbrock & Achenbach, 1980).

Classification Models

Two primary models of classification have been presented in the psychopathology literature, categorical and dimensional. Categorical models are inferential in nature, involving qualitative differences in behavior that are based upon clinical observations. The dichotomous nature of categorical approaches deems that an individual has a disorder as long as pre-determined criteria for that disorder are met. To date, categorical approaches such as the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) and the Individuals with Disabilities Education Act (IDEA) are used most frequently in health and education, perhaps due in part to tradition. In comparison, dimensional classification methods are quantitative and thereby empirical in nature, assuming that there are a number of traits of behavior that all individuals possess in varying degrees along a continuum. These traits or dimensions of behavior are typically derived from measures (e.g., behavior rating scales) through the use of multivariate statistical procedures such as cluster analysis or factor analysis (Achenbach, 1993). However, it has not been clearly demonstrated that either of these classification approaches optimally meets the criteria for the five purposes of classification as outlined by Blashfield (1998).

The relative value of categorical or clinical-inferential, e.g., the DSM-IV-TR (APA, 2000) and dimensional or empirical, e.g., Edelbrock and Achenbach (1980), classification methods has been oft debated (Fletcher, 1985). However, an increasing body of literature has described the advantages of dimensional models (Hendry, 2000; LaCombe, Kline, Lachar, Butkus, & Hillman, 1991). For example, Achenbach and McConaughy (1992) noted that the yes/no nature of categorical methods does not necessarily account for children whose problems vary in degree or severity. As such, the shift between “normalcy” and psychopathology cannot

be well understood with categorical methods since most high prevalence problem behaviors in children, such as inattention and hyperactivity, are not classifiable when below diagnostic threshold levels. Substantial evidence is emerging to suggest that child behavior problems such as inattention, hyperactivity, depression, and conduct problems, in fact, fall along a continuum in the population; therefore, the continuous nature of these child behaviors is more appropriately measured with dimensional scales (Hudziak, et al., 1998) rather than categorical systems (Scahill, et al., 1999).

Although young in comparison to traditional, categorical methods, empirically based dimensional classification approaches have demonstrated utility in the study of psychopathology. For example, dimensional approaches have demonstrated more empirical strength and predictive validity than categorical approaches (Fergusson & Horwood, 1995), as well as statistical reliability (Cantwell, 1996). Such methods also minimize the need for clinical judgement and inference (Haynes & O'Brien, 1988), provide greater sensitivity to the presence of comorbid conditions (Caron & Rutter, 1991), and have the ability to depict multiple symptom patterns in a given individual (Cantwell, 1996). Further, and perhaps most importantly, the usage of dimensional, person-oriented approaches to identify subtypes or clusters of individuals can lead to more efficient, streamlined subtype-specific intervention and prevention services (Achenbach, 1995; Bergman & Magnusson, 1997; Hooper & Willis, 1989).

However, in a sense, a dimensional approach to classification can be viewed as a means to translate underlying latent traits into categories (e.g., internalizing/externalizing behaviors), thereby offering only a communicative alternative to existing classification schemes such as the DSM-IV. Thus, in order to be more meaningful and utilitarian, behavioral types need not only be

organized via dimensional methods, but they also must accurately represent the degree of functional impairment associated with each.

Purpose of the Study

Research teams have increasingly acknowledged the advantages of dimensional models of classification. Using cluster analysis on scores from the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Teacher Rating Scales for Children (TRS-C) for a national normative sample of children 6 to 11 years of age (N=1227), Huberty, DiStefano, and Kamphaus (1997) developed a dimensional seven-cluster typology of child behavior. Per the recommendations of Blashfield and Aldenderfer (1988), clustering was completed using the Ward method followed by a K-means procedure. The seven BASC TRS-C clusters have been supported by evidence of internal validity via correlations between the corresponding structure r's for three pairs of half-samples of the normative sample, hit rates for cross-typology clustering of three pairs of half-samples, and examination of matched cluster centroid locations via linear discriminant function (LDF) plots (Huberty et al., 1997). Therefore, Kamphaus, Huberty, DiStefano, and Petoskey (1997) offered substantive interpretation of the seven clusters on the basis of scale elevations, labeling them (1) Well Adapted; (2) Average; (3) Disruptive Behavior Problems; (4) Learning Problems (since renamed "Academic Problems"); (5) Physical Complaints/Worry; (6) General Psychopathology-Severe; and (7) Mildly Disruptive (Tables 1 and 2). This study has been replicated in three different populations to date, including children in Medellin, Colombia (Kamphaus & DiStefano, 2001) and a rural, as well as an urban sample of children in the United States (DiStefano, Kamphaus, Horne, & Winsor, 2003).

Table 1

Mean T-Scores by Scale for the BASC TRS-C Normative Typology (N=1227)

Scales	Cluster 1	2	3	4	5	6	7
Externalizing							
Aggression	44.00	**43.19**	**67.83**	49.25	49.63	**69.56**	**57.74**
Hyperactivity	43.48	44.56	**66.29**	52.34	49.60	**69.92**	**57.52**
Conduct Problems	45.26	45.60	**65.37**	51.32	47.60	**71.31**	52.66
Internalizing							
Anxiety	45.88	44.80	54.39	52.32	**58.40**	**70.62**	47.28
Depression	44.48	44.55	**61.05**	51.79	55.30	**76.35**	50.28
Somatization	46.58	45.25	53.64	48.87	**64.99**	**61.83**	47.39
School Problems							
Attention Problems	**40.99**	49.18	**63.43**	**60.77**	49.22	**68.34**	52.50
Learning Problems	**42.28**	49.30	**62.90**	**61.11**	50.56	**65.56**	49.70
Other Scales							
Atypicality	45.12	46.22	58.91	55.09	49.41	**80.83**	50.26
Withdrawal	45.11	47.24	54.96	**59.40**	53.79	**69.38**	45.16
Adaptive Skills							
Adaptability	**58.89**	50.10	**37.26**	**41.11**	48.19	**32.54**	46.64
Leadership	**59.02**	43.38	**41.85**	**38.83**	49.99	**41.60**	50.72
Social Skills	**58.81**	44.34	**41.16**	**39.70**	51.89	**42.33**	47.43
Study Skills	**59.98**	46.39	**37.97**	**38.35**	51.06	**38.52**	47.92

Note. Values that differ from the T-Score mean of 50 by 7 points or more in either direction are in boldface. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe, Cluster 7 = Mildly Disruptive.

Table 2

Sample Sizes, Proportions, and Demographic Characteristics for the BASC TRS-C Normative Typology (N=1227)

Cluster	N	%*	%M	%F	%Dx	%C	%AA	%A	%H	%N	%O
1	417	34	39	61	4.2	77.9	12.7	1.7	7.2	0.2	0.2
2	228	19	48	52	4.8	48.7	43.4	0.4	6.1	0.4	0.9
3	103	8	78	22	19.6	57.3	30.1	0.0	10.7	1.0	1.0
4	149	12	60	40	13.4	63.1	32.9	0.0	2.0	1.3	0.7
5	134	11	40	60	5.8	73.1	17.2	0.0	8.2	0.0	1.5
6	51	4	67	33	17.6	73.1	19.2	0.0	7.7	0.0	0.0
7	145	12	70	30	8.5	65.5	24.8	1.4	6.9	0.7	0.7

Note. The proportions that each cluster represents of the total sample do not total 100% due to the rounding of values to the nearest whole number. The abbreviation %* = % of total sample, M = male, F = female, Dx = previously diagnosed with a behavioral, emotional, or academic problem, A = Asian-American, AA = African-American, C = Caucasian, H = Hispanic, N = Native American, O = other race/ethnicity. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe, Cluster 7 = Mildly Disruptive.

In order for the clinical utility of such a dimensional typology to be established, each cluster of behavior must be validated, that is, not only replicated in independent samples of children, but also characterized and differentiated by marker variables of clinical importance. To be optimally effective, classification systems should be reliable, valid, and consist of an integration of empirical methodology and clinical acumen (DeLuca, Adams, & Rourke, 1991). In this vein, Skinner (1981) has proposed a model for the endeavor of classification that encompasses theory formulation, internal validation, and external validation. To date, studies regarding the BASC TRS-C typology of child behavior have addressed, in part, the internal validation components of this model and characterization. Two other studies have specifically addressed characteristics of this typology in clinical referral samples (Hendry, Petoskey, & Kamphaus, 1999; Petoskey, Cody, & Kamphaus, 1997).

Thus far, no study has taken the further step of establishing the link of each behavioral cluster of the BASC TRS-C typology to functional impairment. Of particular interest to this study was the external validation component of Skinner's model that addresses replicability and the markers that characterize a specific group or cluster of individuals, in addition to testing the relationship of the aforementioned behavioral clusters to functional impairment and outcomes. This aspect of the present investigation comprised the most original contribution to this vein of literature.

To this end, BASC TRS-C scores for an independent sample of 200 clinic-referred children, 6 to 11 years of age, were cluster analyzed. Each cluster was characterized according to degree of functional impairment as represented by external indicators of behavioral adjustment, school performance, and cognitive development. For behavioral adjustment, the Total T-Score from the Achenbach Teacher's Report Form (TRF; Achenbach, 1991c) was used as the index of

functional impairment for this study. Per interpretation recommendations (Achenbach, 1991a), a cut point of T = 60 was designated to delineate between the normal and clinical ranges of behavior. Therefore, T-Scores of 60 or above represent borderline clinical to clinically significant behavior problems, with the severity of problems increasing as scores climb higher. School performance was assessed using total reading and total mathematics scores from commonly used standardized measures of individually-administered tests of academic achievement. Cognitive development was measured using total intelligence index scores from frequently used standardized measures of individually-administered tests of cognitive ability. Additionally, risk factors (e.g., pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and previous diagnoses) and outcomes (e.g., current diagnoses and special education placement) for each cluster were identified.

Research Questions and Hypotheses

The first question was whether or not a similar cluster structure could be identified in the smaller clinic-referred sample. It was expected that the original BASC TRS-C cluster solution would be replicated in the independent, clinical sample of children. Consistent with previous research on cross-validation of the seven cluster solution (Kamphaus & DiStefano, 2001), it was predicted that at least five of the clusters in the original solution would be likely to emerge in the clinical sample. In addition, new clusters of behavioral adjustment were not anticipated but, if found, they were expected to be limited to one or two clusters with small proportions of cases included. It was further expected that clusters or types characterized by increased risk (Academic Problems, General Psychopathology-Severe, Disruptive Behavior Problems, and Mildly Disruptive) would have greater proportions in the clinical sample in comparison to the normative sample.

The second question was one of external characterization of the clusters, i.e., whether or not the clusters would be differentiated well by indicators of functional impairment. Previous research findings led to the prediction that the clusters would be supported by variables external to the clustering procedures, and that indices of functional impairment would coincide with increased risk factors.

More specifically, it was expected that the Well Adapted cluster would be characterized by a low index of functional impairment with regards to behavioral adjustment, average to above average scores on tests of cognitive ability and achievement, as well as little to no history of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and prior diagnoses. In terms of outcomes, few members were expected to have current diagnoses and/or special education placement. Children in the Average cluster were expected to have a low index of functional impairment pertaining to behavioral adjustment, average scores on tests of cognitive ability and achievement, as well as little to no history of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and prior diagnoses. In terms of outcomes, few members were expected to have current diagnoses and/or special education placement. Children in the Academic Problems cluster were expected to be distinguished by a borderline index of behavioral functional impairment, low average scores on tests of cognitive ability and achievement, as well as higher rates of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and prior diagnoses. Some members were expected to have current diagnoses and/or special education placement. Children belonging to the Disruptive Behavior Problems cluster were expected to be characterized by a high index of behavioral functional impairment, low average scores on tests of cognitive ability and achievement, as well as higher rates of pre-kindergarten problems, hyperactive/impulsive

behaviors, conduct problems, poor grades, and prior diagnoses. Higher rates of current diagnoses and/or special education placement were also expected in comparison to less affected groups. The Physical Complaints/Worry cluster members were expected to be characterized by a borderline index of behavioral functional impairment and average scores on tests of cognitive ability and achievement. Higher rates of pre-kindergarten problems and prior diagnoses were also expected. Additionally, increased rates of current diagnoses were predicted. Children in the Mildly Disruptive cluster were expected to have a borderline index of behavioral functional impairment, average scores on tests of cognitive ability and achievement, as well as higher incidences of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and prior diagnoses. Further, higher rates of current diagnoses and/or special education placement were expected. Finally, children in the General Psychopathology-Severe cluster were expected to be distinguished by the highest index of functional impairment pertaining to behavioral adjustment, low average to below average scores on tests of cognitive ability and achievement, as well as a histories positive for pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and previous diagnoses. Of all seven clusters, it was predicted that the General Psychopathology-Severe cluster would have the highest number of members with current diagnoses and/or special education placement.

Overall, it was anticipated that this study would yield a possible basis for classification derived through dimensional, person-oriented methods that could sort children by risk and functional impairment for diagnostic purposes. Thus, this study aimed to promote additional advances in the study of child behavior in that more meaning could be inferred from the current line of BASC typology research and that treatment needs of children could be more readily identified.

CHAPTER 2

REVIEW OF THE LITERATURE

The field of developmental psychopathology offers an organizational view that integrates the biological and behavioral systems of the individual, thereby implying that human development is an interactional and holistic process (Cicchetti & Cohen, 1995). In spite of this advancing paradigm, researchers traditionally tend to focus on variables, as opposed to individuals, as the unit of analysis (Magnusson & Bergman, 1990). This approach negates the interactionist and holistic view of development. A more fitting research method focuses on the person as the primary unit of analysis. Methods such as cluster analysis, that focus on "studying individuals by analyzing patterns" coincide with such a person-oriented approach (Magnusson & Bergman, 1990, p. 102). Certainly, variables are oft-used to construct patterns of individuals' scores on given measures; however, such variables have "no meaning in themselves" and are "considered only as components of the pattern under analysis" (Bergman & Magnusson, 1997, p. 293).

Investigators have increasingly acknowledged the multiple advantages of a dimensional, typological model of classification. A growing body of research involves the use of cluster analytic techniques applied to variables concerning children and adults for the purpose of identifying similar syndromal profiles. The multivariate essence of human behavior points to the need for a classification system to organize behavioral expression. This has been referred to as the problem of heterogeneity (Kavale & Forness, 1987). Specifically, researchers have used cluster analytic techniques in a variety of ways using a multitude of variables for the purpose of

solving this heterogeneity problem. Cluster analysis for the derivation of typologies in the social sciences first became widely used in the 1970s and 1980s (Aldenderfer & Blashfield, 1984). Numerous researchers in the field of learning disabilities have taken interest in the concept of subtyping, thereby using cluster analytic techniques for the purpose of identifying more homogeneous subtypes of individuals within that group (Speece, 1995). Additionally, the approach has become widely utilized in the identification of personality types (Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996; Robins, John, & Caspi, 1998).

Typologies Derived from Behavior Rating Scales

Investigators have utilized cluster analytic techniques for the purpose of identifying behavioral types in children and adolescents both with and without disabilities. Parents and teachers often complete behavior rating scales on given children and adolescents as a part of a comprehensive psychoeducational evaluation. In an ideal situation, multiple informants (e.g., one or more teachers and one or more parents/caregivers) will complete ratings. However this is not always possible given time constraints and other impeding factors (Kamphaus & Frick, 2002). Parent ratings are advantageous in that parents tend to possess the most knowledge about their child for the longest period of time. However, parent ratings may also be limited due to biases and lack of knowledge regarding child development. Teachers, usually the second most important adult figures in children's lives, are viewed as being especially valuable in reporting child behavior. Although teachers are less likely than parents to voice concern about or rate internalizing behaviors as opposed to externalizing behaviors, they are nonetheless instrumental participants in special education and mental health assessments for children (Achenbach & McConaughy, 1992; DuPaul, Power, McGoey, Ikeda, & Anastopoulos, 1998; Glaser, Kronsnoble, & Warner Forkner, 1997; Kamphaus & Frick, 2002). In fact, it has been

demonstrated that teachers' reports of child behavior predict poor outcomes (e.g., academic problems and school behavior problems) as well as or better than parents' ratings (Verhulst, Koot, & Van der Ende, 1994). Further, teachers have been shown to possess a high degree of accuracy in identifying children at risk for learning difficulties and attentional problems (Gresham, MacMillan, & Bocian, 1997; Taylor, Anselmo, Foreman, Schatschneider, & Angelopoulos, 2000).

The use of behavior rating scales as assessment tools has demonstrated utility in the prediction of risk and resiliency (Achenbach, Howell, McConaughy, & Stanger, 1995a; Achenbach, Howell, McConaughy, & Stanger, 1995b; Kazdin, Kraemer, Kessler, Kupfer, & Offord, 1997; Petoskey, 2001). For example, numerous studies have indicated that children with learning problems, most often reading disabilities, are likely to have externalizing behavioral symptoms and/or psychiatric disorders, such as Attention-Deficit/Hyperactivity Disorder (Fergusson & Lynskey, 1997; Hinshaw, 1992; Jorm, Share, Matthews, & MacLean, 1986; McGee, Share, Moffitt, Williams, & Silva, 1988; McGee, Williams, Share, Anderson, & Silva, 1986; Rock, Fessler, & Church, 1997; Sanson, Prior, & Smart, 1996). Other researchers have demonstrated that children considered to be at risk for learning difficulties are also regarded as being at risk for not just externalizing behavior problems, but internalizing symptoms, such as anxiety, as well (Achenbach, Howell, McConaughy, & Stanger, 1995a; Achenbach, Howell, McConaughy, & Stanger, 1995b; Thompson & Kronenberger, 1990). Additionally, in related veins, behavior rating scales have been used to study the relationship between preschool temperament and elementary school behavioral adjustment (Nelson, Martin, Hodge, Havill, & Kamphaus, 1999), as well as to predict school dropouts (Janosz, LeBlanc, Boulerice, & Tremblay, 2000). Hence, the importance of behavioral assessment in the practice of psychology

and psychiatry has become heavily emphasized by researchers and clinicians. More specifically, behavioral assessment techniques, including observations and rating scales, comprise a substantial component of psychoeducational evaluations, serving to enhance the precision of educational and psychiatric diagnostic decision-making (Achenbach, 1995b; Edelbrock & Costello, 1988; Haynes & O'Brien, 1988; Hersen, 1988; Kamphaus & Frick, 2002).

As with learning disabilities, "child behavior," generally speaking, is also fraught with a heterogeneity problem. Thus, research teams have attempted to identify behavioral profiles for general as well as clinical samples of children and adolescents using cluster analytic techniques applied to behavior rating scale scores. The goals of the research in the fields of learning disabilities and child behavior are quite similar: to develop a classification system to organize behavioral expression, to evaluate the predictive value of the classification system, and to guide treatment options. To date, a number of studies have been conducted for the purpose of identifying behavioral types in children.

A 1978 review by Achenbach and Edelbrock summarized early typological findings obtained via factor analysis (e.g., Peterson, 1961; Quay, 1964, 1966). Notably, these early works indicated the presence of broad-band undercontrolled and overcontrolled syndromes, in addition to narrow-band aggressive, delinquent, hyperactive, schizoid, anxious, depressed, somatic, and withdrawn syndromes across diverse samples of children and adolescents. Although these early results seemed promising, the authors asserted that "along with the need for greater uniformity of instrumentation and methods of analysis, there is a need for greater differentiation in the samples studied" (p. 1297).

Lessing, Williams, and Gil (1982) conducted a study to determine whether replicable types of children and adolescents could be identified by the cluster analysis of their scores on the

Institute for Juvenile Research (IJR) Behavior Checklist Parent Form (Lessing, Beiser, Krause, Dolinko, & Zagorin, 1973). Item scores range from 0 (behavior not observed) to 2 (behavior observed "often" or "very much so"), assessing socially competent, anxious, insecure, withdrawn, aggressive, distractible, unmotivated, depressed, paranoid, psychosomatic, incontinent, sexually maladjusted, and bizarre/autistic behaviors. Scores for three samples of children were submitted to cluster analysis, including one clinical sample (N = 185) and two mixed clinical and normal samples (N = 358 and N = 373). Seven replicable types across samples were identified as follows: High assets/flat symptom profile, sociopathic/academic problems, moderate assets/egocentric, insecure/somaticizing, aggressive/overreactive, and diffuse, mixed pathology.

Curry and Thompson (1985) initiated a similar study, submitting scores of two matched samples of children referred for psychiatric services on the Missouri Children's Behavior Checklist (MCBC; Sines, Pauker, Sines, & Owen, 1969). Items are scored dichotomously, wherein the parent rates the child as having exhibited the behavior in the past 6 months (1 = yes, 0 = no). The items comprise six scales, including aggression, inhibition, activity level, sleep disturbance, somatization, and sociability. For the two matched samples, each of which constituted 65 participants, the following seven clusters were identified: Inhibited-nonaggressive, low social skills, behavior problem-free, mildly aggressive, aggressive-active, aggressive-inhibited, and undifferentiated disturbance. Classification rules for this cluster solution were applied to a sample of 44 non-referred children and 65 developmentally disabled children. Notable differences in the frequency distributions amongst samples were noted, with significantly more "behavior problem-free" children in the non-referred sample.

Continuing this line of research, Thompson, Kronenberger, and Curry (1989), cluster analyzed scores on the MCBC for three samples of children, including those referred for developmental disability evaluations (N = 471), children referred for psychiatric services (N = 155), and children with chronic illnesses (N = 184). Seven replicable behavior types were identified: internal profile, external profile, mixed internal and external profile, undifferentiated disturbance, low social skills profile, problem-free profile, and sociable profile. Again, notable differences in the frequency distributions amongst samples were noted, with significantly more "behavior problem-free" children in the non-referred sample, as well as the chronic illness sample.

Gdwoski, Lachar, and Kline (1985) investigated the value of the Personality Inventory for Children (PIC; Wirt, Lachar, Klinedinst, & Seat, 1977) in generating an empirically derived typology of child and adolescent psychopathology. The PIC consists of 600 dichotomously scored items, wherein the parent rates the child as having exhibited the characteristic or behavior (1 = true, 0 = false). The items comprise 12 substantive scales, including achievement, intellectual screening, development, somatic concern, depression, family relations, delinquency, withdrawal, anxiety, psychosis, hyperactivity, and social skills. PIC scores for 1,782 children and adolescents referred for multiple emotional and behavioral concerns were submitted to cluster analysis. The total sample was randomly split into two independent samples, 1 (N = 889) and 2 (N = 893) for the purpose of conducting replication analyses. Results yielded a total of eleven replicable behavioral types. These 11 types classified 82% of the total 1,782 cases analyzed. The first type represented a "within normal limits" group of children and adolescents. The score profiles of these individuals reflected the least severe symptomatology. Four groups, generally described as "cognitive dysfunction" types, were also identified. These four types were

differentiated by degree of cognitive/learning impairment, social skills deficits, attention problems, and disruptive behaviors. In addition, six "emotional/behavioral/learning" types were identified. These groups were primarily differentiated according to levels of internalizing and externalizing emotional/behavioral indicators and school achievement.

Lacombe, Kline, Lachar, Butkus, and Hillman (1991) furthered this investigation by identifying external correlates for each of the eleven behavioral types. Mental health case records of 327 of the original 1,782 individuals from the previous study were reviewed for the purpose of providing external validation for the profile types. Examination of case histories supported the general categories of types. For example, the "within normal limits" group was found to have the least severe of presenting problems in addition to relatively typical development and healthy familial background. In contrast, the types categorized as having "cognitive dysfunction" were more likely to present with developmental difficulties, family histories of mental health problems, and diagnosable disorders. Those in the "emotional/behavioral/learning" type groups presented with higher incidences of reports of school achievement difficulties, attention problems, and familial conflict.

McDermott and Weiss (1995) submitted scores of a national sample of 1,400 children and adolescents on the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Marston, & Scott, 1993) to cluster analytic procedures for the purpose of obtaining a normative typology of behavior. The sample was designed to reflect the population of all non-institutionalized 5- through 17-year-old individuals in the United States. The ASCA is a rating scale completed by teachers that contains 97 "problem" and 26 "positive" behavioral indicators. The items form core syndrome scales, including, Attention-Deficit Hyperactive, Solitary Aggressive-Provocative, Solitary Aggressive-Impulsive, Oppositional Defiant, Diffident, and

Avoidant. Results were based on the score profiles across these six core syndromes and yielded 22 normative behavioral styles or types. 12 of the types were generally grouped as "adjusted," accounting for 78.6% of all cases examined. One type was deemed as having "good" adjustment, thus reflecting normal symptom levels on all scales. Individuals having "adequate" adjustment were characterized into four types having mild problems related to both internalizing and/or externalizing difficulties. Those classified as having "marginal" adjustment were grouped into seven types having slightly higher levels of mixed internalizing and externalizing behavioral symptoms. Six "at-risk" types (16.2%) were identified, characterized by varying levels of oppositional, impulsive, and inattentive behaviors. Four "maladjusted" types (5.2%) also emerged, representing youth characterized by aggressive and schizoid behaviors.

Following on their recommendation to establish a more systematic method of examining child behavior profiles, Edelbrock and Achenbach (1980) investigated the utility of their own Child Behavior Profile (CBP; Achenbach, 1978; Achenbach & Edelbrock, 1979) for this purpose. The CBP is a rating scale designed to be completed by parents. It consists of 118 behavior problem and 20 social competence items. Separate editions of the CBP were developed to reflect each sex at ages 4-5, 6-11, and 12-16. In this study, a total of 2,683 score profiles were analyzed. All participants were clinically referred, and included 1,050 boys aged 6-11, 633 boys aged 12-16, 500 girls aged 6-11, and 500 girls aged 12-16. Scores for each of the four groups were analyzed separately. Six reliable behavioral profiles were identified for boys aged 6-11, including Schizoid-Social Withdrawal, Depressed-Social Withdrawal-Aggressive, Schizoid, and Somatic Complaints, all of which were generally categorized as internalizing types (41.8% of the sample), and two externalizing types, Hyperactive and Delinquent (36.5% of the sample). 6.8% of boys aged 6-11 remained unclassified. Six types were also identified for boys aged 12-16,

including two internalizing types (28.9% of the sample), Schizoid and Uncommunicative, and four externalizing types (51.7% of the sample), including, Immature-Aggressive, Hyperactive, Uncommunicative-Delinquent, and Delinquent. 3.9% of boys aged 12-16 remained unclassified. Seven reliable behavioral profiles were identified for girls aged 6-11, including Depressed-Social Withdrawal, Somatic Complaints, and Schizoid-Obsessive, all of which were generally categorized as internalizing types (32.0% of the sample), one mixed type (10.1% of the sample), Sex Problems, and three externalizing types, including Hyperactive, Delinquent, and Aggressive-Cruel (38.9% of the sample). 2.7% of girls aged 6-11 remained unclassified. Seven profiles were also identified for girls aged 12-16, including Anxious-Obsessive, Somatic Complaints, and Anxious-Obsessive-Aggressive, all of which were generally categorized as internalizing types (28.6% of the sample), one mixed type (12.9% of the sample), Hyperactive-Immature, and three externalizing types, including Delinquent, Depressed-Withdrawal-Delinquent, and Aggressive-Cruel (37.4% of the sample). 2.2% of girls aged 12-16 remained unclassified.

In a subsequent study, McConaughy, Achenbach, and Gent (1988) classified an independent sample of 185 clinically referred 6- to 11-year-old boys according to the previously identified behavioral profiles (Schizoid-Social Withdrawal, Depressed-Social Withdrawal-Aggressive, Schizoid, Somatic Complaints, Hyperactive, and Delinquent). Additionally, this research group characterized these children via teacher behavior ratings, direct observations, cognitive measures, achievement tests, and personality inventories. Findings suggested that members of the internalizing behavioral types (Schizoid-Social Withdrawal, Depressed-Social Withdrawal-Aggressive, Schizoid, and Somatic Complaints) functioned better in terms of cognitive, academic, and social functioning than those belonging to the externalizing types (Hyperactive and Delinquent).

Frankel, Hanna, Cantwell, Shekim, and Ornitz (1992) conducted independent cluster analyses of Achenbach Child Behavior Checklist (CBCL; Achenbach, 1991b) scores obtained on three samples of boys, aged 6 to 11 years of age, with varying degrees of behavior problems. The first group (N = 106) consisted of boys clinically referred for behavior problems and general noncompliance. The second group (N = 53) represented boys who carried diagnoses of Attention-Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and/or Conduct Disorder (CD). The third group (N = 69) was comprised of boys who had not been referred for mental health services. Results of cluster analyses revealed the presence of four reliable profiles, including two "problem-free" groups, an externalizing group, and a mixed internalizing/externalizing group.

Typologies Derived from the Behavior Assessment System for Children

The utility of the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) as a basis for developing behavioral typologies is the primary focus of the current investigation. Several studies utilizing the BASC have been conducted to date.

An investigation of child behavior ratings was conducted by Kamphaus, Petoskey, Cody, Rowe, Huberty, and Reynolds (1999) utilizing the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Parent Rating Scales for Children (PRS-C) for a national normative sample of children 6 to 11 years of age (N = 2029). Using the same methodology outlined by Huberty et al. (1997), a nine-cluster solution was identified. Likewise, the interpretation of the nine clusters was done on the basis of scale elevations, with the following groups: (1) Adapted; (2) Physical Complaints/Worry; (3) Average; (4) Well Adapted; (5) Minimal Problems; (6) Attention Problems; (7) Internalizing; (8) General Psychopathology-Severe; and (9) Disruptive Behavior Problems. This cluster solution was quite similar to that

obtained from scores on the TRS-C with two exceptions. Parent ratings yielded two additional clusters, Minimal Problems and Internalizing, that were not present in the teacher rating cluster solution. The authors felt this to be reasonable in that parents would perhaps be more likely to identify internalizing problems and mild difficulties in their children than teachers, whose roles necessitate paying most attention to disruptive, externalizing behaviors in the classroom setting.

Kamphaus, DiStefano, Petoskey, and Hendry (in press), furthered this line of research utilizing the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Teacher Rating Scales for Preschool (TRS-P) for a national normative sample of children 4 to 5 years of age (N = 298). Additionally, a sample of 423 preschool children obtained from an "at-risk" public school system was used in this study for the purposes of replicating and cross-validating the obtained normative cluster solution. Using the cluster analytic methodology outlined by Huberty et al. (1997), a six-cluster solution was identified for the normative sample. The interpretation of the six clusters was done on the basis of scale elevations, with the following groups: (1) Well Adapted; (2) Average; (3) Physical Complaints/Worry; (4) Disruptive Behavior Problems; (5) Withdrawn; and (6) General Problems-Severe. The TRS-P normative cluster solution differed from the TRS-C solution only in that a seventh, mildly disruptive group did not emerge. Cluster analytic results using the independent sample of "at-risk" children yielded only a slightly different solution: (1) Well Adapted; (2) Average; (3) Internalizing; (4) Disruptive Behavior Problems; (5) Withdrawn; and (6) General Problems-Severe. In comparison to the Physical Complaints/Worry cluster identified in the normative sample, the Internalizing group that emerged from this sample appeared to have more impairment, in that both the depression and anxiety scales were elevated. Results of cross-validation indicated considerable overlap, in that five of the six clusters had "hit rates" or levels of agreement of 50% or higher. Additionally,

disciplinary referrals were utilized as external validation data and generally supported the cluster solution (e.g., children in the Disruptive Behavior Problems and General Problems-Severe clusters received the majority of disciplinary actions).

As mentioned earlier in this paper, scores from the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Teacher Rating Scales for Children (TRS-C) for a national normative sample of children 6 to 11 years of age (N=1227), were subjected to cluster analytic techniques. From this, Huberty, DiStefano, and Kamphaus (1997) developed a dimensional seven-cluster typology of child behavior. Per the recommendations of Blashfield and Aldenderfer (1988), clustering was completed using the Ward method followed by a K-means procedure. The seven BASC TRS-C clusters have been supported by evidence of internal validity via correlations between the corresponding structure r's for three pairs of half-samples of the normative sample, hit rates for cross-typology clustering of three pairs of half-samples, and examination of matched cluster centroid locations via linear discriminant function (LDF) plots (Huberty et al., 1997). Therefore, Kamphaus, Huberty, DiStefano, and Petoskey (1997) offered substantive interpretation of the seven clusters on the basis of scale elevations, labeling them (1) Well Adapted; (2) Average; (3) Disruptive Behavior Problems; (4) Learning Problems (since renamed "Academic Problems"); (5) Physical Complaints/Worry; (6) General Psychopathology-Severe; and (7) Mildly Disruptive (Tables 1 and 2).

The original TRS-C study has been replicated in three different populations to date, including children in Medellin, Colombia (Kamphaus & DiStefano, 2001) and a rural, as well as an urban sample of children in the United States (DiStefano, Kamphaus, Horne, & Winsor, 2003).

A study by DiStefano, Kamphaus, Horne, and Winsor (2003) was conducted for the purpose of assessing the internal validity of the TRS-C typology. This was achieved by conducting cluster analyses with two large independent samples, and cross classifying the existing and newly obtained teacher-rated typologies in order to compare cluster assignments amongst cluster solutions. Additionally, with one of the independent samples, the relationship between the behavioral typology and external indicators of adjustment in school was assessed by examining rates of referral for special education or prereferral intervention, disciplinary actions (i.e., major or minor disciplinary action, physical or verbal aggression, or sexual offense), and diagnosis such as ADHD referrals.

Data for two samples of children, 6 to 11 years old, were collected. The first sample consisted of 537 children from Crawford County, a rural community in central Georgia with a history of significant poverty. Recent community demographics document that 39.3 percent of the residents of Crawford County have not completed high school, and that 52.5 percent of school children are eligible for free or reduced lunch (The 2000 Georgia County Guide, 2000). The racial and ethnic composition of the school system is 29.5 percent African-American, .5 percent Hispanic, and 69.6 percent Caucasian (The 2000 Georgia County Guide, 2000). The second independent sample consisted of 1,076 children obtained from the Clarke County School District in Athens, Georgia, through a research grant aimed at teacher professional development designed to improve the management of challenging behaviors in the regular education classroom (Project A. C. T. Early). The Clarke County School District, located in northeast Georgia, has been described as "at-risk" based on several educational factors. Approximately 23 percent of Clarke County residents have not completed high school, and 58.2 percent of the current school district population is eligible for free or reduced lunch. The racial and ethnic

composition of these schools is 57.4 percent African-American, 5.2 percent Hispanic, and 33.4 percent Caucasian (The 2000 Georgia County Guide, 2000). Since both the Crawford County and the Clarke County samples likely demonstrate more "at-risk" characteristics than the BASC normative data set, this study was able to better ascertain if the behavioral typology of children identified using the BASC normative sample could be reliably replicated.

The same clustering procedure used in prior BASC typological studies was employed to assure that differences in cluster solutions would not be the result of a different clustering algorithm or similarity indices used to group the data. A seven-cluster solution was found with the Crawford County sample. All seven of the clusters identified from the normative sample were present with results from the independent cluster analysis of the Crawford County sample: (1) Well Adapted; (2) Average; (3) Disruptive Behavior Problems; (4) Academic Problems; (5) Physical Complaints/Worry; (6) General Problems-Severe; and (7) Mildly Disruptive (Table 3). The interpretation of the seven Crawford County sample clusters was determined to be similar to that of the normative data set. Cross-classification analysis revealed that both clustering methods had a relatively high degree of agreement, with cross validation hit rates reporting between 68.4 to 97.1 percent agreement between the two grouping methods. For cases that were not assigned into the same cluster, the majority of cases were assigned to a cluster with a comparable definition.

An eight-cluster solution was found with the Clarke County sample. Again, all seven of the clusters from the normative sample were identified in this independent sample. An additional cluster, named Mildly Adapted, was also identified. This cluster was considered to represent a variation on the Well Adapted and Average clusters identified in the normative sample. The interpretation of the seven clusters found with the Clarke County sample was similar to the

Table 3

Mean T-Scores by Scale for the Crawford County Cluster Solution (N=537)

	Cluster						
Scales	1	2	3	4	5	6	7
Externalizing							
Aggression	44.44	43.36	**77.79**	49.76	48.89	58.80	59.86
Hyperactivity	43.21	44.46	**74.18**	53.67	49.84	**61.29**	57.87
Conduct Problems	45.51	45.07	**70.27**	51.34	48.68	57.63	53.39
Internalizing							
Anxiety	44.10	43.49	52.45	53.67	**61.13**	**70.26**	44.52
Depression	43.11	43.14	58.45	48.67	51.47	**67.34**	48.84
Somatization	48.43	46.07	48.60	49.60	**81.76**	**64.77**	46.71
School Problems							
Attention Problems	**39.70**	48.09	**64.15**	**61.39**	50.94	**67.94**	52.01
Learning Problems	42.45	47.88	**63.06**	**63.33**	50.97	**69.37**	48.64
Other Scales							
Atypicality	45.05	46.12	**69.76**	53.82	52.37	**71.94**	48.43
Withdrawal	43.41	44.56	49.82	52.46	50.16	**66.74**	44.43
Adaptive Skills							
Adaptability	57.96	49.33	**32.90**	40.17	48.26	**35.03**	44.48
Leadership	57.01	41.65	**39.06**	**36.48**	46.00	**36.40**	45.86
Social Skills	59.29	45.22	**37.18**	**39.60**	50.92	**38.89**	43.16
Study Skills	**60.46**	45.31	**37.18**	**38.01**	50.08	**36.29**	45.49
Cluster N	110	162	33	82	38	35	77
Crawford Co. %	21	30	6	15	7	7	14
Normative %	34	19	8	12	11	4	12
Percent Male	31	54	91	67	37	63	56
U. S. Norm Percent Male	39	48	78	60	40	67	70

Table 3 (cont'd.)

Note. Values that differ from the T-Score mean of 50 by 7 points or more in either direction are in boldface. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe, Cluster 7 = Mildly Disruptive. U. S. normative sample percentages by BASC TRS-C cluster provided for comparison.

solution found with the BASC norm data set (Table 4). For the purposes of cross-classification, the Mildly Adapted cluster was reordered between the Well Adapted and Average clusters as its profile resembled a middle ground between these two groups. Many children were classified into equivalent clusters based on the two clustering methods. Hit rates from the classification methods reported a high degree of agreement (at least 75%) for three clusters, Disruptive Behavior Problems, Physical Complaints/Worry and Mildly Disruptive. The remaining clusters showed moderate levels of agreement between the two classification methods. Overall, hit rate values were generally lower for the Clarke County sample than for the Crawford County sample, possibly due to the more diverse population of students in the Clarke County School System. However, results as a whole supported comparability amongst the two methods of classifying children into clusters.

External indicators of behavioral adjustment were also examined in order to provide support to the utility of this behavioral typology system. To this end, the frequencies of disciplinary infractions during the 1998-1999 school year were collected for each child in the Clarke County sample. Eight actions were targeted: (1) Referral to Student Support Team (SST)

Table 4

Mean T-Scores by Scale for the Clarke County Cluster Solution (N=1076)

	Cluster							
Scales	1	2	3	4	5	6	7	8
Externalizing								
Aggression	**43.47**	44.03	**67.34**	48.83	50.33	**72.22**	**59.91**	44.26
Hyperactivity	**41.64**	**42.78**	**65.88**	49.16	51.25	**67.56**	**61.44**	43.44
Conduct Problems	43.99	45.43	**69.09**	52.17	50.39	**80.56**	53.31	44.87
Internalizing								
Anxiety	43.98	44.88	55.31	46.77	**58.30**	**86.94**	47.94	**42.24**
Depression	43.47	45.02	**61.32**	46.57	54.83	**84.50**	53.36	**42.96**
Somatization	45.76	43.92	51.64	44.36	**67.93**	**68.00**	46.67	44.66
School Problems								
Attention Problems	**38.49**	48.57	**66.75**	59.04	53.06	**66.12**	55.64	**42.54**
Learning Problems	**40.32**	49.63	**65.13**	**61.96**	52.69	**67.50**	51.43	**43.06**
Other Scales								
Atypicality	44.23	45.68	**60.14**	49.76	53.81	**87.67**	49.71	44.32
Withdrawal	43.70	47.46	**61.35**	53.55	55.58	**73.61**	46.56	43.56
Adaptive Skills								
Adaptability	**62.11**	52.06	**32.65**	45.25	**57.76**	**35.83**	**42.86**	**57.76**
Leadership	**65.38**	**42.77**	**39.61**	**36.99**	49.64	46.12	49.90	54.60
Social Skills	**65.45**	45.06	**39.68**	**39.70**	51.64	47.44	48.52	53.21
Study Skills	**63.90**	45.66	**38.56**	**38.02**	48.85	**40.33**	48.42	55.38
Cluster N	185	178	113	139	72	18	142	229
Clarke Co. %	17	17	11	13	8	2	13	21
Normative %	34	19	8	12	11	4	12	n/a
Clarke Percent Male	33	50	75	51	42	56	63	44
U. S. Norm Percent Male	39	48	78	60	40	67	70	n/a

Table 4 (cont'd.)

Note. Values that differ from the T-Score mean of 50 by 7 points or more in either direction are in boldface. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe, Cluster 7 = Mildly Disruptive, Cluster 8 = Mildly Adapted. U. S. normative sample percentages by BASC TRS-C cluster provided for comparison.

meetings, (2) Number of suspensions, (3) Major disciplinary action (parents were called), (4) Minor disciplinary action (parents were not called), (6) Physical offense, (7) Verbal offense, and (8) Sexual Offense. For each of the eight disciplinary actions, the numbers of infractions committed were calculated for each cluster. Results are displayed in Figure 1. Additionally, to determine the extent of differences among groups, one-way ANOVAs were conducted between clusters using each disciplinary action as the dependent variable. Significant differences among the clusters as to the number of disciplinary infractions committed were found. The majority of disciplinary actions were given to students in three clusters: Disruptive Behavior Problems, General Problems-Severe, and Mildly Disruptive. For these clusters, major and minor disciplinary actions, physical offenses, and verbal offenses were most prevalent. Other clusters exhibited behavioral problems, but with less intensity. Children in the Academic Problems group were most often referred to SST meetings, perhaps due to their teachers' awareness of alternative instructional methods and programs designed to academically support these students in the classroom or identification for additional services. Children in the Average cluster had few disciplinary infractions, and infractions that were reported fell into the Minor Disciplinary Action or Verbal Offense categories. Well Adapted and Physical Complaints/Worry children

showed very few problems across the set of eight disciplinary actions. The disciplinary data provided initial but convincing evidence that the number of disciplinary offenses committed during a typical academic year helps support cluster differentiation.

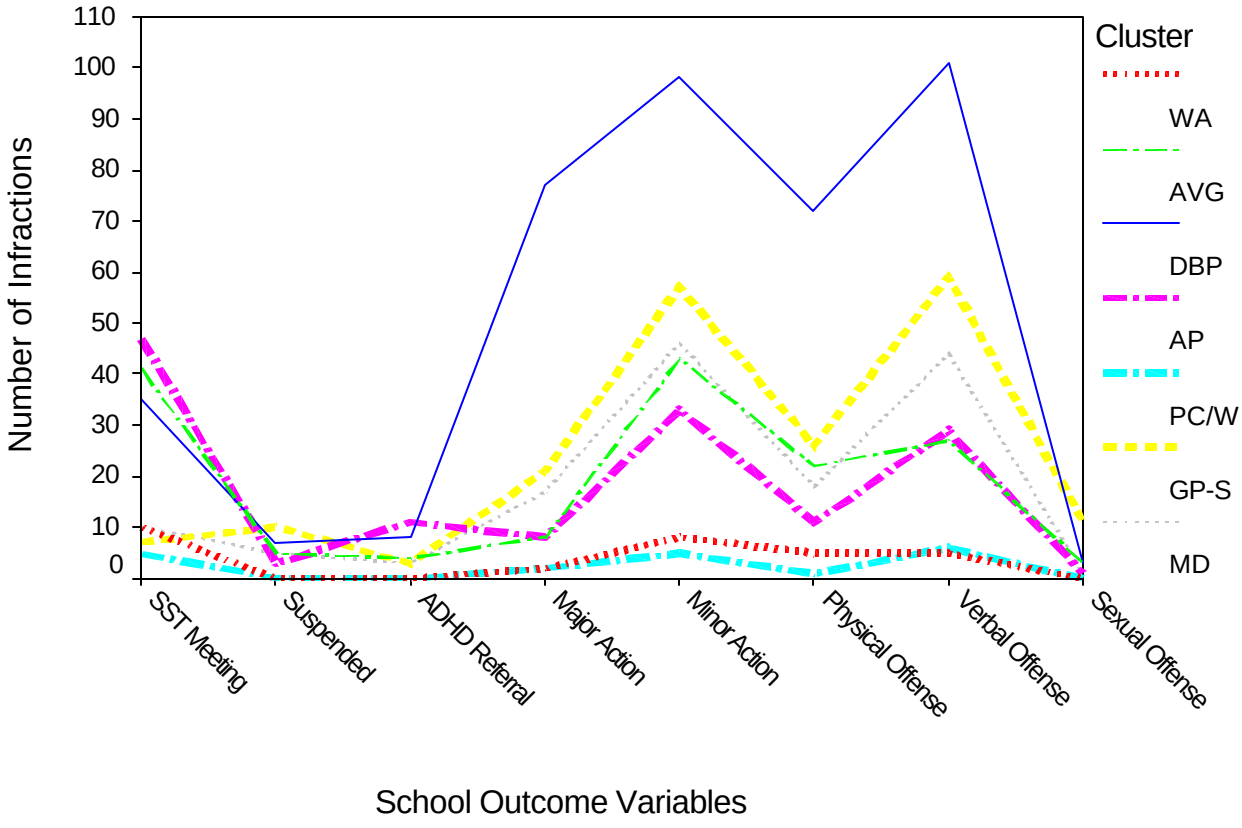

Figure 1. Number of Occurrences of Behavioral Infractions by Cluster for the Clarke County Cluster Solution (N = 1076)

Note. WA = Well Adapted, AVG = Average, DBP = Disruptive Behavior Problems, AP = Academic Problems, PC/W = Physical Complaints/Worry, GP-S = General Problems – Severe, MD = Mildly Disruptive

Kamphaus and DiStefano (2001) conducted a first test of cross-cultural effects on the BASC TRS-C typology using a sample of children from metropolitan Medellin, Colombia. Scores for a sample of 108 children ages 6 to 11 years were subjected to cluster analytic

techniques. Overall, results showed that most of the U. S. teacher-rated types were identified in the Colombian sample (Table 5). One exception was noted, in that the Mildly Disruptive cluster did not emerge.

Table 5

Mean T-Scores by Scale for the Medellin Cluster Solution (N=108)

	Cluster					
Scales	1	2	3	4	5	6
Externalizing						
Aggression	45.00	46.77	**61.33**	44.23	47.69	**69.83**
Hyperactivity	**43.22**	47.88	**58.17**	48.54	46.77	**73.33**
Conduct Problems	43.81	47.77	56.61	47.93	49.31	**75.83**
Internalizing						
Anxiety	**42.03**	48.81	55.78	54.00	50.69	**61.33**
Depression	43.88	46.42	**59.28**	47.15	49.62	**70.33**
Somatization	45.75	48.31	52.17	47.69	**58.13**	52.33
School Problems						
Attention Problems	**40.72**	50.84	**57.56**	**58.69**	**43.15**	**67.33**
Learning Problems	**41.13**	49.23	55.11	**57.00**	46.69	**69.33**
Other Scales						
Atypicality	**42.59**	48.23	**58.56**	49.77	48.62	**69.33**
Withdrawal	**40.44**	**42.69**	53.22	**65.62**	**62.46**	**69.33**
Adaptive Skills						
Adaptability	**59.03**	48.96	**39.61**	47.92	**57.23**	**32.33**
Leadership	**58.34**	45.96	46.22	**40.15**	55.08	**42.67**

Table 5 (cont'd.)

Mean T-Scores by Scale for the Medellin Cluster Solution (N=108)

Scales	Cluster 1	2	3	4	5	6
Social Skills	**59.34**	48.77	**42.56**	**42.92**	**57.92**	**38.67**
Study Skills	**58.63**	49.15	**43.22**	**38.00**	**60.23**	**36.00**
Cluster N	32	26	18	13	13	6
Medellin %	30	24	17	12	12	6
Normative %	34	19	8	12	11	4
Medellin Percent Male	34	50	89	62	31	67
Medellin Low SES %	34	46	50	62	62	67

Note. Values that differ from the T-Score mean of 50 by 7 points or more in either direction are in boldface. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe. Cluster 7 = Mildly Disruptive was not present in the Medellin sample. U. S. Normative sample percentages by BASC TRS-C cluster provided for comparison.

Rationale for the Current Study

In summary, the line of research utilizing the Behavior Assessment System for Children (BASC), to date, appears to support the assertion that child behavioral variation falls into a finite number of clusters or "types" of adjustment. Five behavioral clusters have consistently emerged with similar prevalence rates and gender ratios in studies of teacher report, including the Well Adapted, Average, Physical Complaints/Worry, Disruptive Behavior Problems, and General Psychopathology (or Problems) – Severe groups (Huberty et al., 1997; Kamphaus et al., 1997;

Kamphaus & DiStefano, 2001; DiStefano et al., 2003; Kamphaus et al., in press) as well as parent report (Kamphaus et al., 1999). Preliminary efforts have also been made to externally validate these clusters according to demographic, cognitive, and predictive characteristics (Hendry, Petoskey, & Kamphaus, 1999; Petoskey, Cody, & Kamphaus, 1997; Petoskey, 2001). Additionally, some of these types appear to be rating scale independent with similar types being identified using the Missouri Children's Behavior Checklist (Curry & Thompson, 1985), the Adjustment Scales for Children and Adolescents (McDermott & Weiss, 1995), the Child Behavior Checklist (Edelbrock & Achenbach, 1980), and other instruments. Table 6 illustrates a comparison of cluster solutions presented in the literature.

Further research is needed to support the hypothesis that child behavioral types are sample independent and to externally validate, and thereby advance the potential clinical utility of such types. At this stage, the usefulness of any proposed behavioral typology is limited. A functional classification scheme for behavior in general has eluded behavioral scientists to date (Kagan, 1997). With continued progress toward describing and classifying typical and atypical child behavioral variation, eventually prediction of behavioral adjustment in school will allow for meaningful practical implications such as the design of prevention and intervention programs.

To this end, for this study, BASC TRS-C scores for an independent sample of 200 clinic-referred children, 6 to 11 years of age, were cluster analyzed. Evidence of clusters replicating in an independent sample, particularly one with the unique characteristic of comprising only clinical referrals, will provide greater understanding of behavioral adjustment in this particular subset of children.

Table 6

Comparison of the BASC TRS-C Normative Typology to Related Cluster Solutions

BASC TRS-C Normative Typology

	Well Adapted	Average	Disruptive Behavior Problems	Academic Problems	Physical Complaints/ Worry	General Psychopath-ology-Severe	Mildly Disruptive
IJR (Lessing, Williams, & Gil, 1982)	High Assets/Low Symptom Profile	Moderate Assets/ Egocentric		Sociopathic/ Academic Problems	Insecure/ Somaticizing	Diffuse, Mixed Pathology	
MCBC (Curry & Thompson, 1985)	Problem-Free Profile		External Profile		Internal Profile	Mixed Internal and External Profile	
PIC (Gdwoski, Lachar, & Kline, 1985)		Within Normal Limits		Cognitive Dysfunction		Emotional/ Behavioral/ Learning	
PIC (Lacombe, Kline, Lachar, Butkus, & Hillman, 1991)		Within Normal Limits		Cognitive Dysfunction		Emotional/ Behavioral/ Learning	
ASCA (McDermott & Weiss, 1995)	Adjusted					Maladjusted	Marginal Adjustment
CBP (Edelbrock & Achenbach, 1980)			Delinquent		Somatic Complaints	Schizoid	
CBP (McConaughy, Achenbach, & Gent, 1988)					Somatic Complaints	Schizoid	
CBCL (Frankel et al., 1992)	Problem-Free		Externalizing			Mixed Internalizing and Externalizing	
BASC PRS-C (Kamphaus, Petoskey, Cody, Rowe, Huberty, & Reynolds, 1999)	Well Adapted	Average	Disruptive Behavior Problems		Physical Complaints/ Worry	General Psychopath-ology-Severe	

Table 6 (cont'd.)

Comparison of the BASC TRS-C Normative Typology to Related Cluster Solutions

BASC TRS-C Normative Typology

	Well Adapted	Average	Disruptive Behavior Problems	Academic Problems	Physical Complaints/ Worry	General Psychopath-ology-Severe	Mildly Disruptive
BASC TRS-P (Kamphaus, DiStefano, Petoskey, & Hendry, in press)	Well Adapted	Average	Disruptive Behavior Problems		Physical Complaints/ Worry	General Problems - Severe	
BASC TRS-C Crawford County, Rural Sample (DiStefano, Kamphaus, Horne, & Winsor, 2003)	Well Adapted	Average	Disruptive Behavior Problems	Academic Problems	Physical Complaints/ Worry	General Problems - Severe	Mildly Disruptive
BASC TRS-C Clarke County, Urban Sample (DiStefano, Kamphaus, Horne, & Winsor, 2003)	Well Adapted	Average	Disruptive Behavior Problems	Academic Problems	Physical Complaints/ Worry	General Psychopath-ology - Severe	Mildly Disruptive
BASC TRS-C Medellin, Colombia, Cross-Cultural Sample (Kamphaus & DiStefano, 2001)	Well Adapted	Average	Disruptive Behavior Problems	Academic Problems	Physical Complaints/ Worry	General Psychopath-ology - Severe	

Further, each cluster was characterized according to degree of functional impairment as represented by external indicators of behavioral adjustment, school performance, and cognitive development. For behavioral adjustment, the Total T-Score from the Achenbach Teacher's Report Form (TRF; Achenbach, 1991c) was used as the index of functional impairment. School performance was assessed using total reading and total mathematics

scores from commonly used standardized measures of individually-administered tests of academic achievement. Cognitive development was measured using total intelligence index scores from frequently used standardized measures of individually-administered tests of cognitive ability. Additionally, risk factors (e.g., pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and previous diagnoses) and outcomes (e.g., current diagnoses and special education placement) for each cluster were identified. Such external correlate information was helpful in differentiating both the behaviors and important school outcomes of children in different clusters.

Overall, it was anticipated that this study would yield a possible basis for classification derived through dimensional, person-oriented methods that could sort children by risk and functional impairment for diagnostic purposes. Thus, this study aimed to promote additional advances in the study of child behavior in that more meaning could be inferred from the current line of BASC typology research and that treatment needs of children could be more readily identified.

CHAPTER 3

METHOD

Participants

All participants were children who had been referred to a university-based psychoeducational clinic located in northeast Georgia. The clinic receives primarily local referrals from parents, teachers, physicians, and child welfare agencies. The majority of referrals are in regard to learning problems and/or behavioral difficulties. The clinic provides assessment and intervention services to the surrounding community on a fee-for-service basis with a sliding scale based on income. Typically, assessments take place three to six months after a given referral is received. Fully informed written consent is obtained from each client of legal age or client guardian, and verbal assent is obtained by each minor, prior to participating in a psychoeducational assessment. The consent form notifies the parties that assessment data may be used for research purposes. Clinic services typically include a comprehensive psychoeducational evaluation that takes place over the course of two days. Evaluations are conducted by doctoral students in Educational Psychology or related fields (e.g., clinical and counseling psychology). As the clinic is a teaching and diagnostic facility, all assessment protocols are checked twice for accuracy, and student clinicians are supervised by licensed faculty.

The entire clinic data set consists of 576 participants who were evaluated between the years 1994 to 2002. All data was input into a database with identifying information deleted. The study was exempted by The University of Georgia Institutional Review Board for human subjects review on 11/24/04. Analysis of the database revealed that 91.8% of the clients seen

were Caucasian, 6.5% were African-American, 0.7% were Hispanic, 0.7% were Asian, and 0.2% were coded as "other." Socio-economic status, tracked as years of education attained by parents of the clients seen, yielded a mean number of years of 14.72.

For inclusion in this study, several exclusionary criteria were applied in order to target variables of interest. Participants were children 6 to 11 years of age who had received a psychoeducational evaluation that included the BASC TRS-C, BASC PRS-C, and the Achenbach Teacher's Report Form (TRF). These evaluations were conducted between 1998 and 2002. A total of 200 out of 576 children met the above criteria, and were thereby included in the current study. The sample of 200 participants was 65.5 male and 34.5 female. 92% of the clients were Caucasian, 7% African-American, 0.5% Asian-American, and 0.5% of other ethnic origin. The socio-economic status of the sample, as measured by parent's years of education completed, was 14.62 years. In terms of their highest levels of education, approximately 2% of the parents had not completed high school, 33.5% had obtained a high school diploma, 12% had completed some college, 28% had obtained a Bachelor's degree, and 24.5% attended graduate school for at least one year. In addition to the BASC TRS-C, Achenbach TRF, and BASC PRS-C, each participant received an evaluation that consisted of at least one standardized measure of intelligence, one or more standardized measures of achievement, one or more other behavior rating scales, and a diagnostic interview.

Instrumentation

Behavior Assessment System for Children

The Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) consists of both teacher (BASC TRS) and parent (BASC PRS) ratings scales, with preschool (P), child (C), and adolescent (A) levels of each form, as well as a self-report scale (BASC SRP) with

separate child (C) and adolescent (A) level forms, student observation system (BASC SOS), and structured developmental history form (BASC SDH). The BASC TRS-C and BASC PRS-C are designed for use with children ages 6 to 11 and have 148 items (14 scales) and 130 items (12 scales), respectively. Items are rated on a four-point response scale of frequency, ranging from "Never" to "Almost Always." Separate BASC teacher and parent forms are available for preschoolers (ages 4 to 5) and adolescents (ages 12 to 18).

The BASC TRS and PRS were developed using a blend of rational/theoretical and empirical approaches to instrument development (Martin, 1988). Scales and items were selected a priori to assess a broad array of adaptive as well as maladaptive behavior constructs. Empirical studies with two pilot samples and the national sample, in addition to content reviews, were used to guide scale refinement. As such, the BASC TRS and PRS scales represent a significant reduction from the initial pool of 600 items. Covariance structure analysis was one method used to ensure that the final set of scales was not redundant. Scale items also were ordered in such a way so as to discourage rater response sets (Reynolds & Kamphaus, 1992). Table 6 presents descriptions of the BASC PRS and TRS scales.

The BASC TRS-C and PRS-C norming data were collected at 116 sites representing various regions of the United States, representing a diverse sampling of the population by geographic region, SES, ethnicity, and child exceptionality. The BASC TRS-C normative sample consisted of 1228 elementary school children (ages 6-11), attending both public and private schools. The BASC PRS-C normative sample consisted of 2029 elementary school children (ages 6-11), attending both public and private schools. African-American and Hispanic children were over-sampled to a limited extent in order to ensure adequate representation.

Table 7

Behavior Assessment System for Children Scales and Descriptions

Scale		Description
Externalizing		
	Aggression	Tendency to act in a hostile manner (either verbal or physical) that is threatening to others
	Hyperactivity	Tendency to be overly active, rush through work or activities, and act without thinking
	Conduct Problems	Tendency to engaged in antisocial and rule-breaking behavior, including destroying property
Internalizing		
	Anxiety	Tendency to be nervous, fearful, or worried about real or imagined problems
	Depression	Feelings of unhappiness, sadness, and stress that may result in inability to carry out everyday activities (neurovegetative symptoms) or may bring thoughts of suicide
	Somatization	Tendency to be overly sensitive to and complain about relatively minor problems and discomforts
School Problems		
	Attention Problems	Tendency to be easily distracted and unable to concentrate more than momentarily
	[a]Learning Problems	Presence of academic difficulties, particularly in understanding or completing schoolwork
Other Scales		
	Atypicality	Tendency to behave in ways that are immature, considered “odd,” or commonly associated with a psychosis (such as experiencing visual or auditory hallucinations)
	Withdrawal	Tendency to evade others to avoid social contact

Adaptive Skills

Adaptability	Ability to adapt readily to changes in the environment
Leadership	Skills associated with accomplishing academic, social, or community goals, including, in particular, the ability to work well with others
Social Skills	Skills necessary for interacting successfully with peers and adults in home, school, and community settings
[b]Study Skills	Skills conducive to strong academic performance, including organizational skills and good study habits

Note. From Reynolds and Kamphaus (1992). Adapted with permission.

[a,b]The Learning Problems scale and the Study Skills scale appear only on the BASC TRS.

Additionally, an attempt was made to include children with known exceptionalities (e.g., learning disabilities) in proportion to population characteristics. Characteristics of the normative sample closely approximate population attributes with respect to the distribution of parent education levels and percent of children receiving special education services (5.8% females and 9.9% males) (Kamphaus & Frick, 1996). Over 90 percent of the children in the norm sample had not been diagnosed by medical or special education classification systems.

Although four sets of norm tables (General, Female, Male, and Clinical) were available, the BASC TRS-C and PRS-C normative cluster studies, and therefore the present study, used general national norms for several reasons: (1) gender-separate norms mask sex differences (Kamphaus & Frick, 1996), (2) gender differences on the scales were exceedingly small (Reynolds & Kamphaus, 1992), (3) highly similar typologies were yielded when gender norms were used (Huberty et al., 1997), and (4) major classification systems such as the DSM-IV

(APA, 1994) do not use gender-specific criteria for diagnoses. All norm tables were based on a linear transformation of raw scores to T-Scores (M=50, SD=10).

The BASC manual (Reynolds & Kamphaus, 1992) provides three types of reliability evidence: interrater reliability, test-retest reliability, and internal consistency (median internal consistency coefficient of .82). The manual also presents factor analytic support via principal-axis and covariance structure analysis methods for the construct validity of the scales. Additionally, the BASC TRS scales typically yield high correlations with similar scales from other teacher rating forms (Kamphaus & Frick, 1996). Additionally, several independent reviews of the BASC have noted that the TRS possesses adequate to good evidence of validity and reliability, although as the BASC is a relatively recent measure, additional research is warranted (Adams & Drabman, 1994; Flanagan, 1995; Hoza, 1994; Jones & Witt, 1994; Kline, 1994; Sandoval & Echandia, 1994).

Assessment of Functional Impairment

Behavioral adjustment. The Achenbach Teacher's Report Form (TRF; Achenbach, 1991c) represents one component of a standardized behavior rating program which also consists of the Achenbach Child Behavior Checklist (CBCL; Achenbach, 1991b), a parent rating scale, as well as a self-report scale, the Achenbach Youth Self-Report (YSR; Achenbach, 1991d). This instrument is considered to be a reliable, well-validated measure of child behavior (Kamphaus & Frick, 2002) and has shown evidence of cross-cultural generalizability (DeGroot, Koot, & Verhulst, 1994). The Achenbach TRF is designed for use with children ages 5 to 18 and consists of eight competence items and 113 "problem" items. Problem items are rated on a three-point response scale of frequency, including "Not True" = 0, "Somewhat or Sometimes True" = 1, and "Very True or Often True" = 2. These items comprise the following nine syndrome scales:

Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, Aggressive Behavior, and Other Problems. Scores from each syndrome scale comprise the Total Problems composite.

Per interpretation recommendations (Achenbach, 1991a), a cut point of T = 60 was designated to delineate between the normal and clinical ranges of behavior as measured by the Total Problems composite. Therefore, Total Problems T-Scores of 60 or above represented borderline clinical to clinically significant behavior problems, with the severity of problems increasing as scores climb higher.

As a second indicator of behavioral adjustment, the BASC PRS-C total Behavioral Symptoms Index, similar to the Achenbach TRF Total Problems composite, was examined. The same T-Score metric applied.

School performance. This index of functional impairment was assessed using total reading and total mathematics scores from commonly used standardized measures of individually-administered tests of academic achievement. Quantitative outcome measures of academic achievement included standard scores from the Wechsler Individual Achievement Test (WIAT; The Psychological Corporation, 1992), the Kaufman Test of Educational Achievement (K-TEA; Kaufman & Kaufman, 1985), the Basic Achievement Skills Individual Screener (BASIS; The Psychological Corporation, 1983) and the Woodcock-Johnson Psycho-Educational Battery-Revised Tests of Achievement (WJ-R ACH; Woodcock & Johnson, 1989). The reading achievement and mathematics achievement scores submitted for analysis each represented a composite mean of all relevant scales.

Cognitive development. This indicator of development was measured using total intelligence index scores from frequently used standardized measures of individually-

administered tests of cognitive ability. Quantitative outcome measures of intelligence were full-scale I. Q. scores from one of the following standardized measures: the Differential Ability Scales (DAS; Elliott, 1990), the Wechsler Intelligence Scale for Children-Third Edition (WISC-III; Wechsler, 1991), the Stanford-Binet Intelligence Scale-Fourth Edition (SB-IV; Thorndike, Hagen, & Sattler, 1986), and the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983).

Assessment of Risk Factors and Outcomes

Additionally, risk factors (e.g., pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and previous diagnoses) and outcomes (e.g., current diagnoses and special education placement) for each cluster were identified using information obtained from developmental histories. In addition to the BASC Structured Developmental History form (BASC SDH; Reynolds & Kamphaus, 1992), observations, clinical interview responses, and reviews of files were used to document qualitative data. Specific response variables included demographic characteristics such as gender, ethnicity, and socio-economic status as determined by parental level of education. Educational and psychological characteristics included history of pre-kindergarten problems, special education placement, conduct problems, poor grades, hyperactive/impulsive behaviors, and prior diagnoses. Current diagnostic characteristics of the sample also were investigated.

Procedures

Cluster Analysis

Cluster analysis refers to a set of classification procedures used to uncover homogeneous groups underlying a data set (Anderberg, 1973; Aldenderfer & Blashfield, 1984; Blashfield & Aldenderfer, 1988; Hartigan, 1975; Milligan & Cooper, 1987). The goal of cluster analysis is to

create smaller subgroups of children that are similar to members within a cluster yet distinct from members of other clusters. Many different methods exist for clustering data. The most popular algorithm in the social sciences, Ward's hierarchical analysis, creates groups that have minimum variance within a cluster (Ward, 1963). However, a drawback to the Ward method is that once a case is assigned as a member of a particular cluster, it cannot be reassigned as the clustering procedure continues. Therefore, a case assigned to a cluster early in the procedure may ultimately have a stronger association with a different cluster at the conclusion of the analysis. However, such a case would not be permitted to change cluster membership.

To correct this problem, a K-means iterative clustering procedure was used. The K-means iterative procedure allows for cases to switch from their initial cluster assignment to a different cluster when it becomes more closely represented as a typical member of a new cluster (MacQueen, 1967). The iterative process continues making "passes" through the data set until cases do not change clusters. By using the final Ward's solution as the initial starting point for the K-means procedure, the benefits of both clustering algorithms are achieved.

To begin the clustering procedure, a Cubic Clustering Criterion (CCC) plot was used to judge the number of clusters underlying the data set (Sarle, 1983). The CCC plot was used to visually demonstrate the number of clusters needed to reduce the larger data set into a smaller number of groups. The squared Euclidean distance measure was used as the index of similarity to group cases. When used in conjunction with the Ward/K-means procedure, cases join the cluster in which the squared Euclidean distance between the case and the cluster centroid was minimized. Further, pseudo F and T^2 statistics were examined as additional indicators of the number of interpretable clusters. The same clustering procedure to be used in the present study was employed with the BASC TRS-C norming sample (Kamphaus et al., 1997). As the identical

clustering procedures were used, there was assurance that differences in cluster solutions were not the result of a different clustering algorithm or different similarity indices used to group the data. For the normative sample and the clinical sample described in the study, all 14 BASC TRS-C scales were used for their respective typologies. SAS for Windows (version 8, SAS Institute, 1996) was used to conduct all analyses.

Cross-Validation. In order to assess internal validation, obtained cluster solutions were submitted to a half-sampling procedure.

Cross-Classification. Assuming that at least 5 of the 7 BASC TRS-C clusters emerged as a result of the aforementioned cluster analysis, cross-classification methods were used to further validate the solution. If not, the obtained cluster solution from this study would be used for external validation purposes. It is common to apply a classification rule built on an existing cluster solution to classify ungrouped cases. The classification rule was based upon predictive discriminant analysis where the linear classification function can be used to "predict" membership of an ungrouped case by assigning each case to the cluster it most closely associates (Huberty, 1994; Huberty, DiStefano & Kamphaus, 1997). Prediction of cluster membership requires information from the original sample, including cluster membership of the grouped cases, and probability information relaying the likelihood of encountering a certain subgroup of children in the population. The classification rule used a combination of the definition of the cluster solution and prior probability information to classify a case into the cluster with which it most closely associates. Results between cases assigned with the classification rule and through independent clustering may be compared to determine if children were assigned to similar clusters. If cross classification results for children classified with the rule built on the TRS-C norm sample are similar to results from independent clustering, this provides assurance that a

child would have received the same or a similar typology assignment regardless of grouping method used to classify the data.

Hit rates were computed by taking the number of cases classified into the same cluster by both methods (i.e., "correctly"), divided by the cluster sample size from the U. S. normative sample. To assist in judging the adequacy of results, hit rates showing at least 75% agreement between the two classification methods were considered to represent high agreement among the two methods, hit rates between 50% and 74% agreement would represent moderate agreement, levels between 30% and 49% agreement would mark fair agreement, and hit rates lower than 30% agreement would denote poor agreement between the classification methods (DiStefano, Kamphaus, Horne & Winsor, 2003).

External validation. Clusters were then characterized with regard to frequencies and mean vectors on the following (p=14) quantitative and qualitative response variables. Demographic variables included: gender (1 = male, 0 = female), ethnicity (Caucasian, African-American, Other), and socio-economic status as determined by number of years of parental education. Behavioral adjustment will be measured according to the Achenbach TRF Total T-score (mean = 50, standard deviation = 10). School performance (mathematics and reading achievement) and cognitive development will be measured according to standard scores (mean = 100, standard deviation = 15). The following risk factors and outcomes were scored dichotomously (1 = present, 0 = not present): pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, prior diagnoses, current diagnoses, and special education placement.

Additionally, to provide additional support of cluster differentiation, chi-square analyses were conducted for the purpose of determining differences among the clusters in terms of gender, ethnicity, and socio-economic status as determined by parental educational level. This

type of procedure was also used in order to determine if clusters differ in proportions of children having the risk factors of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and prior diagnoses, as well as the outcomes of current diagnoses and special education placement.

Analysis of variance was utilized in order to determine the extent of the differences among the clusters on indicators of functional impairment (i.e., behavioral adjustment, school performance, and cognitive development). Obtained BASC TRS-C clusters were used as the independent grouping variables for a series of three one-way ANOVAs reflecting each type of measured functional impairment. Differences at the .05 level were be followed by post-hoc contrasts (e.g., Tukey post-hoc test) to investigate mean differences amongst the groups.

All of these analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 10.0 for Windows and SAS for Windows (version 8, SAS Institute, 1996).

CHAPTER 4

RESULTS

Cluster Analytic Findings

The entire clinic-referred dataset (N=200) was submitted to the Ward's hierarchical cluster analysis followed by a K-means iterative clustering procedure. As mentioned earlier, the same cluster methodology was applied to this dataset as had been utilized in the original BASC TRS-C norming sample (Kamphaus et al., 1997). As the identical clustering procedures were used, there was assurance that differences in cluster solutions were not the result of a different clustering algorithm or different similarity indices used to group the data.

To begin the clustering procedure, a Cubic Clustering Criterion (CCC) plot was used to judge the number of clusters underlying the data set (Sarle, 1983). The CCC plot was used to visually demonstrate the number of clusters needed to reduce the larger data set into a smaller number of groups. The CCC plot information suggested that between six and ten clusters were underlying the clinic-referred data set (Figure 2). Pseudo F and T^2 statistics were examined as additional indicators of the number of interpretable clusters, confirming the presentation of the resulting CCC plot. Upon further examination, it was determined that the nine and ten cluster solutions were not appropriate for further interpretation given that some clusters in each only comprised one participant. Visual inspection of scatterplots for outliers revealed no significant interference.

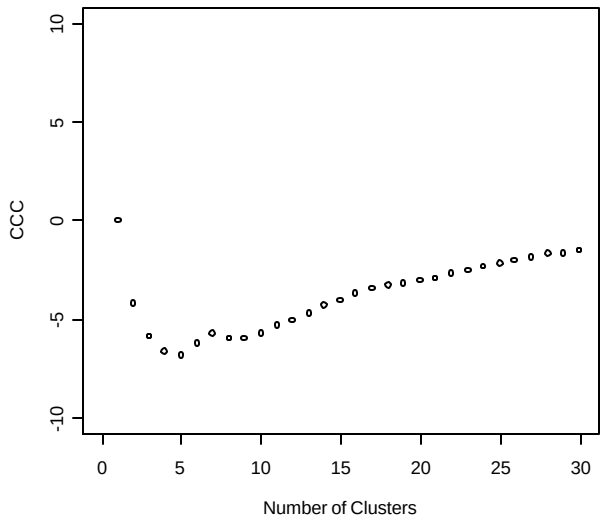

Figure 2. Cubic Clustering Criterion Scatterplot for the Clinic-Referred Sample

From this initial information, six through eight cluster solutions were run and interpreted for the clinic-referred sample. In order to investigate internal validation, each of the six through eight cluster solutions were further submitted to cluster analysis of half-samples to provide evidence of cross-validation After evaluating each of the cluster solutions, a six-cluster solution was agreed upon as the most parsimonious, due to the interpretability of centroid information, match of the solution to previous research, evidence of cross-validation, and cluster characteristics such as gender distribution and cluster size. The BASC TRS-C means and standard deviations for the entire sample (N=200) are presented in Table 8. The cluster solution is presented in Table 9.

The naming of the clusters was somewhat arbitrary in nature. The clusters were so named based on results from the BASC TRS-C normative typology. In looking at the obtained results for the clinic-referred sample, one might associate Cluster 1 (Internalizing) with the General

Psychopathology-Severe type from the normative solution, and Cluster 5 (Disruptive Behavior Problems) with the Mildly Disruptive type from the normative solution.

Table 8

BASC TRS-C Means and Standard Deviations for the Clinic-Referred Sample (N=200)

Scales	Mean*	Standard Deviation
Externalizing		
Aggression	51.50	10.47
Hyperactivity	54.72	12.16
Conduct Problems	49.72	8.33
Internalizing		
Anxiety	54.13	11.16
Depression	51.26	11.80
Somatization	52.73	13.78
School Problems		
Attention Problems	62.66	10.99
Learning Problems	61.63	10.79
Other Scales		
Atypicality	55.94	10.76
Withdrawal	53.22	11.02
Adaptive Skills		
Adaptability	45.17	9.61
Leadership	44.82	8.57
Social Skills	46.49	9.77
Study Skills	42.51	7.96

Note. Scores are based on a T-Score metric (M = 50, SD = 10)

Table 9

Mean T-Scores by Scale for the BASC TRS-C Clinic-Referred Sample Cluster Solution (N=200)

	Cluster					
Scales	1	2	3	4	5	6
Externalizing						
Aggression	**64.09**	47.45	**42.44**	**62.55**	**59.76**	47.06
Hyperactivity	**59.79**	44.95	**41.68**	**58.84**	**61.95**	51.31
Conduct Problems	**58.44**	49.14	**42.15**	**58.68**	**61.02**	47.32
Internalizing						
Anxiety	**63.22**	49.80	44.59	56.92	43.97	54.09
Depression	**65.99**	48.68	43.65	**70.83**	48.88	47.33
Somatization	**76.32**	47.51	48.78	50.50	46.36	51.33
School Problems						
Attention Problems	**58.28**	53.22	**37.26**	**57.07**	53.27	53.04
Learning Problems	**63.66**	52.85	**39.85**	53.12	48.59	54.28
Other Scales						
Atypicality	**64.81**	50.19	**41.87**	**58.23**	54.70	49.30
Withdrawal	**64.09**	52.94	45.44	**62.46**	46.56	46.13
Adaptive Skills						
Adaptability	**37.98**	47.24	**59.86**	**39.03**	43.95	53.10
Leadership	45.12	**42.23**	**58.67**	45.19	47.18	53.98
Social Skills	47.71	**42.10**	**57.91**	43.90	43.88	56.86
Study Skills	**37.44**	**42.54**	**61.52**	44.41	46.54	52.82

Note. Values that differ from the T-Score mean of 50 by 7 points in either direction are in boldface. Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems.

Demographic Characteristics

The entire sample of 200 participants was 65.5 male and 34.5 female. 92% of the clients were Caucasian, 7% African-American, 0.5% Asian-American, and 0.5% of other ethnic origin. The socio-economic status of the sample, as measured by parent's years of education completed, was 14.62 years. In terms of their highest levels of education, approximately 2% of the parents had not completed high school, 33.5% had obtained a high school diploma, 12% had completed some college, 28% had obtained a Bachelor's degree, and 24.5% attended graduate school for at least one year. Demographic characteristics for the cluster solution are presented in Table 10.

Table 10

Sample Sizes, Proportions, and Demographic Characteristics for the BASC TRS-C Clinic Referred Sample Cluster Solution (N=200)

Cluster*	N	%**	%M	%F	%C	%AA	%A	%O	SES-L***	SES-A	SES-H
1	8	4.0	75.0	25.0	100.0	0.0	0.0	0.0	37.5	25.0	37.5
2	50	25.0	66.0	34.0	88.0	12.0	0.0	0.0	46.0	30.0	24.0
3	47	23.5	51.1	48.9	95.7	4.3	0.0	0.0	21.3	38.3	40.4
4	19	9.5	73.7	26.3	89.5	10.5	0.0	0.0	47.4	31.6	21.0
5	28	14.0	89.3	10.7	89.3	10.7	0.0	0.0	42.9	46.4	10.7
6	48	24.0	60.4	39.6	93.7	2.1	2.1	2.1	29.2	54.2	16.6
Total	200	100	65.5	34.5	92.0	7.0	0.5	0.5	35.5	24.5	40.0

Note. *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. The abbreviation %** = % of total sample, ***SES-L = Socio-economic status defined by <12

years of parental education, SES-A = Socio-economic status defined by 12-16 years of parental education, SES-H = Socio-economic status defined by = 17 years of parental education, M = male, F = female, A = Asian-American, AA = African-American, C = Caucasian, O = Other race/ethnicity.

Functional Impairment

Behavioral adjustment. The Achenbach Teacher's Report Form (TRF; Achenbach, 1991c) and BASC PRS-C were used as indicators of behavioral adjustment. The Achenbach Total Problems composite and BASC PRS-C total Behavioral Symptoms Index means and standard deviations by cluster are presented in Table 11. A cut point of T = 60 was designated to delineate between the normal and clinical ranges of behavior.

School performance. This index of functional impairment was assessed using total reading and total mathematics scores from commonly used standardized measures of individually-administered tests of academic achievement. Quantitative outcome measures of academic achievement included standard scores from the Wechsler Individual Achievement Test (WIAT; The Psychological Corporation, 1992), the Kaufman Test of Educational Achievement (K-TEA; Kaufman & Kaufman, 1985), the Basic Achievement Skills Individual Screener (BASIS; The Psychological Corporation, 1983) and the Woodcock-Johnson Psycho-Educational Battery-Revised Tests of Achievement (WJ-R ACH; Woodcock & Johnson, 1989). The reading achievement and mathematics achievement scores submitted for analysis each represented a composite mean of all relevant scales. Results are presented in Table 12.

Cognitive development. This indicator of development was measured using total intelligence index scores from frequently used standardized measures of individually-administered tests of cognitive ability. Quantitative outcome measures of intelligence were full-scale I. Q. scores from one of the following standardized measures: the Differential Ability Scales (DAS; Elliott, 1990), the Wechsler Intelligence Scale for Children-Third Edition (WISC-

III; Wechsler, 1991), the Stanford-Binet Intelligence Scale-Fourth Edition (SB-IV; Thorndike, Hagen, & Sattler, 1986), and the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983). Results are presented in Table 13.

Table 11

Achenbach TRF and BASC PRS-C Means and Standard Deviations by Cluster for the Clinic-Referred Sample (N=200)

	Achenbach TRF Total Problems**				BASC PRS-C BSI***			
Cluster*	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Cluster 1	72.63	4.63	66.00	80.00	65.25	15.82	52.00	90.00
Cluster 2	57.04	7.24	37.00	71.00	58.68	14.03	29.00	89.00
Cluster 3	50.60	6.31	34.00	68.00	52.49	10.28	32.00	81.00
Cluster 4	68.47	5.47	57.00	76.00	65.95	13.52	44.00	87.00
Cluster 5	62.25	6.38	48.00	80.00	58.14	12.47	37.00	95.00
Cluster 6	59.27	7.02	45.00	76.00	54.52	10.94	37.00	86.00
Total	58.50	8.81	34.00	80.00	57.10	12.85	29.00	95.00

Note. Scores are based on a T-Score metric (M = 50, SD = 10). *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. **Achenbach Teacher's Report Form Total Problems Composite. ***BASC Parent Rating Scale – Child Form Behavioral Symptoms Index.

Table 12

Reading and Mathematics Achievement Means and Standard Deviations by Cluster for the Clinic-Referred Sample (N=200)

	Reading Achievement[1]				Mathematics Achievement[2]			
Cluster*	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Cluster 1	85.87	18.88	53.00	109.00	89.38	14.58	73.00	116.00
Cluster 2	94.38	15.50	67.00	125.00	95.46	12.76	67.00	125.00
Cluster 3	100.64	15.95	69.00	135.00	103.47	16.11	59.00	143.00
Cluster 4	102.21	16.69	74.00	140.00	97.32	12.51	74.00	122.00
Cluster 5	100.71	15.98	66.00	131.00	100.07	15.11	62.00	128.00
Cluster 6	96.52	13.75	64.00	128.00	97.40	15.03	65.00	135.00
Total	97.66	15.78	53.00	140.00	98.39	14.78	59.00	143.00

Note. Scores are based on a standard score metric (M = 100, SD = 15). *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. [1, 2]Reading Achievement and Mathematics Achievement scores submitted for analysis were the composite means of all relevant scales from the Wechsler Individual Achievement Test (WIAT; The Psychological Corporation, 1992), Kaufman Test of Educational Achievement (K-TEA; Kaufman & Kaufman, 1985), Basic Achievement Skills Individual Screener (BASIS; The Psychological Corporation, 1983), and the Woodcock-Johnson Psycho-Educational Battery-Revised Tests of Achievement (WJ-R ACH; Woodcock & Johnson, 1989).

Table 13

Means and Standard Deviations of Intelligence Scores by Cluster for the Clinic-Referred Sample (N=200)

	Intelligence Scores[1]			
Cluster*	Mean	SD	Min.	Max.
Cluster 1	84.38	17.21	71.00	123.00
Cluster 2	95.46	15.18	73.00	138.00
Cluster 3	106.04	16.06	56.00	134.00
Cluster 4	97.32	14.98	70.00	120.00
Cluster 5	95.11	14.26	65.00	122.00
Cluster 6	96.88	14.34	64.00	126.00
Total	97.97	15.79	56.00	138.00

Note. Scores are based on a standard score metric (M = 100, SD = 15). *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. [1]Intelligence scores were total intelligence index scores from frequently used standardized measures of individually-administered tests of cognitive ability, i.e., Differential Ability Scales (DAS; Elliott, 1990), Wechsler Intelligence Scale for Children-Third Edition (WISC-III; Wechsler, 1991), Stanford-Binet Intelligence Scale-Fourth Edition (SB-IV; Thorndike, Hagen, & Sattler, 1986), Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983).

Risk Factors and Outcomes

Indicators of risk factors were assessed and scored dichotomously (1 = present, 0 = not present): pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, prior diagnoses, and special education placement. Risk factor data is presented in Table 14. Outcomes, defined as current DSM diagnoses, are presented in Tables 15 and 16.

Table 14

Risk Factor Characteristics by Cluster for the Clinic-Referred Sample (N=200)

Cluster*	N	%**	PreK	Hyp/Imp	Conduct	Poor Grades	Prior Dx	Sp. Educ.
1	8	4.0	62.5	62.5	50.0	37.5	37.5	50.0
2	50	25.0	40.0	32.0	14.0	54.0	22.0	20.0
3	47	23.5	25.5	19.1	6.4	23.4	14.9	12.8
4	19	9.5	36.8	52.6	42.1	52.6	10.5	10.5
5	28	14.0	53.6	67.9	32.1	39.3	14.3	10.7
6	48	24.0	31.3	33.3	8.3	50.0	14.6	12.5
Total	200	100	37.0	37.5	17.5	43.0	17.0	15.5

Note. *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems.The abbreviation %** = % of total sample. All figures presented for risk factors are percentages of children exhibiting the respective characteristics. PreK = history of pre-kindergarten problems, Hyp/Imp = presence of hyperactive/impulsive behavior, Conduct = conduct problems, Poor Grades =

history of poor grades in school, Prior Dx = prior psychological/psychiatric diagnosis, Sp. Educ. = special education placement.

Table 15

Diagnostic Characteristics by Cluster for the Clinic-Referred Sample (N=200)

Cluster*	N	%**	Primary Dx	Secondary Dx	Tertiary Dx
1	8	4.0	87.5	50.0	33.3
2	50	25.0	60.0	18.0	6.0
3	47	23.5	46.8	8.5	0.0
4	19	9.5	94.7	31.6	10.5
5	28	14.0	75.0	14.3	0.0
6	48	24.0	56.3	20.8	10.4
Total	200	100	62.5	18.5	6.0

Note. *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. The abbreviation %** = % of total sample. All figures presented are percentages. Primary Diagnosis = Child received a primary DSM diagnosis as a result of evaluation, Secondary Diagnosis = Child received a secondary DSM diagnosis as a result of evaluation, Tertiary Diagnosis = Child received a third DSM diagnosis as a result of evaluation.

Table 16

Primary Diagnostic Characteristics by Cluster for the Clinic-Referred Sample (N=200)

DSM Diagnoses		Cluster* 1 (n=8)	2 (n=50)	3 (n=47)	4 (n=19)	5 (n=28)	6 (n=48)
61.2	Parent-Child Relational Problem	0 (0)	0 (0)	1 (2.1)	0 (0)	0 (0)	0 (0)
62.89	Borderline Intellectual Functioning	0 (0)	0 (0)	0 (0)	1 (5.3)	1 (3.6)	1 (2.1)
296.2	Major Depressive Disorder, Single Episode Unspecified	0 (0)	0 (0)	0 (0)	2 (10.5)	0 (0)	0 (0)
296.8	Bipolar Disorder NOS	0 (0)	1 (2.0)	0 (0)	0 (0)	0 (0)	0 (0)
300.00	Anxiety Disorder NOS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.1)
300.02	Generalized Anxiety Disorder	0 (0)	2 (4.0)	0 (0)	0 (0)	0 (0)	1 (2.1)
300.4	Dysthymic Disorder	0 (0)	2 (4.0)	0 (0)	0 (0)	1 (3.6)	0 (0)
307.6	Enuresis	0 (0)	0 (0)	0 (0)	1 (5.3)	0 (0)	0 (0)
307.9	Communication Disorder NOS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.1)
309.0	Adjustment Disorder w/ Depr. Mood	0 (0)	0 (0)	0 (0)	1 (5.3)	0 (0)	0 (0)
309.21	Separation Anxiety Disorder	0 (0)	0 (0)	1 (2.1)	0 (0)	0 (0)	0 (0)
309.24	Adjustment Disorder w/ Anxiety	0 (0)	1 (2.0)	0 (0)	0 (0)	0 (0)	1 (2.1)
309.4	Adjustment Disorder w/ Mixed Dist. of Emotions and Conduct	0 (0)	0 (0)	0 (0)	1 (5.3)	0 (0)	0 (0)
313.00	Overanxious Disorder	0 (0)	3 (6.0)	0 (0)	0 (0)	0 (0)	0 (0)
313.81	Oppositional Defiant Disorder	0 (0)	1 (2.0)	0 (0)	0 (0)	3 (10.7)	0 (0)

Table 16 (cont'd)

Primary Diagnostic Characteristics by Cluster for the Clinic-Referred Sample (N=200)

DSM Diagnoses		Cluster* 1 (n=8)	2 (n=50)	3 (n=47)	4 (n=19)	5 (n=28)	6 (n=48)
314.00	ADHD, Inattentive	3 (37.5)	9 (18.0)	2 (4.3)	3 (15.8)	2 (7.1)	7 (14.6)
314.01	ADHD, Combined	2 (25.0)	4 (8.0)	1 (2.1)	6 (31.6)	12 (42.9)	7 (14.6)
314.01	ADHD, Hyperactive-Impulsive	0 (0)	1 (2.0)	2 (4.3)	1 (5.3)	1 (3.6)	0 (0)
314.09	ADHD, NOS	1 (12.5)	1 (2.0)	0 (0)	0 (0)	0 (0)	0 (0)
315.00	Reading Disorder	1 (12.5)	2 (4.0)	11 (23.4)	1 (5.3)	1 (3.6)	7 (14.6)
315.1	Mathematics Disorder	0 (0)	0 (0)	1 (2.1)	0 (0)	0 (0)	0 (0)
315.2	Disorder of Written Expression	0 (0)	2 (4.0)	0 (0)	0 (0)	0 (0)	1 (2.1)
315.32	Developmental Language Disorder	0 (0)	0 (0)	1 (2.1)	0 (0)	0 (0)	0 (0)
317	Mild Mental Retardation	0 (0)	1 (2.0)	2 (4.3)	1 (5.3)	0 (0)	0 (0)
No Diagnosis		1 (12.5)	20 (40.0)	25 (53.2)	1 (5.3)	7 (25.0)	21 (43.7)

Note. *Cluster 1 = Internalizing, Cluster 2 = Poorly Adapted, Cluster 3 = Well Adapted, Minimum Problems, Cluster 4 = Depressed, Cluster 5 = Disruptive Behavior Problems, Cluster 6 = Mild Academic Problems. **Figures are presented as Frequencies/(Percentages). DSM diagnoses presented include the primary DSM diagnosis received as a result of evaluation.

Chi-square analyses of equal proportions were used to determine whether differences between proportions amongst clusters on demographic and risk factor variables were large enough to be considered significantly different from chance. Notably, due to low frequencies in ethnic groups aside from Caucasian, results for chi-square analysis of ethnicity were not valid and not reported here. Chi-square analyses were not significant for indicators of pre-kindergarten problems, prior diagnoses, or special education placement. Chi-square analyses were significant for each of the following indicators: gender $?^2$ (5) = 12.782, p = .0255, socio-economic status $?^2$ (10) = 19.621, p = .0331, conduct problems $?^2$ (5) = 25.220, p = .0001, hyperactive-impulsive behaviors $?^2$ (5) = 22.753, p = .0004, and poor grades $?^2$ (5) = 11.767, p = .0381. Further, chi-square analyses of current diagnostic characteristics were generally significant at the .05 level: primary diagnosis $?^2$ (5) = 18.300, p = .0025, secondary diagnosis $?^2$ (5) = 11.042, p = .0505, and tertiary diagnosis $?^2$ (5) = 12.258, p = .0314.

Further, analysis of variance (ANOVA) was utilized in order to determine the extent of the differences among the clusters on indicators of functional impairment (i.e., behavioral adjustment, school performance, and cognitive development). Obtained BASC TRS-C clusters were used as the independent grouping variables for a series of three one-way ANOVAs reflecting each type of measured functional impairment. Differences at the .05 level were be followed by post-hoc contrasts (e.g., Tukey post-hoc test) to investigate mean differences amongst the groups.

Both the Achenbach TRF Total Problems Composite F (5, 194), p = .0001 and BASC PRS-C Behavioral Symptoms Index Composite F (5, 194), p = .0005 as indicators of functional impairment in terms of behavioral adjustment were significant at the .05 level. Tukey post-hoc

contrasts further revealed that comparisons between Clusters 1 and 4, 2 and 6, and 5 and 6, were not significant, but that all other combinations of clusters were significant.

Both the Reading Achievement Composite F (5, 194), p = .0457 and Mathematics Achievement Composite F (5, 194), p = .0458 as indicators of functional impairment in terms of school performance were significant at the .05 level. Tukey post-hoc contrasts revealed no statistically significant differences after the adjustment.

Functional impairment as assessed by measures of cognitive development F (5, 194), p = .0007 was significant at the .05 level. Tukey post-hoc contrasts revealed that Cluster 3 was statistically different from Clusters 1, 2, 5, and 6 after the adjustment.

Cross-Classification

It was assumed that at least 5 of the 7 BASC TRS-C clusters would emerge as a result of the aforementioned cluster analysis, and that therefore, cross-classification methods would be used to further validate the solution. Although only three of the clusters emerged, cross-classification methods were still employed to help determine the validity of the clinic-referred cluster solution against the normative cluster solution. The classification rule was based upon predictive discriminant analysis where the linear classification function can be used to "predict" membership of an ungrouped case by assigning each case to the cluster it most closely associates (Huberty, 1994; Huberty, DiStefano & Kamphaus, 1997). Prediction of cluster membership requires information from the original sample, including cluster membership of the grouped cases, and probability information relaying the likelihood of encountering a certain subgroup of children in the population. The classification rule used a combination of the definition of the cluster solution and prior probability information to classify a case into the cluster with which it most closely associates. Results between cases assigned with the classification rule and through

independent clustering may be compared to determine if children were assigned to similar clusters. If cross classification results for children classified with the rule built on the TRS-C norm sample are similar to results from independent clustering, this provides assurance that a child would have received the same or a similar typology assignment regardless of grouping method used to classify the data.

Hit rates were computed by taking the number of cases classified into the same cluster by both methods (i.e., "correctly"), divided by the cluster sample size from the U. S. normative sample. To assist in judging the adequacy of results, hit rates showing at least 75% agreement between the two classification methods were considered to represent high agreement among the two methods, hit rates between 50% and 74% agreement would represent moderate agreement, levels between 30% and 49% agreement would mark fair agreement, and hit rates lower than 30% agreement would denote poor agreement between the classification methods (DiStefano, Kamphaus, Horne & Winsor, 2003). Results are presented in Table 17.

Cluster Descriptions

Cluster 1 (Internalizing). Cluster 1 (N = 8, 4.0%) was so named as it was marked by elevations on scales reflecting problems with depression, anxiety, somatization, and withdrawal. Elevations were also noted on the aggression, hyperactivity, conduct problems, attention problems, learning problems, and atypicality scales, indicating overall global impairment due to overarching internalizing concerns. Low adaptive scores in terms of adaptability and study skills were also notable. This was the smallest obtained cluster in the solution. The cluster was comprised primarily of males (75%) and was entirely Caucasian. Most members were characterized by low or high socio-economic status as measured by years of parental education.

Table 17

Cross-classification Results by Cluster for the Clinic-Referred Sample (N=200)

Cluster Assignment (using normative classification rule)

	Normative Cluster Solution (N=1228)*						
Clinic-Referred Cluster Solution (N=200)	1(WA)	2(Avg.)	3(DBP)	4(Acad.)	5(PC/W)	6(GP-S)	7(MD)
1 (Internalizing)			4 (28.57)	1 (3.33)	2 (7.69)	1 (25.00)	
2 (Poorly Adapted)		25 (44.64)		21 **(70.0)**	3 (11.54)		1 (3.7)
3 (Well Adapted, MP)	34 **(79.07)**	11 (19.64)			2 (7.69)		
4 (Depressed)			8 **(57.14)**	5 (16.67)	3 (11.54)	3 **(75.00)**	
5 (Disruptive Beh. Prob.)		2 (3.57)	2 (14.29)	3 (10.0)			21 **(77.78)**
6 (Mild Acad. Prob.)	9 (20.93)	18 (32.14)			16 **(61.54)**		5 (18.52)
Total	43	56	14	30	26	4	27

Note. *Normative Cluster Solution. Cluster 1 = Well Adapted, Cluster 2 = Average, Cluster 3 = Disruptive Behavior Problems, Cluster 4 = Academic Problems, Cluster 5 = Physical Complaints/Worry, Cluster 6 = General Psychopathology-Severe, Cluster 7 = Mildly Disruptive. Figures are presented as Frequencies/(Percentages). Moderate to high hit-rates are presented in boldface.

Cluster members were characterized as having functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have the lowest mean reading and mathematics achievement scores, as well as intelligence score of the entire cluster solution. 62.5% of the children in this group were characterized as having had pre-kindergarten problems and history of hyperactive-impulsive behavior. Special education placement and history of conduct problems were noted in 50% of the cluster members, while prior diagnosis and poor grades were noted in 37.5% of the group. In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 87.5% of the members were given a primary DSM diagnosis, while 50% carried a secondary diagnosis, and 33.3% carried a tertiary diagnosis. The majority of diagnoses made were attention-related, and one was categorized as a learning disorder. As presented in the cross-classification table, this cluster did not replicate well with the normative solution.

Cluster 2 (Poorly Adapted). Cluster 2 (N = 50, 25.0%) was so named as it was marked by low average scores on the leadership, social skills, and study skills adaptive scales. No significant externalizing or internalizing behaviors were noted. This was the largest obtained cluster in the solution. The cluster was comprised primarily of males (66%) and was 88% Caucasian and 12% African-American. Most members were characterized by low socio-economic status as measured by years of parental education. Cluster members were characterized as having mild functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have low average mean reading and mathematics achievement scores, as well as low average intelligence. The following risk factors were endorsed: pre-

kindergarten problems (40%), history of hyperactive-impulsive behavior (32%), history of conduct problems (14%), poor grades (54%), prior diagnosis (22%), and special education placement (20%). In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 60% of the members were given a primary DSM diagnosis, while 18% carried a secondary diagnosis, and 6% carried a tertiary diagnosis. The majority of diagnoses made were attention-related, anxious/depressed in nature, or representative of a learning disorder. Interestingly, this cluster replicated best with the Academic Problems cluster from the normative solution.

Cluster 3 (Well Adapted, Minimum Problems). Cluster 3 (N = 47, 23.5%) was so named as it was marked by no significant externalizing or internalizing behaviors and high average adaptive skills. This was the third largest obtained cluster in the solution. The cluster was almost equally split between males (51.1%) and females (48.9%). The membership was 95.7% Caucasian and 4.3% African-American. Most members were characterized by average to high socio-economic status as measured by years of parental education. Cluster members were characterized as no discernible functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have solid average mean reading and mathematics achievement scores. The mean intelligence score was also solidly average and represented the highest figure of all obtained clusters. The following risk factors were endorsed: pre-kindergarten problems (25.5%), history of hyperactive-impulsive behavior (19.1%), history of conduct problems (6.4%), poor grades (23.4%), prior diagnosis (14.9%), and special education placement (12.8%). In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 46.8% of the members were given a primary DSM diagnosis,

while 8.5% carried a secondary diagnosis, and 0% carried a tertiary diagnosis. The majority of diagnoses made were attention-related or representative of a learning disorder. This cluster replicated highly with the Well Adapted type from the normative solution.

Cluster 4 (Depressed). Cluster 4 (N = 19, 9.5%) was so named as it was marked by clinically significant ratings on the depression scale. Elevations were also noted on the aggression, conduct problems, hyperactivity, attention problems, atypicality, and withdrawal scales. Low adaptability was also noted. This was the second smallest obtained cluster in the solution. The cluster was comprised of mostly males (73.7%). The membership was 89.5% Caucasian and 10.5% African-American. Most members were characterized by low socio-economic status as measured by years of parental education. Cluster members were characterized as having functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have average mean reading and mathematics achievement scores. The mean intelligence score was also average. The following risk factors were endorsed: pre-kindergarten problems (36.8%), history of hyperactive-impulsive behavior (52.6%), history of conduct problems (42.1%), poor grades (52.6%), prior diagnosis (10.5%), and special education placement (10.5%). In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 94.7% of the members were given a primary DSM diagnosis, while 31.6% carried a secondary diagnosis, and 10.5% carried a tertiary diagnosis. The majority of diagnoses made were related to depressive symptoms, adjustment disorders, and attentional problems. This cluster replicated moderately with the Disruptive Behavior Problems type and highly with the General Psychopathology-Severe type from the normative solution.

Cluster 5 (Disruptive Behavior Problems). Cluster 5 (N = 28, 14%) was so named as it was marked by elevations on the aggression, conduct problems, and hyperactivity scales. The cluster was comprised of majority males (89.3%). The membership was 89.3% Caucasian and 10.7% African-American. Most members were characterized by low to average socio-economic status as measured by years of parental education. Cluster members were characterized as having some degree of functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have average mean reading and mathematics achievement scores. The mean intelligence score was low average. The following risk factors were endorsed: pre-kindergarten problems (53.6%), history of hyperactive-impulsive behavior (67.9%), history of conduct problems (32.1%), poor grades (39.3%), prior diagnosis (14.3%), and special education placement (10.7%). In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 75% of the members were given a primary DSM diagnosis, while 14.3% carried a secondary diagnosis, and 0% carried a tertiary diagnosis. The majority of diagnoses made were related to disruptive behavior disorders and attention-related disorders. This cluster replicated highly with the Mildly Disruptive type from the normative solution.

Cluster 6 (Mild Academic Problems). Cluster 6 (N = 48, 24%) represented the second largest obtained cluster in the solution. It was so named as it was marked by mild elevations on the attention problems and learning problems scales. A mild elevation was also noted on the anxiety scale. The cluster was comprised of majority males (60.4%). The membership was 93.7% Caucasian, 2.1% African-American, 2.1% Asian-American, and 2.1% Other race/ethnicity. Most members were characterized by average socio-economic status as measured by years of parental education. Cluster members were characterized as having a relatively mild

degree of functional impairment in terms of behavioral adjustment as measured by BASC parent ratings and an instrument-independent teacher rating scale (i.e., Achenbach TRF). These children were also noted to have low average/average mean reading and mathematics achievement scores. The mean intelligence score was also low average/average. The following risk factors were endorsed: pre-kindergarten problems (31.3%), history of hyperactive-impulsive behavior (33.3%), history of conduct problems (8.3%), poor grades (50%), prior diagnosis (14.6%), and special education placement (12.5%). In terms of current diagnoses (i.e., diagnoses made as a result of psychoeducational evaluation), 56.3% of the members were given a primary DSM diagnosis, while 20.8% carried a secondary diagnosis, and 10.4% carried a tertiary diagnosis. The majority of diagnoses made were related to learning disorders and attention-related disorders. This cluster replicated moderately with the Physical Complaints/Worry type from the normative solution.

CHAPTER 5

DISCUSSION

The purpose of the study was to add to a growing line of research regarding the utility of a previously developed person-oriented, dimensional typology of child behavior derived from the normative sample for the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) Teacher Rating Scales for Children (TRS-C). This seven-cluster typology of child behavior has been supported by evidence of internal validity: (1) Well Adapted; (2) Average; (3) Disruptive Behavior Problems; (4) Learning Problems (since renamed "Academic Problems"); (5) Physical Complaints/Worry; (6) General Psychopathology-Severe; and (7) Mildly Disruptive. This typology has been replicated in three different populations to date, including children in Medellin, Colombia (Kamphaus & DiStefano, 2001) and a rural, as well as an urban sample of children in the United States (DiStefano, Kamphaus, Horne, & Winsor, 2003).

In order to further understanding of this behavioral typology, BASC TRS-C scores for an independent sample of 200 clinic-referred children, 6 to 11 years of age, were cluster analyzed. Each cluster was characterized according to degree of functional impairment as represented by external indicators of behavioral adjustment, school performance, and cognitive development. Additionally, demographic characteristics and risk factors (e.g., pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, poor grades, and previous diagnoses) and outcomes (e.g., current diagnoses and special education placement) for each cluster were identified. Thus far, no study has taken the further step of establishing the link of each behavioral

cluster of the BASC TRS-C typology to functional impairment. This aspect of the present investigation comprised the most original contribution to this vein of literature.

Research Questions and Hypotheses

The first question was whether or not a similar cluster structure could be identified in the smaller clinic-referred sample. It was expected that the original BASC TRS-C cluster solution would be replicated in the independent, clinical sample of children. Consistent with previous research on cross-validation of the seven cluster solution (Kamphaus & DiStefano, 2001), it was predicted that at least five of the clusters in the original solution would be likely to emerge in the clinical sample. In addition, new clusters of behavioral adjustment were not anticipated but, if found, they were expected to be limited to one or two clusters with small proportions of cases included. It was further expected that clusters or types characterized by increased risk (Academic Problems, General Psychopathology-Severe, Disruptive Behavior Problems, and Mildly Disruptive) would have greater proportions in the clinical sample in comparison to the normative sample.

Results of cluster analysis of the clinic-referred sample (N=200) yielded a six cluster solution: (1) Internalizing; (2) Poorly Adapted; (3) Well Adapted, Minimum Problems; (4) Depressed; (5) Disruptive Behavior Problems; (6) Mild Academic Problems. Three of the seven original BASC TRS-C clusters were therefore identified. Contrary to expectations, new clusters of behavioral adjustment, Internalizing, Poorly Adapted, and Depressed emerged. Further, the identified clusters characterized as having the highest degree of increased risk did not have greater proportions in the clinical sample. Cross-classification results indicated that the clinic Well Adapted, Minimum Problems cluster replicated highly with the Well Adapted cluster from the normative sample. The Poorly Adapted cluster from the clinic sample associated most with

the Academic Problems cluster from the normative sample. The Depressed cluster from the clinic sample associated most with the General Psychopathology-Severe type, and to a lesser extent, with the Disruptive Behavior Problems type from the normative sample. The Disruptive Behavior Problems cluster from the clinic sample associated most with the Mildly Disruptive type from the normative sample. The Mild Academic Problems type from the clinic sample associated most with the Physical Complaints/Worry type from the normative sample.

The second question was one of external characterization of the clusters, i.e., whether or not the clusters were differentiated well by indicators of functional impairment. Previous research findings led to the prediction that the clusters would be supported by variables external to the clustering procedures, and that indices of functional impairment would coincide with increased risk factors. Per the obtained cluster solution, these principles generally held true. Factors that were statistically significant in differentiating the six clusters included gender, socio-economic status, history of conduct problems, hyperactive-impulsive behaviors, poor grades, and presence of a current primary, secondary, and/or tertiary DSM diagnosis.

More specifically, in terms of cluster characteristics, as expected, the Well Adapted, Minimum Problems cluster was characterized by a low index of functional impairment with regards to behavioral adjustment, average to above average scores on tests of cognitive ability and achievement. This group had the least occurrences of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, and poor grades. This group also experienced comparatively less occurrences of prior diagnoses and special education placement. As expected, this group also received the least diagnoses as a result of psychoeducational evaluation in the clinic. The Well Adapted, Minimum Problems type represented the third largest group in the solution.

An Average cluster per se was not identified. The Poorly Adapted cluster from the clinic sample emerged as the closest approximation to this group, but notably, this cluster associated most with the Academic Problems cluster from the normative solution. The Poorly Adapted type was the largest obtained cluster in the solution and was characterized as having a mild index of functional impairment pertaining to behavioral adjustment, as well as low average scores on tests of cognitive ability and achievement. Pre-kindergarten problems, hyperactive/impulsive behaviors, and poor grades emerged as the most frequent risk factors. In terms of outcomes, over half of the members received DSM diagnoses.

The Mild Academic Problems cluster represented the second largest cluster in the clinic-referred solution. This group was distinguished by a relatively mild index of behavioral functional impairment, and low average/average scores on tests of cognitive ability and achievement. This cluster was also characterized by pre-kindergarten problems, hyperactive/impulsive behaviors, and poor grades representing the most frequently occurring risk factors. Over half of the children in this group were assigned a DSM diagnosis, the majority of which were learning and/or attention-related in nature.

The Disruptive Behavior Problems cluster was comprised of 14% of the total sample. A moderate degree of behavioral functional impairment, low average scores on tests of cognitive ability, and average scores of tests of achievement were noted. Histories of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, and poor grades occurred most frequently for this group. Three-fourths of the cluster members were assigned a DSM diagnosis, with most relating to disruptive behavior and attention-related disorders.

A Physical Complaints/Worry cluster did not emerge in the clinic sample per se. However, a small group was identified as Internalizing (4%). This cluster did not replicate well

with any cluster from the normative solution. Members were characterized by evidence of behavioral functional impairment and the lowest average scores on tests of cognitive ability and achievement. Relatively high rates of pre-kindergarten problems, hyperactive/impulsive behaviors, special education placement, and conduct problems were noted. 87.5% of the cluster members were assigned a DSM diagnosis, with most disorders relating to learning and attention.

The Depressed cluster represented the second smallest group in the solution (9.5%). Children in this group had a relatively high index of behavioral functional impairment and average scores on tests of cognitive ability and achievement. Risk factors of pre-kindergarten problems, hyperactive/impulsive behaviors, conduct problems, and poor grades were the most frequently occurring. This group also had the highest rates of current DSM diagnoses (94.7%), with most being related to adjustment, depressive, and attentional disorders. Notably this group associated most with the General Psychopathology-Severe, and to a lesser extent, the Disruptive Behavior Problems clusters from the normative solution.

Implications and Suggestions for Future Research

Overall, it was anticipated that this study would yield a possible basis for classification derived through dimensional, person-oriented methods that could sort children by risk and functional impairment for diagnostic purposes. Thus, this study aimed to promote additional advances in the study of child behavior in that more meaning could be inferred from the current line of BASC typology research and that treatment needs of children could be more readily identified.

The results of this research lent some support in the fulfillment of this overarching goal. As mentioned in the outset of this project, Blashfield (1998) delineated five primary purposes for classification in psychopathology: (1) creation of a common professional nomenclature; (2)

organization of information; (3) clinical description; (4) prediction of outcomes and treatment utility; and (5) the development of concepts upon which theories may be based. These goals, although sound and pragmatic, have yet to be obtained by any single classification system.

This project contributed to these goals as outlined by Blashfield (1998) by yielding some commonalities in nomenclature with prior BASC TRS-C typology research, utilizing the same cluster analytic procedures in the attempt to organize information regarding child behavior, and in offering more detailed clinical descriptions of patterns of behavior in terms of functional impairment and external validators of import. The obtained clusters from the clinic-referred sample showed good overall external validity and relationships to indicators of functional impairment.

The cluster solution also pointed to the legitimacy of the concept of a "continuum" of child behavior (Hudziak, et al., 1998; Scahill, et al., 1999) in that many of the most severely affected children (e.g., Internalizing and Depressed types) had not been identified as being in need of special education or other services, yet clearly possessed risk factors and demonstrated functional impairment in terms of learning and behavior. Further, issues regarding greater sensitivity to comorbid conditions (Caron & Rutter, 1991) came forth in the cluster solution, in that children with strong ratings of depression also had indications of poor emotional control and externalizing behaviors, as well as a higher tendency to have been assigned more than one DSM diagnosis. Notably, although the sample utilized in this study was derived from a clinical population, over one-third of the sample did not receive a DSM diagnosis of any kind, pointing to the presence of multiple symptom patterns that are not "classifiable" according to categorical systems when below diagnostic threshold levels. Results of this project indicated that the categorical DSM/IDEA approach to classification is perhaps too narrow in focus, especially

when considering the need to target children for prevention and early intervention services. Treatment needs may be better guided by examination of cluster membership so as to avoid the potential danger of missing therapeutic opportunities for children with "sub-syndromal" problems.

Additional work would be advantageous to further expand upon and support these aims. Furthermore, supplementary work would be needed to adequately assess the reliability and validity of this dimensional model, as well as to establish stronger bearing with regard to treatment and theory development.

The primary limitation of this study involved the sample utilized for analysis. The overall number of participants was relatively small (N = 200), especially in comparison to the normative group (N = 1227) upon which the original BASC TRS-C typology was based. BASC TRS-C norming data were collected at 116 sites representing various regions of the United States, representing a diverse sampling of the U. S. population by geographic region, socio-economic status, ethnicity, and child exceptionality. Further, African-American and Hispanic children were over-sampled to a limited extent in order to ensure adequate representation.

In comparison, the clinic-referred sample was 65.5% male and 34.5% female. 92% of the clients were Caucasian, 7% African-American, 0.5% Asian-American, and 0.5% of other ethnic origin. The socio-economic status of the sample, as measured by parent's years of education completed, was 14.62 years. In terms of their highest levels of education, approximately 2% of the parents had not completed high school, 33.5% had obtained a high school diploma, 12% had completed some college, 28% had obtained a Bachelor's degree, and 24.5% attended graduate school for at least one year. As can be seen, the clinical sample suffers from a high degree of referral bias, and is not well-differentiated in nature. Another inherent problem is the obvious

fact that children were referred for psychoeducational evaluation at the clinic due to perceived deficits in learning, cognition, and/or behavior. These descriptors point to a need to expand outreach services in making clinic services more accessible to the community at large.

Ideally, future research in this area would be conducted using larger clinical samples with more diverse population parameters. Additionally, future research along these lines should continue to employ the same statistical methodologies so that differences in any obtained results would not be a result of incongruent techniques. External validators in terms of demographic characteristics, risk factors, functional impairment, and outcomes should also continue to be investigated in order to lend more support to the clinical import of behavioral typologies.

Longitudinal investigations would also be of benefit for the purpose of studying the temporal stability of a given typology of child behavior, as well as for identifying creodes of "normal" and deviant development (Petoskey, 2001). Such designs would better direct more in-depth assessment of etiology, course, prognosis, and responsiveness to interventions with regards to child behavior. As perhaps the most pertinent assumption of the utility of dimensional, person-oriented approaches in that the study and identification of clusters of individuals may lead to more efficient, streamlined subtype-specific intervention and prevention services (Achenbach, 1995; Bergman & Magnusson, 1997; Hooper & Willis, 1989), it would be of great importance to study the clusters in terms of treatment response (e.g., medication, cognitive-behavioral therapy, social skills training, parent management training, tutoring/special education services). In this vein, systematic research efforts to assess the effectiveness of given treatment protocols would be needed.

As demonstrated in the literature, dimensional approaches provide an opportunity to study behavioral manifestations that are not necessarily captured by the use of traditional, categorical systems. By expanding the current line of research regarding the BASC TRS-C typology of child behavior, a stronger case for the formulation and use of dimensional, person-oriented approaches in studying behavioral phenomena will able to be ascertained.

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