

**PREDICTION OF CLINICAL DIAGNOSIS FROM A BRIEF PARENT REPORT:
VALIDATION OF THE BEHAVIORAL SUMMARY SCALES**

by

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Objective: The current study examined the ability of the Behavioral Summary, which is the short form of the Personality Inventory for Children, second edition (PIC-2) as a tool for differentiating behavioral disorders of children. The Behavioral Summary includes 96 items, structured into eight short adjustment scales. **Method:** A sample of 444 referred children; age 3-18 participated in this study. They were independently rated as fitting into one of five diagnostic groups prior to completing the measure. Groups included: Academic Cognitive Difficulties, Attention-Deficit-Hyperactivity-Disorder (ADHD), Oppositional Defiant Disorder (ODD), Conduct Disorder (CD) and Pervasive Developmental Disorder (PDD). A discriminant function analysis and multivariate pairwise comparison determined which scales contributed to the discrimination of the five diagnostic groups. **Results:** Overall 55.5% of cases were correctly classified, in the pairwise comparison 66.7% up to 87.4% of cases were correctly classified. The Behavioral Summary demonstrated good differentiation between Academic Cognitive Difficulties and any other diagnostic group and between externalizing disorders and PDD. Weaker results were found for the discrimination of ODD and CD. **Conclusion:** The Behavioral Summary is a tool for monitoring treatment progress and it may be utilized as a quick and supportive tool for clinicians in the fine discrimination of difficult to distinguish disorders.

Keywords: PIC-2, Behavioral Summary, parent ratings, discriminant analysis, prediction of clinical diagnosis

CHAPTER I

Introduction

Child assessment is used in clinical, educational and forensic settings. Due to the nature of child assessment several informants may contribute to the assessment of the child. Parents, caregivers, teachers and the child itself may respond to the questionnaire or inventory in order to get the most precise and trustworthy results. Overall this process is time consuming; every informant may not be available, able or willing to provide answers to numerous questions.

In addition to these constraints, Piotrowski, Belter and Keller (1998) have addressed the impact of managed care on assessment choices. Of 137 psychologists questioned, 72% of them stated changes in the use of assessment tests over the last 5 years due to the impact of managed care. Managed care organizations (MCO) may show resistance towards psychological assessment at times. One MCO argued that the DSM-IV makes no reference to psychological testing for the purpose of diagnosing however the DSM-IV emphasizes the use of the clinical interview to obtain information about the patient (Eisman et al., 2000). In addition psychological assessment is increasingly neither authorized nor reimbursed by third party payers (Eisman et al., 2000).

Even though the use of psychological assessment appears to be contested at times, Reschly's review (1998) of three school psychologist surveys demonstrated that the use of structured observations and behavior rating scales are increasingly prevalent even outside of mental health settings, where payment may depend on health care reimbursement. Cashel (2002) described that the Child Behavior Checklist (CBCL) and Conners' Parent and Teacher Rating scales are among the top 10 assessment instruments for youth. Cashel (2002) furthermore reported a decrease in the utilization of large assessments such as the MMPI-A (11.7%) and the

WISC (22.8%), while at the same time the use of behavioral rating scales such as the CBCL was increased by 6.2%. Cashel (2002) concluded that the ease of administration and the availability of computerized software have led to an increase in the utilization of behavioral rating scales. The pressure of managed care and well as the desire of informants to spend a smaller amount of time in filling out questionnaire and inventories may have also influenced the development of short forms of existing full length tests.

Chapter II

Parent rating scales as a popular child assessment instrument

Rating scales in general can be defined as a diagnostic schedule that provides a structured form for reporting and categorizing behavioral data that eventually responds to diagnostic categories or systems. Therefore a rating scale may be used to diagnose a syndrome such as externalizing problems or internalizing problems (Frick, Barry, & Kamphaus, 2010).

Parent rating scales have become a popular source for the assessment of child behavior in which parents are viewed as the main source of information about the child. They are considered the most important source in assessing childhood behavior and emotional problems (Achenbach, McConaughy, & Howell, 1987). It is argued that children are at times less than accurate reporters of their own behavior, due to lack of insight or due to their inability to observe their own behavior. Furthermore younger children may have limited skills to describe their own situation. Teachers can be good observers of child behavior, but may be limited in that they normally see children only in a certain setting for a limited time of the day. Parents themselves regard mothers as the most accurate source in reporting internalizing problems (Phares, 1997). Frequently mothers spend a substantial amount of time with the children throughout the day, and across various settings. Those circumstances set mothers apart from all other informants. (De Los Reyes & Kazdin, 2005). This allows them to observe and experience behavior that may not be observed by teachers or other professionals. Moreover it is often the concern of a parent that leads to the request for evaluation of their child.

Discrepancies and Correspondence in parent rating scales

Parents' ratings differ in two major aspects, in the perception of the overall existence of a behavioral problem and in the perception of the severity of the behavioral problem. Achenbach and colleagues (1987) found that parents did not differ in their evaluation of externalizing and internalizing problems. Later studies found that mothers tended to report more problem behavior in children than fathers. Duhig, Renk, Epstein and Phares (2000) reported that mothers and fathers agreed only moderately on internalizing problems of children but showed high levels of correspondence in their ratings when assessing externalizing problems.

Different factors such as relationship to the child, parent psychopathology, stress, setting and cultural background and SES influence the perception of the child's behavior. Furthermore gender, age and treatment status of the child needs to be considered when comparing the reports of mothers and fathers (Duhig et al., 2000). Next to those general aspects of parent reports there are findings that indicate that parents are less likely to portray their children as having cognitive problems, somatic concern or problems with social withdrawal (Howells Wrobel & Lachar, 1998). Furthermore there may be the tendency of parents to underreport depressive symptoms of their children or to solemnly report the behavioral manifestations of depressive symptoms (Angold et al., 1987; Kazdin, Esveldt-Dawson, Sherick, Colbus, 1985).

Utilization of parent rating scales

Cashel (2002) reported that rating scales rang behind the clinical interview but before projective test. There are many comprehensive child assessment inventories, many of which provide information from multiple informants, including parents. As noted earlier, CBCL and Conners Rating Scales are commonly used multi-informant ratings. In addition the Behavior

Assessment System for Children, second edition (BASC-2) and the Personality Inventory for Children (PIC-2) are also important child behavior measurements.

Even though parent ratings have the danger of being biased or show discrepancies, they are a valuable source of additional information about the child. In general parent rating scales are a good tool to identify problem behaviors, assess emotional functioning and to support possible diagnosis. Specifically the repeated use of a specific rating scale may help to understand the progression of certain behaviors or emotions and providing feedback regarding the effectiveness of treatment or other interventions. In the following paragraphs the above mentioned children behavior measurements will be discussed with special attention to the parents rating scales.

BASC-2

The Behavior Assessment System for Children, second edition (BASC-2) is an assessment tool that includes a variety of scales, such as teacher, parent and self rating scales; and it also includes the structured developmental history measure, the parenting relationship questionnaire and the student observation system for teachers. There are three different forms for the parents rating, depending on the age of the child (age 2-5, age 6-11, and age 12-21).

The BASC-2 focuses on assessing four composites such as externalizing problems, internalizing problems, adaptive skills and behavioral symptoms. Those composites are composed of clinical and adaptive scales. The clinical scales focus on behavioral excesses, such as aggression, hyperactivity and depression and the adaptive scales focuses on good adaption to home and community (Frick et al., 2010). Furthermore the BASC-2 has seven optional content scales, such as bullying, emotional self control, executive functioning, anger control,

developmental social disorders, negative emotionality and resiliency. The specific focus on study skills, social skills, leadership and adaptability (adaptive skills) distinguishes this assessment from the other assessment mentioned.

The parents' perspectives on child behavior are assessed with the parent rating scale (PRS). The PRS of the BASC-2 contains 134-160 questions and it uses a four choice response system. Validity indexes are included to verify the quality of the answers. A fourth grade reading level is required and it takes 10-20 minutes to answer the questions.

The general norm sample for the PRS includes samples of 5800 children and adolescents and the clinical sample includes 1975 samples, mostly of parents with children who are diagnosed with a learning disability or ADHD. The reliability coefficients suggest median reliability. The test retest reliability was median as well ($r=0.70$) with the exception of depression for which the test-retest reliability was lower ($r=0.66$). This may be explained through the limited length of a depressive episode. In general the interrater reliability is good, however the interrater reliability was not so good for aggression on the child and preschool form and for anxiety on the preschool forms.

The robust content and criterion validity is based on a sound three factor model. The three factors loadings are externalizing problems, internalizing problems and daily living and social skills. Furthermore secondary factor loadings may be helpful in supporting and interpreting a diagnosis. For example the secondary factor loading suggest that poor adaptive skills occur with attentions problems or internalizing problems are accompanied by poor adaptability (Frick et al., 2010). In addition the factor loading on some scales may allow a differential diagnosis, for example Anxiety vs. Depression or Hyperactivity vs. Aggression vs. Attention problems. Several studies (Kent, 2006; Valencia, 2006, & Nicpon 2010) indicate that BASC-2 parent rating

scales are successfully used in the differential diagnosis of autism spectrum disorders, because of the number of scales assessing psychosocial functioning. Due to the broad content coverage the BASC-2 is a great tool to assess a wide variety of child behavior; however the different formats of the parent form, the teacher form and the self report make a direct comparison of informants difficult.

CBCL

The Achenbach system of empirically based assessment (ASEBA) is characterized by a variety of assessments measures, such as direct observation forms, semi-structured interviews, Adult Behavior Checklists, adult self report, teacher report forms and Child Behavior Checklists (CBCL).

There are two forms for the CBCL, one for the age of 1.5-5 and a second one for the age group of 6-18. Those forms are filled out by the parent or care giver, and in addition there is a youth self report form, which the older child fills out by him or herself. The development of this assessment dates back to the 1960s. Achenbach placed high importance onto the parent report. The preschool version is composed of 100 items and the school age version is composed of 113 items. It takes about 15-20 minutes for the parent to complete the form, which is composed of one part with questions that require a response on a *Likert* scale and one part with open ended questions. The extensive part with the open-ended questions is a quite unique approach among parent rating scales.

The pre-school and school age form are composed of syndrome scales and DSM oriented scales. In both test formats is one total problem score and two composite scores for internalizing

problems and externalizing problems. The syndrome scales are mainly empirically derived, while the DSM oriented scales are based on experts' ratings. The syndrome scales for school-age children differ from the syndrome scales for pre-school children in a way that more emphasis is put on social problems, thought problems and rule breaking behavior. This approach is mirrored in the DSM oriented scales for school children such as oppositional defiant problems, conduct problems, attention/hyperactivity problems and emotional problems, while the pre-school version in addition to emotional problems and oppositional defiant problems focuses on pervasive developmental problems. The DSM oriented scales are a newer addition to the Achenbach system and several studies (Laird, Jordan, Dodge, Pettit, & Bates, 2001; Kendal, Marrs-Gacia, Nath, & Sheldrick, 1999; Carter, O'Donnell, Scahill, Schultz, Leckmann, & Pauls, 2000, Sikora, Hall, Hartley, Gerrard-Morris, & Cagle, 2008; Reef, van Meurs, Verhulst, & van der Ende, 2010) have demonstrated the usefulness of the CBCL in predicting psychopathology.

The norm sample for the school aged CBCL includes data from 1753 children matching closely the US census, and data from 700 pre-school children was used for the pre-school norm sample. Interestingly no separate clinical norms are offered for the CBCL (Frick et al., 2010). For the preschool measure the internal consistency coefficient ranges from .63-.95, which reflects a moderate to good reliability; the reliability for the school CBLT is slightly better, ranging from 0.66-0.95 (Frick et al., 2010). For both formats the internal consistency for the DSM-oriented scales is somewhat weaker. 8-day Test-retest reliability and mother-father interrater agreement for the school age format is generally good, only the interrater reliability on the preschool version is moderate (Achenbach & Rescorla, 2000).

The manual of the CBCL attests good content validity, criterion-related validity and construct validity, however there are some points of concern. The validity research includes only

ASEBA findings and little correlational studies with other measure are published. In the manual only a study with a small number of participants (82 mothers, 68 fathers, 51 teachers) demonstrated the correlation of the CBCL scales with the BASC scales, which actually showed quite positive correlation, besides the correlation for withdrawal/depression ($r=0.38$, mothers). Even though the manual may provide good practical support in interpreting the results of the test, it is unusual to find depression/anxiety items in one scale, questioning the content validity of this empirically based scale. Furthermore it was demonstrated that the correspondence of the DSM-oriented Anxiety scale in regards to the DSM criteria for anxiety disorders is somewhat questionable (Ferdinand, 2008). Until now no validity are scales included in this measure. The ASEBA and specifically the CBCL is a quite popular rating scale even though the interpretation of the scales may not always be unambiguous, especially due to a lack of close correspondence between the empirically derived scales and some diagnostic criteria or due to the heterogeneous content of some scales (Frick et al., 2010).

Conners

Conners' rating scales (CRS) are a measure that is used in the assessment of behavioral problems in children and adolescents with special emphasis on attention deficit/hyperactivity. It furthermore assesses learning problems, relationships to family and peers. The current form is Conners' rating scales, third edition (CRS-3; 2008). The age range of the test format has changed for Conners'-3, parent and teachers forms are for children from 6-18 years, and the self report form covers the age range from 8-18. In 2009 Conners Early Childhood (Conners EC) was added. This is an additional parent rating scale for children in the age range of 2-6. Conners EC

is available in a long version with 115 items and in a short version with 49 items, the completion time for the long form is about 15 minutes.

The CRS-3 is available as parent rating scales, teacher rating scales and self report scales for youth and they are all available in long and in short forms. In general the CRS-3 is an advancement of the older version CRS-R, specifically because it includes validity scales in the long form as well as in the short form. The questionnaire consists of short phrases that need to be answered with 0 = not true at all (Never, seldom), 1 = Just a little bit (Occasionally), 2 = Pretty much true (often, Quite a bit) and 3 = Very much true (very often, very frequent). The parent scales are written at fourth to fifth grade reading level.

The Conners' parent rating scale long (CPRS-3:L) contains 110 items, which are allotted to 15 scales. The empirical scales include Inattention, Hyperactivity, Executive Functioning, Learning problems, Aggression, Peer relations and Family relations. The DSM-IV-TR symptom scales include three ADHD scales and furthermore a scale for Oppositional Defiant Disorder and a scale for Conduct Disorder. The long form has 3 validity scales, positive impression (fake good), negative impression (fake bad) and an inconsistency index. Comparable to the CBCL the Conners includes two open-ended questions and it also includes critical items comparable to the BASC. The long form includes items (screener items) that should serve the purpose to alert the clinician to certain problems such as mood disorders, student problems in regards to school work, friendship and life at home. The long form furthermore includes critical items that are intended to detect severe behavioral problems that need immediate attention. The completion time for the long version is 20 minutes.

The Conners' parent rating scale, short form (CPRS-3:S) consists of 45 items which are allotted into the 6 empirical scales and two validity scales. The ADHD index and the Global index

are also available as separate brief indexes, each consisting of just 10 items. Screener items and the critical items are not included in the short form. The short version may be completed in 10 minutes. Gau, Soong, Chiu and Tsai (2006) found that the CPRS-R: S and the CTRS-R: S demonstrated discriminant validity by clearly distinguishing referred children with ADHD from referred children with disorders other than ADHD in a sample with 479 clinical participants in Taipei.

The normative sample for the Conners-3 with 1200 cases is slightly smaller than the normative sample for the CBCL. A clinical sample with 718 cases is also included and over 35% of this sample are diagnosed with an ADHD spectrum disorder. The reliability of this measure is comparable to other measure, however the internal consistency coefficient for the DSM related scales is $r = 0.80$ or higher, which demonstrates very good reliability of those scales. Again with this measure there is only a limited amount of validity research done by others besides the test developer themselves. Criterion related validity is considered moderate to high. In comparison to the CBCL the Conners-3 demonstrated good differential validity in regards to differentiating a clinical sample from a general population sample. Based on differential validity evidence this test appears to be able to successfully distinguish within clinical samples and within non-clinical samples (Frick et al., 2010).

PIC-2

The Personality Inventory for Children-2 (PIC-2) is a comprehensive measure of childhood behavior and adaptability. The PIC-2 is the parent version. Next to the PIC-2 the Student Behavior Survey (SBS) was developed as a teacher version. The SBS is based on a

different theoretical approach and this measure contains only 102 items. The Personality Inventory for Youth (PIY) is a self report measure for youth of age of 9-19 and it contains 270 items. The development of the first PIC dates back to 1958 and the development of the PIC-2 has led to several improvements including the reduction of content overlap between the scales and the inclusion of validity scales.

The PIC-2 is a test with 275 true-false items, distributed onto nine adjustment scales and 21 relating subscales and three response validity scales. The eight adjustment scales include cognitive impairment, impulsivity & distractibility, delinquency, family dysfunction, reality distortion, somatic concerns, psychological discomfort, social withdrawal and social skills deficit. It becomes obvious at this point that the PIC-2 does not include DSM oriented scales and appears more related to the MMPI. The scales were developed on a basis of empirical research as well as through rational and theoretical approaches.

The PIC-2 is designed for the assessment of children with the age range of 5-19 years. It takes about 40 minutes to complete the Standard form (long form). Next to the PIC-2 the PIC-2 Behavioral Summary was designed. The Behavioral Summary is constructed out of the first 96 items of the Standard form. The 96 items are distributed onto eight adjustment scales. These eight adjustment scales are highly correlated to the Standard Form adjustment scales (Lachar & Gruber, 2001), but with just 12 items in each scale and without the Cognitive Impairment Scale. All eight scales together provide the Total Composite Score. Seven of the eight scales (without the Family Dysfunction scale) provide the externalizing, the internalizing and the social adjustment composite scores. It takes 15 minutes to complete the short form. The item content of the short adjustment scales is voiced in the present tense, reflecting conditions and behaviors that respond to contemporary and relatively brief interventions (Lachar & Gruber, 2001).

The non clinical norm sample includes 2306 children and the referred sample includes 1551 children, the normative samples represent the US census from 1998. Linear transformations of *t*-scores were used, making a comparison with a specific child's behavior to children behavior in general somewhat difficult (Frick et al., 2010). The PIC-2 provides good reliability with internal consistency scores mostly in the range of $r = 0.80-0.92$. Internal consistency in the standardization sample reached only values of $r = 0.61$ for some subscales, Somatic Concern and Psychological Discomfort Scales in the long form. In general the internal consistency coefficients for the referred sample are better. The short form adjustment scales demonstrated a slightly better reliability than the long form. For both forms the test-retest reliability is good, with median values of $r = 0.77$ for the non clinical sample and with $r = 0.88$ and with $r = .90$ for the clinical sample. The interrater reliability between mother and fathers is generally very good, with somewhat lower internal consistency coefficient for subscales of somatic concerns ($r=0.48-0.54$)

The developers of the PIC-2 have done an extensive "internal" research to establish validity. Content validity was improved from the PIC to PIC-2 by removing and rephrasing items (in total 56 items). This led to a reduction of item overlap. Factorial validity was established through extensive factor analysis and intercorrelation. The standard form of the PIC-2 has a five factor structure, (Externalizing problems, internalizing problems, cognitive status, social adjustment and family dysfunction). The Behavioral Summary on the other hand has a two factor structure, (externalizing problems and internalizing problems). It was also attempted to provide evidence for criterion validity by measuring the correlation of the PIC-2 measure with clinician symptoms ratings, student self report ratings and teacher behavior ratings. Specifically the criterion validity in regards to the clinician Symptom Checklist may be helpful for the practitioner

to support a diagnosis. One drawback which is common to most behavior rating scales is the notion that not enough cross validation with other measure is performed.

Rating scales for specific disorders

SNAP-IV and the Vanderbilt ADHD rating scale (Wolraich et al., 2003) evaluate based on the DSM criteria for ADHD and therefore the rating outcome may be close to interview based ADHD diagnosis. SNAP-IV (Swanson, Nolan and Pelham) is a 90 items rating scale which assesses the frequency and severity of ADHD symptoms, the scale corresponds to DSM-IV-TR criteria for ADHD and ODD (Newcorn, Ivanov, Sharma, Schulz & Halperin, 2008). Factor structure of this scale demonstrated two ADHD factors and one ODD factor. Study findings suggest that SNAP-IV is able to discriminate the varying degrees of ADHD in children; however it may not be suitable as a diagnostic tool (Bussing, Fernandez, Harwood, Hou, Garvan & Eyberg, 2008). Teacher and parent report forms are available for SNAP-IV. The Vanderbilt ADHD rating scale is somewhat similar to the SNAP-IV rating scale, however the Vanderbilt ADHD parent rating scale (VADPRS) assesses to a certain extent ODD, CD and anxiety and depression in addition to ADHD symptoms, while the Vanderbilt ADHD teacher rating scale includes a rating of the child's performance.

The New York Teacher rating scale and the Children Aggression Scale (CAS) are measures for aggressive behavior. CAS measures the frequency and the severity of aggressive behavior in different environments. Parent and teacher forms are available for CAS. (Newcorn et al., 2008) The New Teacher rating scale focuses on types of aggression such as defiance, physical aggression and delinquent aggression. This scale also includes DSM-IV items for ODD and CD (Newcorn et al., 2008).

Current testing trends for children age 4-19

Several trends in regards to assessment of children with behavioral and/or academic problems can be observed. Reschly's (1998) review demonstrated that on one hand "structured observation" and the Wechsler intelligence scales remain consistently popular assessment tools, on the other hand behavior rating scales increased to a great extent in popularity and prevalence between 1986 and present (Cashel,2002, Reschly,1998).

The number of individuals who received special education under the Individuals with Disabilities Education Act (IDEA) has increased from 3.7 million children (age 6-21) in 1977 to 6.6 million children in 2008 (National Center for Education Statistics, 2010). Specific learning disabilities, speech or language impairments and other health impairments, which include ADHD, lead the list of disabilities that may require special education.

The increasing numbers of students in U.S. public schools with a possible need for special education fuel the trend for more testing in schools (Kamphaus, Petoskey & Rowe, 2000). Kamphaus et al (2000) reported that schools have become the predominant site for testing of behavioral and academic problems and that specifically school psychologists use behavior rating scales. Also Shapiro & Heick (2004) reported that rating scales have become the most commonly used assessment tool for school psychologists. 75% of psychologist reported that they use behavioral rating scales with parents/teachers in more than 4 of their last 10 cases.

The enormous amount of children that need testing in schools may also drive the decision for more specialized and shorter psychological assessments, such as behavioral rating scales. The increased emphasis on early screening measures (Kamphaus et al., 2000) may also support the notion of the utilization of short forms of existing standard behavioral rating scales.

Advantages of the utilization of behavioral rating scales for children

A discrepancy between the increased use of behavioral rating scales by school psychologists and the denial of its benefits by the managed care organization becomes obvious in the present article. Already 12 years ago, Stout and Cook (1999) stated that in order to increase the significance of psychological testing the numerous benefits of testing need to be communicated more clearly.

Christ, Riley-Tillman & Chafouleas (2009) described the following as essential features of behavioral assessment. The specific measure needs to exhibit sound psychometric research, be suitable for a variety of testing situations, be time and cost efficient and be feasible for repeated use. Meyer et al (2001) reported in his extensive review that psychological test validity is strong and that psychological test validity can be compared to medical test validity. Furthermore Meyer stated that distinct assessment methods offer unique sources of information. All behavioral rating scales described in this article include diagnostic scales or scales which can be correlated to certain diagnostic groups. Furthermore BACS, CBCL, Conners and the PIC-2 demonstrated good reliability, which makes them an excellent tool for repeated measurements.

Behavior rating scales demonstrate advantages in the area of child behavior research and in the clinical application. Rating scales and specifically their raw scores are a good source for cluster analytical investigations of child behavior problems. This type of analysis enables researches to research behavior grouped by dimensions. This approach allows detecting possible comorbidities and subsyndromal conditions (Kamphaus et al., 2000). For quite some while behavioral rating scales have been proven to be valuable and efficient in the research of disruptive behavior and ADHD and its differentiation (Kamphaus & Frick, 1996).

The advantage of behavioral rating scales in the clinical and school use is time efficiency and the repeatability. Stout & Cook (1999) stated that psychological testing may be beneficial as a supporting tool for advancing differential diagnosis and psychodiagnostic accuracy and as an instrument for uncovering undiagnosed psychopathology. For example, ADHD and other disorders with externalizing problems are best assessed by using a behavioral rating scale, because children with externalizing problems may have the tendency to underreport their symptomatology (Kamphaus & Frick, 1996). Furthermore psychological testing and specifically behavioral assessment may be a useful in the evaluation of progress toward a specific goal.

In addition it needs to be made clearer that behavioral testing adds value for the patients and also for the attending clinician. But it appears that it is not always clear on how to accomplish this goal. Brenner (2002) suggested in his study several ways in which psychologists may improve the utilization of psychological testing, such as individualizing assessment reports, emphasizing strengths of the patient and make the report more understandable to the client. Brenner (2002) emphasized that psychologists should focus their assessments foremost on referral questions. The use of a specific measure instead of an extensive test battery may fulfill this request better. The use of specific measures may satisfy the requirements of managed care organizations and at the same time provide the clinician and the patient with meaningful results but in less time and with less effort.

Camara, Nathan and Puente (2000) found in their study that clinical psychologists perform most often personality- psychopathology and intellectual achievement assessments. Camara et al (2000) stated that clinical psychologists require 156 minutes each for administering, scoring and interpreting of a full psychological assessment battery in this field of intellectual achievement assessment and personality- psychopathology. This again is most often not in agreement with

current reimbursement policies, in which reimbursement for assessment is typically limited to less than two hours. Those circumstances call for creative changes in assessment, especially when assessment is used for the confirmation of a suspected diagnosis.

The short forms of Conners and the Behavioral Summary of the PIC -2 offer the advantage of shorter administration time, and less time is required to score and interpreting the results. The consumers of behavioral rating scales are parents, teachers and youth itself and a short form may improve their appreciation for psychological testing as well. Treatment success can be more frequently monitored through short forms and under the assumption of a good discriminant validity, the short forms of behavior rating scales may be used for diagnostic purposes as well.

Externalizing disorders and pervasive developmental disorders

Educators, physicians, psychologists and parents are faced with child behavior problems that can be quite unspecific. The vagueness of symptoms complicates the classification of symptoms to a specific disorder. One of the major challenges for psychologists poses the differential diagnosis of externalizing disorders such as Conduct Disorder (CD), Oppositional Defiant Disorder (ODD) and Attention-Deficit-Hyperactivity-Disorder (ADHD). Pervasive Developmental Disorders (PDD) and specifically milder forms of PDD and PDD-NOS are disorders that may involve disruptive behavior or behavior that is characterized by social withdrawal and social skills deficit.

Recent literature demonstrates the challenges in differentiating PDD-NOS and ADHD and at the same time questions the distinct categories of those disorders (Scheirs&Timmers, 2009; Nimeijer et al., 2009; Aebi, 2010; Nock, Kazdin, Hiripi &Kessler, 2007). ADHD, ODD and

CD are all disorders with relatively high prevalence. Prevalence rates for ODD, CD and ADHD and PDD vary widely. The DSM-IV-TR states as prevalence for ODD 2-16%, for Conduct Disorder 1-10%, for ADHD 3-7% and the prevalence for PDD is not defined in the DSM-IV-TR. This may be due to the wide variety of disorders covered by the term PDD. Kadesjo, Gillberg and Nagberg (1999) estimated that about 1% of school aged children are affected by Asperger Syndrome, however the prevalence of Aspergers Syndrome is increasing (Smith Myles & Simpson, 2002). Polanczyk, Silva de Lima, Horta, Biederman and Rhode (2007) found in an extensive systematic review that the worldwide prevalence for ADHD is 5.29% and that the observable worldwide variability is due to differences in the methodology of the studies.

ADHD, ODD and CD share several core characteristics such as impulsivity, disruptive behavior, lack of social skills and at times academic underachievement. There is a great degree of mutual comorbidity. 92.4 % of children with ODD have another DSM-IV-TR disorder and the rate for a Concomittant Impulse Disorder is 62.3% (Nock et al., 2007). And 60-70% of children with ADHD have coexisting ODD, especially children with ADHD who show high levels of hyperactivity/impulsivity are at greatest risk for developing of having ODD (Newcorn et al. ,2008).

Even though there is a frequent co-occurrence of symptoms such as inattention, hyperactivity, impulsivity, oppositional and aggressive behavior, ADHD, ODD and CD don't have much overlap in regards to the diagnostic criteria of each disorder. However the behavioral expression of each of the above mentioned disorders may be quite similar and this may make differential diagnosis quite difficult (Newcorn et al. ,2008).

Specifically the relationship between ODD and CD is quite unique. ODD may be viewed as a precursor to CD, because 90% of children with CD also meet criteria for ODD (Newcorn et

al., 2008). On the other hand both disorders are distinct disorders, because only a percentage (42.3%) of children with ODD actually develops CD (Nock et al., 2007). Nock et al (2007) found in their study that ODD is temporally primary to other comorbid disorders such as Impulse Control Disorder, mood and anxiety disorders and substance use disorders. This may suggest that the presence ODD increases the risk for developing the beforehand mentioned disorders.

ODD is highly comorbid with ADHD and symptom overlap can be observed for both disorders (Aebi et al., 2010). Nock et al (2007) found that 25% of children with ODD develop ADHD. Again other studies found that ADHD may be a precursor to CD (Mannuzza, Klein, Abikoff & Mouton, 2004) and that this occurrence is independent from reported (parents/teachers) childhood ODD behavior. Again, other studies contradict those findings and it could not be found that ADHD places children at a greater risk for later CD (Mannuzza et al., 2004). It can be observed here how difficult it is establish a distinct relationship between ADHD, ODD and CD.

The differentiation of ADHD and PDD and to which degree subtle symptoms of PDD are also present in children with ADHD poses another challenge for clinicians. The symptom overlap between those disorders occurs in the domain of social deficits. The DSM-IV (DSM-IV-TR, 2000) however does not agree with a double diagnosis of ADHD and PDD when symptoms of inattention and hyperactivity are present. Santosh & Mijovic (2004) demonstrated that children with ADHD have relationship difficulties as well as social communication problems. Those social communication problems include repetitive behavior, speech and language problems and developmental problems which resemble symptoms of PDD. Other studies found similar results, Carpenter Rich et al. (2009) described the social deficits in ADHD as social naivety and Nijmeijer et al.,(2008) described ADHD as an apparent lack of understanding of the consequences to their

behavior to others. Nijmeijer et al (2009) demonstrated that children with ADHD have elevated levels of PDD symptoms; however the familiarity of the PDD symptoms is somewhat independent from the ADHD familiarity.

Rating scales as suitable screening instruments for the identification and discrimination of psychological disorders

Rating scales have become a popular and significant tool for the identification of psychological disorders in research and in clinical settings. The following examples demonstrate the proven usefulness of behavior rating scales as tools for the identification and discrimination of disorders and syndromes. Already in 1994 Lahey et al. utilized parent and teacher rating scales such as the Children's Global Assessment Scale (CGAS), the adapted Homework Problem Checklist (parents) and the adapted Academic Performance Rating Scale (teachers) in the DSM-IV field trials for ADHD in children and adolescents. The factor analysis of the parent and teacher rating scales of this study revealed the two core dimensions of ADHD, inattention and hyperactivity/impulsivity which are now the basis for ADHD criteria in the DSM-IV-TR.

In another study the relationship of social problems in ADHD to social problems in PDD was recognized (Carpenter-Rich et al., 2009). Social functioning was assessed by using the parent report of the Social Problem Behavior scale of the Behavior Checklist (CBCL; Achenbach 1991). Factor analysis revealed two different factors for social functioning, peer rejection and social immaturity. In this study CBCL was successfully utilized to discover that Children with ADHD may have two types of social problems (peer rejection and social immaturity) and that those subclinical constructs are shared between PDD and ADHD.

The predictability of ODD in children with ADHD (Aebi et al., 2010) was examined utilizing Conners' parent rating scale (CPRS-R; Conners' et al., 1998) and the Strength and Difficult Questionnaire, parent form (PSDQ; Goodman, 2001). Christiansen et al. (2008) found, that CPRS-R and the SDS are excellent measures in discriminating ADHD from ODD and CD. In another study (Aebi et al., 2010) it was found that both assessment tools (PSDQ and CPRS-R) were adequate in the prediction of ODD, even though the measurements demonstrated varying ability in predicting subgroups of ODD, such as ODD hurtful, ODD irritable and ODD headstrong.

Utility of the PIC-2 Behavioral Summary for the identification and discrimination of disorders

The increasing number of children who are in need of accurate identification of their behavioral problems and the pressure of managed care to be time and cost efficient stipulate the importance for short but all-encompassing behavioral rating scales with excellent reliability and validity. The Behavioral Summary with its eight scales and 96 items is a very short but also broad behavior assessment tool. The PIC-2 Behavioral Summary has established substantial validation evidence. Especially interesting is the validation evidence in regards to clinician symptom ratings. In a prior study, a 178 item clinician checklist was completed for 888 referred children. Then 110 items of the 178 items on the clinician symptom checklist were placed into six factor derived dimensions of psychopathology. The six psychopathology factors include: disruptive behavior ($\alpha = .94$), antisocial behavior ($\alpha = .89$), psychological discomfort ($\alpha = .90$), developmental disability ($\alpha = .85$), serious psychopathology ($\alpha = .71$) and family psychopathology ($\alpha = .81$). It is noteworthy that the clinician symptom ratings and the sample of 888 children were completely

unrelated to prior PIC-2 research. However the relationship between these groupings of psychopathology and the short adjustment scales of the PIC-2 revealed strong correlations especially between the impulsivity & distractibility short scale ADH-S ($r = .64$), the delinquency short scale DLQ-S ($r = .66$) and the dimension of disruptive behavior. Also a somewhat strong correlation was found between the delinquency short scale DLQ-S ($r = .51$) and the dimension of antisocial behavior and between the psychological discomfort short scale DIS-S ($r = .53$) and the dimension of psychological discomfort (Lachar & Gruber, 2001).

Another diagnosis based study evaluated the ability of the Behavioral Summary scales to differentiate diagnostic groups of cases. Eleven diagnostic groups were formed based on clinicians' diagnosis with the sample of 754 referred children. The diagnostic groups were based on DSM-IV criteria. The diagnostic groups included Academic and Cognitive Disorders, ADHD, ODD, CD, any psychotic diagnosis, Major Depressive Disorder (MDD), other Depressive Disorders, Anxiety Disorders, Bipolar Disorder and the group of Disruptive Behavior and Depressive Disorders. The statistical analysis revealed that each diagnostic group had a specific *t-score* pattern, which may be useful in the discrimination of the above mentioned disorders.

CHAPTER III

Method

The present study addresses the discriminant validity of the Behavioral summary with special consideration of the diagnostic groups of ADHD, ODD, CD and PDD. Given the evidence above and considering the characteristics of the above mentioned disorders, it is predicted that the scales ADH-S, DLQ-S, WDL-S and SSK-S will be most useful in the discrimination of the above mentioned disorders.

Participants

The data used in this study was retrieved from the standardization sample of the PIC-2, which was a representative cross section of US students, from kindergarten through the 12th grade (Lachar & Gruber, 2001). The data for the present study consisted of 444 children of the referred sample. The sample of this study included children who had one of the following diagnosis: Academic and Cognitive difficulties, ADHD, ODD, CD or other disruptive behavior problems or a Pervasive Developmental Disorder (PDD). The appropriate diagnosis was reported on a clinician description form *prior to any knowledge of the Behavioral Summary scores*. 76.8% of the sample were boys and 23.2 % were girls. This demographic characteristic is common with clinical referral patterns for children with the above mentioned diagnoses (Lachar & Gruber, 2001). The age ranged from 3 years to 18 years, however the mean varied widely due to the association with a certain diagnostic group. The majority of the sample was Caucasian (69.6%) followed by African-American (16%), other ethnic groups included Asian and Hispanic children. The specific demographics are presented in Table 1.

Place Table 1 about here

The majority of referrals were clinical referrals, such as in-and-out patients of hospital settings and of freestanding clinics. The other referrals included outpatients of private practices followed by special education referrals and juvenile justice referrals from juvenile justice residential facilities (Lachar & Gruber, 2001). The raters of the child behavior included mainly mothers, but also fathers, and other females and males functioned as informants, too.

Measure

The measure used in this study is the PIC-2 Behavioral summary. The Behavioral Summary is composed of the first 96 items of the PIC-2 Standard form. It consists of eight non-overlapping scales (Short Adjustment Scales) and produces three composite scales, and one total score. The first scale is called the Impulsivity and Distractibility–Short (ADH-S) and it is a measure of uncontrolled behavior. The Delinquency-Short scale (DLQ-S) focuses on manifestations of noncompliance and was mainly derived from the DLQ 3 subscale for noncompliance of the standard PIC-2 form. The Family Dysfunction-Short scale (FAM-S) is a scale that assesses the presence of problematic relationships within the family. Prior analytic research (i.e., Lachar & Gruber, 2001) confirmed the FAM-S scale as a unique factor. Furthermore this scale shows strong correlations to under- and overcontrolled behavior. The Reality Distortion-Short scale (RLT-S) consists of statements that may indicate more serious psychopathology such as BPD, a form of psychotic diagnosis or problem behavior involving disruptive behavior and depressive disorders. The Somatic Concern-Short scale (SOM-S) is a

measure of internalizing problems, however this scale appears to have the weakest validity. The Psychological Discomfort-Short scale (DIS-S) consists of statements that reflect internalizing as well as externalizing problems. Elevations on this scale also occurred for children that had a Disruptive Behavior Disorder comorbid with a Depressive Disorder. The Social Withdrawal-Short scale (WDL-S) measures social discomfort and withdrawal. The Social Skill Deficits-Short scale (SSK-S) is a measure of limited social standing and problematic peer relations. SSK-S and WDL-S together form distinct measures for social adjustment (Lachar & Gruber, 2001). Even though those two scales serve as a distinct dimension limited social standing and problematic peer relations can be observed in a variety of psychological disorders and somewhat frequently with referred children.

The Behavioral Summary also provides three composite scores, the externalizing composite (EXT-C), the internalizing composite (INT-C) and the Social Adjustment-Composite (SOC-C). In addition all 96 statements can be summed up into one total score (TOT-C). The individual items are voiced in present tense to enhance the focus on current behavior problems. Validity scales are not part of the Behavioral Summary. In case of doubt about the validity of the ratings, the standard PIC-2 can be administered. The standard form includes three validity scales.

Reliability

The reliability of the PIC-2 and the Behavioral Summary are both considered good (Frick, 2010). For the referred sample the internal consistency (Cronbach's alpha) was reasonable good. It ranged from $r = .73$ to $.89$ for the individual Short Adjustment scales and from $r = .94$ to $.86$ for the composite scales of the Behavioral Summary (Lachar & Gruber, 2001). Furthermore the

correlation scores for the test-retest reliability ranged from $r = .85$ to $.89$ for the Behavioral Summary and provided additional support for the good reliability of this measure.

The interrater (mother-father) agreement displayed somewhat lower scores. For the nonclinical sample scores ranged from $r = .54$ to $.82$ for the Behavioral Summary. The agreement was lowest on somatic concerns in the nonclinical sample. In the referred sample the scores were lower, reaching from $r = .61$ to $.82$ for the Behavioral Summary. For the referred sample mothers and fathers disagreed most on the Psychological Discomfort Short scale; the findings are somewhat statistically significant however don't appear to be clinically significant.

Validity

Criterion related analysis, differential diagnosis and factorial analysis have been conducted to establish validity for the PIC-2 and the Behavioral Summary. The diagnosis based study examined the performance of the PIC-2 scales on differentiating eleven diagnostic groups. Each diagnostic group represented the characteristics of a DSM diagnosis and each clinical dimension or diagnostic group is also reflected by a typical pattern of t -score elevations on the Behavioral Summary scales (Lachar & Gruber, 2001). The sample of their study consisted of 754 children from the referred sample. This study supported the differential validity for the PIC-2 scales and the Behavioral Summary scales. For example, children belonging to the diagnostic group of ADHD demonstrated, on average, no elevations over 67.5 while other groups compared had at least one elevation over 70. Children with a diagnosis of ODD exhibited elevated t -scores on the ADH-S scale ($t=73.7$) and the DLQ-S scale ($t=74.3$), while children assigned to the diagnostic group of CD demonstrated only elevated scores on the DLQ-S scale ($t=70.9$). Children with a

diagnosis of PDD scored higher ($t=76.8$) on the SSK-S scale than children of any other diagnostic group.

Moderate to good evidence for the concurrent validity for the Behavioral Summary has been demonstrated by correlating the Behavioral Summary Scales to the Clinician Symptom Checklist Dimensions. As expected the correlation between the ADH-S scale and the clinicians' dimension of disruptive behavior ($r=.64$) and the correlation between DLQ-S scale and the clinicians' dimension of disruptive behavior ($r=.66$) was somewhat strong. A moderate correlation ($r=.53$) could be observed between the DIS-S scale and the clinical dimension of psychological discomfort. This correlation supports the validity of this scale, which is especially important since depression and anxiety are common concern in childhood psychopathology (Lachar, 2001).

Procedures

The present study is based on the diagnostic groups established for the former study of Lachar & Gruber (2001). Referring back to the former study, clinicians' diagnostic rating forms completed on 754 children were used to create the eleven diagnostic groups. The forms were completed by several different clinicians and in different settings, assuming and thus may include some differences in the interpretation of the DSM-criteria; therefore the diagnoses on the forms are not rigorously standardized (Lachar & Gruber, 2001). Several children had received more than one diagnosis, which made it essential to create the following procedure of allocating children to a certain diagnostic group.

All children (from the total group of 754 children) who had a diagnosis of psychosis were placed in the diagnostic group of "Any Psychotic diagnosis", regardless of other comorbidities.

Patients with a Bipolar Disorder were placed in the second group and children with PDD in the third group. Children with a dual diagnosis of a Disruptive Behavior Disorder and a Depressive Disorder were placed in the fourth group, leaving 552 patients. Into the group of “Academic and Cognitive Difficulties” 161 children were placed. Children with the diagnosis of Major Depression were assigned to group six, children with Anxiety Disorders to group seven; this was done regardless of comorbid academic or cognitive deficits. Patients with other Depressive Disorders were assigned to group eight. Children who had been identified as having an externalizing disorder were classified as follows: Children with a diagnosis of CD were placed in group nine, regardless of an additional diagnosis of ODD or ADHD; Children who had exclusively the diagnoses of ADHD were placed into group ten, children with ODD/ with and without ADHD were placed into group eleven.

For the purpose of the present study only specific diagnostic groups were included. The following five diagnostic groups were utilized: Academic and Cognitive Disorders ($N=161$), Attention-Deficit/Hyperactivity Disorder ($N=85$), Oppositional Defiant Disorder ($N=63$), Conduct or other disruptive Behavior Disorders ($N=83$) and Pervasive Disorder ($N=52$).

Statistical Analysis

All analyses were performed using SPSS version 19.0. Discriminant function analysis was selected as the statistical approach. Discriminant function analysis is very similar to multivariate analysis of variance (MANOVA). One purpose of the discriminant function analysis is to predict group membership and this is done by examining which variable(s) contributes to group separation and which variable(s) best captures group differences (Sherry, 2006). The predicted group membership is expressed in a percentage of cases correctly classified. In the present study

a direct discriminant function analysis was conducted using the eight Short Adjustment scales of the Behavioral Summary as predictors for group membership with a certain diagnostic group.

The predictors were: ADH-S, DLQ-S, FAM-S, RLT-S, SOM-S, DIS-S, WDL-S and SSK-S.

The diagnostic group included: Academic Cognitive Difficulties, ADHD, ODD, CD and PDD. In

the present study the discriminant analysis was a helpful tool for understanding the data set and

the relationship between the predicting variables (scales) and the group membership. The

discriminant function analysis and specifically the multivariate pairwise comparison gave insight

into which variables were especially valuable for predicting group membership.

Following the discriminant function analysis multivariate pairwise comparisons were conducted, comparing each diagnostic group with all the other diagnostic groups on an individual level. Multivariate pairwise comparisons give more statistical insight to which extent the predicting variables do or do not contribute to a specific discrimination of just two groups. The multivariate pairwise comparison is especially important if the two groups share several clinical qualities.

CHAPTER IV

Results

In the present sample *t*-score means for children belonging to the group with Academic and Cognitive Difficulties were all below 55.3. Average scores for children of the ADHD group included four scales over 60*T* including: ADH-S, DLQ-S, RLT-S and SSK-S but none of the scale means for this group were over 70*T*. On average children belonging to the ODD group received the highest ratings, which include two scales over 70*T* (ADH-S and DLQ-S) and four scales over 60*T* (FAM-S, RLT-S, DIS-S and SSK-S). For the CD group only the DLQ-S scale had average *t*-score elevation over 70*T*. Furthermore average scores for the CD group included five scales over 60*T*: ADH-S, FAM-S, RLT-S, DIS-S and SSK-S. The PDD group also displayed only one scale with a *t*-score elevation above 70 (SSK-S) and three scales with scores above 60*T* (ADH-S, RLT-S and WDL-S). Table 2 displays the means and standard deviations for the five diagnostic groups on the eight short adjustment scales.

Place Table 2 about here

Several assumptions need to be met in order to conduct a robust discriminant function analysis (Klecka, 1980; Tabachnick & Fidell, 1996). These assumptions include the utilization of mutually exclusive groups, continuous variables measured in interval levels and each group must demonstrate multivariate normality or homogeneity of variance. This last assumption is not easy to assess, because it is not always clear that the error rates from each group come from the same distribution (Sherry, 2006). In the present study Box'M test was used to assess the homogeneity of variance. The Box'M test was significant ($p < 0.01$), this indicates that the homogeneity of

variance was not met. However Box'M test is not so much a test of statistical significance but a test that is utilized to assess the quality of data used in a discriminant analysis. Several sources (Sherry, 2006, Field 2005, Hancock, n.d.) specify Box'M test as a test that is highly sensitive to violations of normality and that this may lead to rejection in most typical cases. It appears that Box'M test is extremely sensitive to even small departures from the homogeneity of dispersion that may exist among the samples' variance-covariance matrices. When the samples sizes are large, the discriminant function analysis tends to be robust to violations of non-normality (Sherry, 2006, Tabachnick & Fidell, 1996). The sample of the current study included 444 referred children. The procedure of placing children into diagnostic groups resulted in unequal group sizes; however the different group sizes reflect the distribution of the cases into diagnostic groups. The largest group consisted of 161 participants (Academic Cognitive Difficulties) and the smallest group included 52 participants (PDD) and this may have produced a significant Box'M test. Other reasons for the significance of Box'M test may include possible non homogeneity of covariances, especially in regards to age of child and referral source and large differences in standard deviations (SD) especially in the diagnostic group of ODD. Within the ODD group a SD of 7.30 and 18.67 were found. The RLT-S scale exhibited the largest differences in SD ($M = 69.08$, $SD = 18.67$). Given the high sensitivity of the Box'M test experts have suggested setting the p value at 0.001 (Sherry, 2006, Henson, 1999). In order to satisfy the assumptions for a robust discriminant analysis and to examine the impacting factors for the significant Box'M test we reconciled the discriminant function analysis by excluding 1) the RLT-S scale and 2) by excluding the ODD group (see page 37)

The above mentioned factors (unequal group size, possible non-homogeneity of covariance and large differences in SD) were taken into consideration while conducting the discriminant analysis. The three resulting functions, the weights and loadings of the predicting variables produced interpretable results despite a significant Box'M test.

Four discriminant functions were calculated. The test on function four was not statistically significant and was therefore excluded from further analysis. The three discriminant functions accounted for 64.3% (Function 1), 25.2%, (Function 2) and 9.6% (Function 3) of the between-group variability. The canonical correlation (R_c) between the grouping variables (diagnostic groups) and the predictors variables (Short Adjustment scales) accounted for 38.9% of the variance for the first function and for 20% of the remaining variance for the second function. The third function accounted only for 8 % of the remaining variance. All three functions were statistically significant however only the first two functions appear to be practically significant. The above mentioned results suggest that the first two functions discriminate moderately well between the five diagnostic groups and that the eight adjustment scales generate significant differences for the five diagnostic groups. Table 3 represents those findings.

Place Table 3 about here

Standardized discriminant function coefficients, structure coefficients and group centroids were examined to determine in which way the elevation on certain scales contributed to group differences. Structure coefficients demonstrate the loadings on the specific function while the standardized coefficients explain the weights of the loadings. For discriminant function 1, the structure coefficients suggest that the scales DLQ-S ($r = .95$), ADH-S ($r = .72$) and DIS-S ($r = .59$)

contribute most to the difference between the five diagnostic groups. Furthermore the standardized discriminant function coefficient suggests that DLQ-S contributes more to the discrimination of the groups than ADH-S and DIS-S. DLQ-S accounts for 89.87% of the variance accounted for on function 1.

The structure matrix of function 2 revealed that the scales SSK-S ($r = .89$), RLT-S ($r = .62$) and WDL-S ($r = .58$) also contributed strongly to a discrimination of the diagnostic group. Even though WDL-S has a somewhat strong correlation with the grouping variables (diagnostic groups) as indicated by its structure coefficient, the relative importance of WDL-S is quite small (.17). This indicates that the predictive variance of WDL-S is partly explained by SSK-S and RLT-S. The variance accounted for by the specific scales in function 3 reached only 20.16% and was therefore considered practically insignificant. Table.4 represents the standardized discriminant function coefficients and structure coefficients for all three functions.

Place Table 4 about here

With regards to group centroids on function 1, it appeared that children in the ODD group scored higher on the scales DLQ-S, ADH-S and DIS-S than children belonging to any other diagnostic group. Children with CD showed in total less elevation on DLQ-S, ADH-S and DIS-S than children with ODD. Children with ADHD demonstrated even lower scores overall on the above mentioned scales than children with CD. The lowest total scores on DLQ-S, ADH-S and DIS-S received children with Academic and Cognitive Difficulties.

Group centroids on function 2 revealed that children diagnosed with PDD displayed higher scores than any other diagnostic group on SSK-S and RLT-S and also somewhat on WDL-

S. But the group centroids suggest that even though children with ODD scored less high on the social adjustment scales SSK-S, WDL-S and on the internalizing RLT-S scale than children with PDD, they scored higher on those scales than children with ADHD, CD and Academic Cognitive difficulties. See results for the centroids represented in table 5.

Place Table 5 about here

The discriminant function analysis revealed that generally 55.5% of the entire sample was correctly classified into their assigned diagnostic group, which exceeds the cut off point for classification by chance (33.3%). At the individual group level, 80.6% of children with only academic and cognitive problems were correctly classified, 48.1 % of individuals with Conduct Disorder, 39.7% with ODD, 46.2 % of children with PDD but only 32.1% of children with ADHD were correctly classified.

Multivariate pairwise comparisons on the five diagnostic groups revealed that in pairwise comparison at least 66.7 % of originally grouped cases were correctly classified (see table 6 for more detailed information). The individual discrimination of Academic and Cognitive Difficulties with PDD revealed that SSK-S and RLT-S accounted mainly for the difference. The correlation between the grouping variable and the predictor variable accounted for 38% of variance and 82.5% of cases were correctly classified. As expected the discrimination between ODD and PDD as well as CD and PDD demonstrated the best results, allowing 85.2% and 82.7% of cases to be correctly classified.

The weakest discrimination was found between the diagnostic groups of ODD and CD. The canonical correlation accounted only for 15% of the variance; however 66.7% of cases of this

individual discrimination were correctly classified. Furthermore in the discrimination of the diagnostic groups of Academic and Cognitive Difficulties and ADHD, 74.6% of cases were correctly classified, which represents 24% of the variance accounted for. This finding demonstrates that ADHD and Academic and Cognitive Difficulties share certain characteristics. The discrimination of ADHD and ODD/CD led to 72.1%/67.9% of cases that were correctly classified. The canonical correlation for those two individual comparisons accounted for 24% and 23% of the variance. DLQ-S accounts mainly for the discrimination of ADHD and ODD/CD. Table 6 summarizes those findings.

Place Table 6 about here

The predictor variable DIS-S contributed to several pairwise discriminations, such as ADHD vs. Academic Cognitive Difficulties, ODD vs. Academic Cognitive Difficulties and CD vs. Academic Cognitive Difficulties. To a lesser degree DIS-S also contributed to the discrimination of ODD vs. CD and ODD vs. PDD. It appears that the diagnostic groups of ADHD, ODD and CD (externalizing disorders) demonstrate in addition to elevations on the DLQ-S scale and the ADH-S specifically elevations on the DIS-S scale. SSK-S scale is another important predictor variable which contributed as expected significantly to the discrimination of PDD from any other disorder. FAM-S and SOM-S didn't contribute significantly to the discrimination of diagnostic groups in the multivariate pairwise comparison.

Discriminant function analysis without RLT-S

The discriminant analysis which was carried out with the exclusion of the RLT-S scale produced similar results as the analysis including the RLT-S, however the analysis without the RLT –S scale led to non-significant Box’M ($p = 0.005$), indicating that the homogeneity of variance assumption is met now.

The results of this analysis are presented in Table 7-9.

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Place Table 7-9 about here

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Similar to the original analysis for the discriminant function 1 the scales DLQ-S ($r = .95$), ADH-S ($r = .71$) and DIS-S ($r = .58$) contribute most to the differentiation of the five diagnostic groups, however the function coefficients in this analysis suggest that the relative importance of DLQ-S (.88) and ADH-S (.91) for the group differentiation has become more similar. In function 2, SSK-S ($r = .96$), WDL-S ($r = .58$) and ADH-S ($r = .39$) contributed to the group differentiation. It needs to be pointed out that the SSK-S scale accounts for 92.16% of the variance accounted for in this function. This may be due to the exclusion of RLT-S. In function 3 the WDL-S ($r = .55$) scale contributed 30,25% to the variance accounted for, however this can be considered practically insignificant due to overall low canonical correlation (0.29, 8.6%) on function 3.

The results for the group centroids on function 1 and function 2 are very similar for the analysis with and without with RLT-S. It could be observed though that after the removal of the

RLT-S scale group centroids on function 2 suggest that children with ADHD (-0.04) score more similar to children with ODD (0.25) on the social adjustment scales SSK-S and WDL than in the original analysis.

Similar to the original discriminant function analysis 53.2% of the sample was correctly classified. 77.0% of children with Academic-Cognitive Difficulties, 30.6% of children with ADHD, 38.1% of children with ODD, 47% of children with CD and 44.2% of children with PDD were correctly classified.

Discriminant function analysis without the ODD group

The discriminant analysis with the exclusion of the diagnostic group of ODD produced slightly different results than the original analysis, however the Box' M test delivered an even lesser p-value ($p = 0.015$).

For function 1 the structure coefficients suggest that DLQ-S ($r = .81$), ADH-S ($r = .53$), DIS-S ($r = .42$) and FAM-S ($r = .42$) contribute to the group differentiation of the four diagnostic groups (Academic-cognitive difficulties, ADHD, CD and PDD). In this analysis DLQ-S accounts for only 65.16% of the variance accounted for. The function coefficients suggest that FAM-S (.04) is a fair predictor for distinguishing between the diagnostic groups

The structure matrix on function 2 revealed that SSK-S ($r = .86$), RLT-S ($r = .78$) and WDL-S ($r = .59$) also contributed strongly to the differentiation of the four diagnostic groups. In comparison to the original analysis with five diagnostic groups, RLT-S is even more responsible for the variance accounted for in this analysis (60.84% without ODD vs 38.44% with ODD). The discriminant function coefficients suggest also in this analysis, that the relative importance of WDL-S is small (.12) and that the predictive variance of WDL is partly explained by SSK-S and

RLT-S. The variance accounted for in function 3 reached only 26.01% and this was considered practically insignificant. The practical unimportance of function 3 for this analysis could also be observed on the value for the canonical correlation (.31, 9.61%). Table 10 represents the canonical correlations and table 11 represents the discriminant function coefficients and structure coefficients for all three functions.

Place Table 10 and 11 about here

For the analysis without the ODD group, the group centroids for function 1 are somewhat similar to the original analysis, it appears in this analysis that children with CD score highest on the scales DLQ-S, ADH-S and DIS-S. Children with PDD received the lowest scores on DLQ-S, ADH-S and DIS-S. This is different from the original analysis, in which children with Academic-cognitive difficulties received the lowest scores on DLQ-S, ADH-S and DIS-S for function 1. The group centroids for function 2 revealed that children with PDD scored highest on the SSK-S and RLT-S scales. Other than in the original analysis children diagnosed with CD scored higher on the SSK-S and RLT-S scales than children diagnosed with ADHD. The results for the group centroids are presented in Table 12.

Place Table 12 about here

For this analysis 60.7% of the overall sample was correctly classified into their diagnostic groups. At the individual level 79.4% of children with Academic-Cognitive Difficulties were correctly classified, 39.3% of children with ADHD were correctly classified, 51.9% of individuals

with CD and 51.9% of individuals with PDD were correctly classified. Slightly more cases with ADHD (7.2%) and slightly more cases of PDD (5.7%) were correctly classified in comparison to the original analysis.

CHAPTER V

Discussion

The Behavioral Summary is a multidimensional brief rating scale intended as a screening tool for behavioral problems in different settings, such as school, clinical settings and residential juvenile justice settings. The Behavioral Summary may be of benefit for evaluating treatment progress, especially when repeated measures are necessary (Lachar & Gruber, 2001). The Behavioral Summary may also be valuable as an aid in designing the treatment. Children and adolescents often demonstrate symptom comorbidities and it can be challenging to differentiate the co-occurring disorders. In general multidimensional rating scales are more useful in capturing an array of behavioral problems than scales that evaluate only one problem aspect (Lachar, 1998).

The discriminant function analysis in the present study delivered encouraging results for the utilization of the Behavioral Summary as a tool to differentiate various diagnostic groups. It examined whether the Behavioral Summary was able to discriminate between the following diagnostic groups: Academic Cognitive Difficulties, ADHD, ODD, CD and PDD. It is particularly important to find instruments that can aid clinicians in discriminating between these diagnostic groups as such groups hold several clinical similarities. The present study suggested that children with the externalizing disorders ADHD, ODD and CD share characteristics and elevations on scales which measure externalizing behavior but also exhibit qualities such as social adjustment problems or depressive symptoms which are generally attributed to disorders such as PDD and internalizing disorders. On the other hand ratings for children in the diagnostic group of PDD demonstrated that those children may have difficulties with inattention and disruptive behavior, behaviors that are typically associated with externalizing disorders. The etiology for the

disruptive behavior may be different for children with externalizing disorders or with PDD, however it is the behavior itself which may be problematic for the child and of concern for parents, teachers and clinicians. Also, across these diagnostic groups, the presence of such behaviors is likely to produce elevations to clinical scales that tap such behaviors, and would be expected regardless of the origins of these behaviors.

There is some evidence to suggest that the Behavioral Summary can distinguish children with solely Academic Cognitive Difficulties from any other diagnostic group as 74.6 -87.4% of cases were correctly classified. However, parent ratings indicated that children with Academic Cognitive Difficulties had no significant elevations on any of the Short Adjustment scales of the Behavioral Summary. This is a surprising result in itself that in the sample of the present study Academic Cognitive Difficulties apparently do not involve problems in the family or limited peer status to a degree that would lead to consistently elevated scores for clinical scales. Thus, an evaluation involving clinical indications of academic difficulties but a failure to obtain clinical elevations on the PIC-2 Behavioral Summary may be suggestive of Academic Cognitive Difficulties.

Even though a good discrimination between Academic Cognitive Difficulties and ADHD was possible, it became obvious that children with those disorders share some characteristics. The present study demonstrated that children with ADHD differ from children with Academic Cognitive Difficulties on the ADH-S, DLQ-S and WDL-S scale. Children with ADHD have more problems with disruptive behavior or irresponsible behavior than children with Academic Cognitive Difficulties. Children with Academic Cognitive Difficulties may present themselves as more withdrawn than children with ADHD. On the other hand the low variance accounted for (24%) indicates that both disorders share clinical similarities. Children with ADHD and children

with Academic Cognitive Difficulties demonstrate academic underachievement and this may be related to inattention in both cases. Marshall, Hynd, Handwerk and Hall (1997) hypothesized that inattention interferes with the student's ability to understand abstract concepts, especially in learning arithmetic skills in elementary grades. This hypothesis may explain why academic difficulties can be observed in both disorders. Future research may be directed at understanding the causes of inattention and may explore whether inattention is expressed differently in children with ADHD and in children with Academic Cognitive Difficulties

It appears that the DLQ-S scale is the most influential scale for distinguishing externalizing disorders such as ADHD, ODD and CD. The DLQ-S scale captures several manifestations of non-compliant behavior. Children with elevations on the DLQ-S scale can be easily angered; they may lie to get out of trouble, be impulsive and disobedient, engage in delinquent behavior and may be unresponsive to discipline. The following three diagnostic groups of the present sample (ADHD, ODD and CD) are characterized by a variety of non compliant behavior, poor social skills and impulsivity (Newcorn et al., 2008). The fact that the diagnostic groups of ADHD, ODD and CD share those characteristics is also demonstrated in the low percentage (15%-24%) of variance accounted for in the pairwise comparison of those three diagnostic groups. The discriminant power of the Behavioral Summary was weakest for the discrimination of ODD and CD. Only 66.70% of cases were correctly classified and the variance accounted for was only 15%. Those results are consistent with challenges in differentiating ODD and CD clinically. Recent research describes ODD as a distinct disorder which has somewhat different socio-environmental and genetic correlates than CD (Dick, Viken, Kaprio, Pulkkinen & Rose, 2005). It has been suggested that some adolescents (42.3%) develop CD after being diagnosed with ODD (Nock, et al., 2007). DSM-IV-TR acknowledges the similarities of those two disorders however

it does not agree with a dual diagnosis of CD/ODD, when the criteria for CD are met. Current research suggests the distinct nature of the externalizing disorders CD and ODD. But the above mentioned research also indicates that there are several opinions on how to define and differentiate ODD and CD. The Behavioral Summary with its only 96 items may not be the most adequate tool for differentiating ODD and CD. Future research may explore if the PIC-2 with its 275 items is able to deliver better results in discriminating ODD and CD.

A common question for clinicians involves the differentiation of ADHD and ODD/CD. Recent research (Mannuzza, Klein, Abikoff, & Moulton, 2004) indicated that ADHD may be a precursor for later antisocial disorders, even though absence of CD or only low levels of CD type problems were observed during childhood. Other research (Burt, Krueger, McGue & Iacono, 2001) confirmed that ADHD, ODD and CD co-occur at greater than chance levels, even though the disorders are differently influenced by genetic and environmental factors. Thus, the disorders are likely to share many common challenges and behavioral outputs, but may nonetheless also be relatively distinct. Those present findings are generally consistent with the notion that ADHD is distinct from ODD/CD, though clearly sharing some qualities.. The shared characteristics can be explained by the low variance accounted for in the discrimination of ADHD and CD (24%) and ADHD and ODD (23%). The weak discrimination of those disorders was mainly based on the marginal difference in scores on the DLQ-S and ADH-S scales. But the Behavioral Summary was able to somewhat satisfactorily discriminate ADHD from ODD (72.1 % of cases were correctly classified). The discrimination of ADHD and CD (67.9%) delivered similar weak results as the discrimination between ODD and CD (66.7%). These results indicate again how interwoven those externalizing disorders are and how many qualities they share. The Behavioral Summary

may be of use for the general differentiation of ADHD and ODD/CD, if a differentiation between ODD and CD isn't necessary.

Several other interesting findings in regards to externalizing disorders could be observed. Nock et al (2007) found in his study that ODD develops typically before other comorbid disorders and that ODD may increase the general vulnerability for later psychiatric disorders. In the present study it could be observed that children with ODD demonstrated the highest T-scores of all examined diagnostic groups on the ADHD-S scale, the DLQ-S scale and the DIS-S scale. Children belonging to the ODD group demonstrated higher T-scores on the ADHD-S scale than children belonging to the ADHD group. This may indicate that children with ODD have more areas of concerns and greater severity of their symptoms in this domain. However, it is important that additional research using the PIC-2 Behavioral Summary be conducted before such conclusions are considered substantiated.

The present study demonstrated that all children in our sample with externalizing disorders demonstrated somewhat elevated scores on the DIS-S scale. This indicates that children with ADHD, ODD and even with CD experience some form of psychological discomfort. Disruptive behaviors often occur in the presence of a dysphoria ("mad and sad") and this can especially be observed in children referred for hospitalization (Lachar & Gruber, 2011). Nock et al (2007) also described in his study ODD as a disorder with a substantial risk of secondary mood and anxiety disorders. Another study (Cosgrove et al., 2011) observed a higher correlation between Major Depressive Disorder (MDD) and externalizing disorder than between MDD and internalizing disorders. The co-occurrence of internalizing next to externalizing symptoms may not be so obvious at times. The Behavioral Summary is a tool that can monitor the development of dysphoric affects throughout treatment. It may be mentioned here that research by Apter,

Orvaschel, Laseg, Moses, & Tyano, 1989; Angold et al., 1987; Kashani, Orsaxchel, Burk & Reid, 1985 found that the parent report on the child depression is general somewhat less useful due to underreporting. This may indicate that the child him/herself or other raters would have rated his/her psychological discomfort even higher.

The social adjustment scales SSK-S and WDL-S are in general good predictors for developmental disorders such as PDD. The Behavioral Summary demonstrated adequate ability in discriminating ADHD from PDD (80.10% of cases were correctly classified). Elevations on the DLQ-S are associated with the externalizing disorders, while children with PDD show characteristic elevations on the Social Adjustment scales SSK-S and WDL-S. However children with ADHD and PDD also share difficulties in the domain of social adjustment and they may also share hyperactivity and inattention. Research indicates that children with ADHD have social problems which are often expressed as social immaturity (Carpenter Rich et al., 2009). Other research indicates that children with ADHD are perceived as having a lower quality of life, due to their problems in school and with family and friends. It needs to be noted here that parents described the quality of life of their children significantly lower than the children themselves. However 77 % of children of this study felt being different than others (Scriberras, Elfron & Iser, 2011). Those characteristics might also apply to children with PDD. In addition the DSM –IV-TR does not agree with a dual diagnosis of ADHD and PDD, if symptoms of hyperactivity and inattention occur during the course of PDD. This fact and the above mentioned findings demonstrate how challenging a differential clinical diagnosis can be between ADHD and PDD. Behavior rating scales such as the Behavioral Summary may be quick, preliminary tools for the differentiation of those two disorders. This study furthermore revealed that children with ODD and CD also demonstrate problems with social adjustment mainly expressed as limited peer status

or as conflict with peers. In the pairwise comparison 85.2% of cases were correctly classified when predicting group membership of ODD and PDD. Another interesting finding is that the SOM-S scale didn't significantly contribute to the discrimination of any disorder in this study. SOM-S is classified as a measure of internalizing disorders (Lachar & Gruber, 2001). The results of the present study indicate that the internalizing problems for the diagnostic groups examined were not linked to somatic concerns. This is especially interesting in regards to the diagnostic groups of ODD. This group showed significant elevations on the RLT-S and DIS-S scale. Especially elevations on the DIS-S scale indicate the presence of tension, worry or unhappiness; however the parent ratings suggest that those negative mood states didn't lead to somatic problems

One of the limitations of this study is that the sample was composed only of referred children. The findings of this study may not be attributable to the general population. Another issue is related to the definition of the diagnostic groups. For example the CD group included also children diagnosed with "other Disruptive Behavior Disorders." It is not clear if a group with an exclusive diagnosis of CD would have altered the results. The same applies to the group of PDD. The group of PDD includes a wide array of disorders from Asperger Syndrom to fullblown Autism. It is not known what kind of pervasive developmental disorder the children of our sample were diagnosed with. Furthermore the sample sizes were quite different ($N = 52 - 161$). The homogeneity of variance assumption was not met in this study. The homogeneity of variance was measured with the Box'M test. Box's M test is considered an overly sensitive test of non-normality (Sherry, 2006), which may question the usefulness of the Box'M test. It is not always evident why the Box' M test delivers significant results. In the present study it may be suspected

that unequal group sizes and large differences in the Standard Deviation for the specific diagnostic groups are reasons for a significant Box'M test.

The two additional analyses indicated that both, the RTL scales with its substantial differences in the SD, especially in individuals with ODD, and the diagnostic group of ODD itself, are factors accountable for the significant Box'M test of the original analysis. The removal of the RLT-S scale made the Box' M test non-significant. But the removal of the RLT-S scale didn't change much the overall results of the analysis and this may indicate that the RLT-S may not be so important for the differentiation of ODD from the other diagnostic groups

The discriminant analysis without the ODD group led to some changes in the results and to a non-significant Box'M test. The exclusion of the ODD group changed the impact of the individual scales onto the four diagnostic groups, Academic-cognitive difficulties, ADHD, CD and PDD. For example children with CD scored highest on DQL-S and ADH-S, but the impact of the scales changed, the variance accounted for decreased for those scales. Children diagnosed with PDD scored high on the SSK-S and RLT-S scale, but in this case the variance accounted for for the RLT-S increased in comparison to the original analysis. This may indicate that RLT-S may not be beneficial for the discrimination of ODD from CD and ADHD, but it may be a useful scale for discriminating PDD from CD and ADHD. The exclusion of the ODD group slightly impacted the percentage of cases correctly classified. Slightly more cases of ADHD and PDD were correctly classified. As previously mentioned ODD, CD, ADHD and even PDD share behavioral qualities and especially ODD may share characteristics with all the disorder. So the exclusion of ODD may results in a clearer discrimination of the especially ADHD and PDD.

Summary

At times healthcare providers and policies of managed care have questioned the value of assessment and assessment tools. Several behavior rating scales are evolving into tools that are intended to differentiate between disorders or confirm clinician's diagnosis. The results of the present study indicate that the Behavioral Summary with only 96 items is a good tool for screening purposes of abnormal behavior and may be a useful supplement for aiding clinicians attempting to discriminate among related diagnostic groups. The present study demonstrated that the overall discriminant power for all eight scales is an improvement over chance (55.5% of cases were correctly classified). Thus it is likely that the Behavioral Summary is capable of aiding clinicians in making discriminations between diagnostic groups that empirically and historically have been difficult to differentiate. The diagnostic effectiveness of this instrument can be utilized to distinguish disorders such as Academic and Cognitive Difficulties from other Psychological Disorders. It also seems to perform well when differentiating between PDD and ADHD.

Even though the Behavioral Summary demonstrates some diagnostic utility there are some weaknesses in discriminating externalizing disorders from each other, such as CD and ODD. On the other hand this measure may be valuable in the detection of depressive symptoms in externalizing disorders. Data from the present study suggests that this instrument can be considered as a supportive aid for the clinician. Of course clinical decisions must be based on the integration of data from different sources and if possible from multiple view points. Nonetheless, the present data suggests that the PIC-2 Behavioral Summary may be one viewpoint that is helpful.

Future research that includes the Behavioral Summary Scales SSK-S and WDL-S may be directed at a better understanding of the influence of the social adjustment dimension onto

externalizing disorders. Other research may be aimed at ways in which the brief Behavioral Summary scales together with alternative patient information may be of benefit to determine in which ways these scales can be combined with other data points to further improve the accuracy of predicting a clinical diagnosis.

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TABLES

Table 1

Sample Demographics

		<i>Academic Cognitive Difficulties</i>	<i>Attention- Deficit- Hyperactivity Disorder</i>	<i>Oppositional Defiant Disorder</i>	<i>Conduct Disorder</i>	<i>Pervasive Developmental Disorder</i>	<i>Total</i>	<i>%</i>	
<i>N</i>		161	85	63	83	52	444	100	
<i>Age</i>		3 - 18	3 - 17	3 - 16	4 - 17	3 - 18	3 - 18		
<i>Gender</i>	Boys	105	69	52	70	45	341	76.8	
	Girls	56	16	11	13	7	103	23.2	
<i>Ethnicity</i>	Asian	4	0	0	0	1	5	1.1	
	Black	20	12	11	23	5	71	16.0	
	Hispanic	14	8	6	16	6	50	11.3	
	White	119	64	45	43	38	309	69.6	
	Other	2	0	0	1	1	4	0.9	
<i>Informants</i>	Mother	128	63	48	40	36	315	71.0	
	Father	16	6	4	6	9	41	9.2	
	Other Female	10	4	4	5	4	27	6.1	
	Other Male	0	0	0	1	0	1	0.2	
	Total	154	73	56	52	49	384	86.5	
	<i>Referral Source</i>	Clinician Inpatient or Outpatient Setting	151	69	55	38	45	358	80.6
		Special Education	10	15	7	5	7	44	9.9
Juvenile Justice Residential		0	1	1	40	0	42	9.5	
<i>Region</i>	East	1	1	0	0	0	2	0.4	
	Midwest	43	18	19	12	2	94	21.2	
	South	111	61	41	69	13	295	66.4	
	West	6	5	3	2	4	20	4.5	

Table 2

Means and Standard Deviations of t-scores on the Eight Short Adjustment Scales for the Five Diagnostic Groups

Scale	Academic Cognitive Difficulties N = 161		Attention- Deficit- Hyperactivity Disorder N = 85		Oppositional Defiant Disorder N = 63		Conduct Disorder N = 83		Pervasive Developmental Disorder N = 52	
	M	SD	M	SD	M	SD	M	SD	M	SD
ADH-S	53.40	11.34	64.90	10.74	70.66	7.30	64.80	10.78	60.33	9.60
DLQ-S	52.34	11.63	63.81	12.70	74.33	7.83	70.85	11.46	57.58	11.40
FAM-S	53.49	11.53	57.39	12.76	65.05	14.31	64.44	13.24	56.50	12.58
RLT-S	52.66	11.69	60.05	15.29	69.08	18.67	64.72	15.12	68.52	12.76
SOM-S	52.25	12.56	53.50	13.00	56.46	12.37	55.94	14.21	54.60	11.65
DIS-S	52.49	11.36	59.79	14.19	69.67	11.27	65.15	12.52	59.90	15.25
WDL-S	52.54	11.06	52.19	10.60	55.60	12.39	56.75	10.88	64.12	14.40
SSK-S	55.27	14.55	61.65	16.04	69.64	17.89	60.75	13.72	76.85	11.76

Note. ADH-S = Impulsivity and Distractibility – Short; DLQ-S = Delinquency – Short; FAM-S = Family Dysfunction – Short; RLT-S = Reality Distortion – Short; SOM-S = Somatic Concern – Short; DIS-S = Psychological Discomfort – Short; WDL-S = Social Withdrawal – Short; SSK-S = Social Skill Deficit – Short

Table 3*Wilk's Lambda and Canonical Correlation for the Five Diagnostic Groups*

<i>Function</i>	<i>Wilk's Lambda</i>	χ^2	<i>df</i>	<i>p</i>	R_c	R_c^2
1	0.44	351.69	32	<0.001	0.62	38.9%
2	0.73	139.24	21	<0.001	0.45	20.0%
3	0.91	43.06	12	<0.001	0.29	8.6%

Note. R_c = Canonical correlation

Table 4*Standardized Discriminant Function and Structure Coefficient for the Five Diagnostic Groups*

<i>Scale</i>	<i>Discriminant function coefficient</i>	<i>Structure coefficient</i> r_s	r_s^2
Function 1			
ADH-S	0.06	0.72	52.13%
DLQ-S	0.85	0.95	89.87%
FAM-S	0.02	0.46	20.79%
RLT-S	0.13	0.43	18.58%
SOM-S	-0.16	0.15	2.13%
DIS-S	0.27	0.59	34.81%
WDL-S	-0.21	0.05	0.02%
SSK-S	-0.18	0.22	4.75%
Function 2			
ADH-S	-0.03	0.31	9.00%
DLQ-S	0.30	0.14	0.20%
FAM-S	-0.02	0.08	0.60%
RLT-S	0.40	0.62	38.44%
SOM-S	-0.17	0.09	0.86%
DIS-S	-0.04	0.30	8.76%
WDL-S	0.17	0.58	33.99%
SSK-S	0.82	0.89	79.92%
Function 3			
ADH-S	-1.28	-0.41	16.97%
DLQ-S	0.83	0.08	0.61%
FAM-S	0.21	0.30	9.00%
RLT-S	0.30	0.14	1.96%
SOM-S	0.15	0.11	1.30%
DIS-S	-0.13	0.10	0.94%
WDL-S	0.60	0.45	20.16%
SSK-S	-0.27	0.11	1.19%

Note. ADH-S = Impulsivity and Distractibility – Short; DLQ-S = Delinquency – Short; FAM-S = Family Dysfunction – Short; RLT-S = Reality Distortion – Short; SOM-S = Somatic Concern – Short; DIS-S = Psychological Discomfort – Short; WDL-S = Social Withdrawal – Short; SSK-S = Social Skill Deficit – Short

Table 5*Group Centroids*

<i>Diag. Group</i>	<i>Function 1</i>	<i>Function 2</i>	<i>Function 3</i>
Acad.-cog. Diff.	-0.83	-0.31	0.05
ADHD	0.24	-0.14	-0.50
ODD	1.18	0.22	-0.16
CD	0.84	-0.23	0.47
PDD	-0.59	1.27	0.12

Note. Acad.-cog. Diff. = Academic Cognitive Difficulties; ADHD = Attention-Deficit-Hyperactivity Disorder; ODD = Oppositional Defiant Disorder; CD = Conduct Disorder; PDD = Pervasive Developmental Disorder

Table 6

Individual Discriminant Analysis of the Diagnostic Groups

<i>Diagnostic Groups</i>			<i>Cases Correctly Classified</i>	<i>Variance Accounted for</i>	<i>Scales Accounted for Difference</i>
Acad.-cog. Diff.	vs.	PDD	82.50%	38.00%	SSK-S, RLT-S ^{a)}
Acad.-cog. Diff.	vs.	ADHD	74.60%	24.00%	ADH-S, DLQ-S, DIS-S ^{b)}
Acad.-cog. Diff.	vs.	ODD	87.40%	50.00%	DLQ-S, ADH-S, DIS-S ^{c)}
Acad.-cog. Diff.	vs.	CD	83.00%	40.00%	DLQ-S, DIS-S ^{d)}
ADHD	vs.	ODD	72.10%	23.00%	DLQ-S, DIS-S ^{e)}
ADHD	vs.	CD	67.90%	24.00%	DLQ-S, WDL-S ^{f)}
ADHD	vs.	PDD	80.10%	43.00%	SSK-S, WDL-S ^{g)}
ODD	vs.	CD	66.70%	15.00%	ADH-S,SSK-S, (DIS-S) ^{h)} *
ODD	vs.	PDD	85.20%	54.30%	DLQ-S, ADH-S, (DIS-S) ⁱ⁾
CD	vs.	PDD	82.70%	53.00%	SSK-S, WDL-S ^{j)}

Note. Acad.-cog. Diff. = Academic Cognitive Difficulties; ADHD = Attention-Deficit-Hyperactivity Disorder; ODD = Oppositional Defiant Disorder; CD = Conduct Disorder; PDD = Pervasive Developmental Disorder

a) denotes higher for PDD; b) denotes higher for ADHD; c) denotes higher for ODD; d) denotes higher for CD; e) denotes higher for ODD; f) denotes higher for CD; g) denotes higher for PDD; h) denotes higher for ODD; i) denotes higher for ODD; j) denotes higher for PDD

ADH-S = Impulsivity and Distractibility – Short; DLQ-S = Delinquency – Short; RLT-S = Reality Distortion – Short; DIS-S = Psychological Discomfort – Short; WDL-S = Social Withdrawal – Short; SSK-S = Social Skill Deficit – Short

* (DIS-S) indicates weaker differential power of the DIS-S in the multivariate pairwise comparison

Table 7*Discriminant Function Analysis without RLT-S*

<i>Function</i>	<i>Wilk's Lambda</i>	χ^2	<i>df</i>	<i>p</i>	R_c	R_c^2
1	0.46	342.52	28	<0.001	0.62	38.44%
2	0.74	129.22	18	<0.001	0.43	18.49%
3	0.91	41.98	10	<0.001	0.29	8.41%

Note. R_c = Canonical correlation ; RLT-S = Reality Distortion – Short

Table 8

Standardized Discriminant Function and Structure Coefficient for the Five Diagnostic Groups without RLT-S

<i>Scale</i>	<i>Discriminant function coefficient</i>	<i>Structure coefficient</i> r_s	r_s^2
Function 1			
ADH-S	0.91	0.71	50.41%
DLQ-S	0.88	0.95	90.25%
FAM-S	-0.00	0.44	19.36%
SOM-S	-0.14	0.14	1.96%
DIS-S	0.29	0.58	33.64%
WDL-S	-0.21	0.03	0.09%
SSK-S	-0.17	0.20	4.00%
Function 2			
ADH-S	0.15	0.39	15.21%
DLQ-S	-0.29	0.19	3.61%
FAM-S	-0.05	0.09	0.81%
SOM-S	-0.14	0.10	1.00%
DIS-S	0.02	0.33	10.89%
WDL-S	0.19	0.58	33.64%
SSK-S	0.94	0.96	92.16%
Function 3			
ADH-S	-1.24	-0.36	12.96%
DLQ-S	0.86	0.13	1.69%
FAM-S	0.16	0.32	10.24%
SOM-S	0.15	0.12	1.44%
DIS-S	-0.04	0.18	3.24%
WDL-S	0.68	0.55	30.25%
SSK-S	-0.10	0.02	0.04%

Note. ADH-S = Impulsivity and Distractibility – Short; DLQ-S = Delinquency – Short; FAM-S = Family Dysfunction – Short; RLT-S = Reality Distortion – Short; SOM-S = Somatic Concern – Short; DIS-S = Psychological Discomfort – Short; WDL-S = Social Withdrawal – Short; SSK-S = Social Skill Deficit – Short

Table 9*Group Centroids without RLT-S*

<i>Diag. Group</i>	<i>Function 1</i>	<i>Function 2</i>	<i>Function 3</i>
Acad.-cog. Diff.	-0.81	-0.32	0.03
ADHD	0.25	-0.04	-0.51
ODD	1.17	0.25	-0.11
CD	0.84	-0.27	0.43
PDD	-0.66	1.17	0.19

Note. Acad.-cog. Diff. = Academic Cognitive Difficulties; ADHD = Attention-Deficit-Hyperactivity Disorder; ODD = Oppositional Defiant Disorder; CD = Conduct Disorder; PDD = Pervasive Developmental Disorder; RLT-S = Reality Distortion – Short

Table 10*Wilk's Lambda and Canonical Correlation for the Five Diagnostic Groups without ODD*

<i>Function</i>	<i>Wilk's Lambda</i>	χ^2	<i>df</i>	<i>p</i>	R_c	R_c^2
1	0.47	277.25	24	<0.001	0.57	32.49%
2	0.70	134.30	14	<0.001	0.48	23.04%
3	0.91	36.09	6	<0.001	0.31	9.61%

Note. R_c = Canonical correlation ; ODD = Oppositional Defiant Disorder

Table 11

Standardized Discriminant Function and Structure Coefficient for the Five Diagnostic Groups without ODD

<i>Scale</i>	<i>Discriminant function coefficient</i>	<i>Structure coefficient r_s</i>	<i>r_s^2</i>
Function 1			
ADH-S	-0.02	0.53	28.09%
DLQ-S	1.00	0.81	65.61%
FAM-S	0.04	0.42	17.64%
RLT-S	-0.05	0.21	4.41%
SOM-S	-0.05	0.11	1.21%
DIS-S	0.22	0.42	17.64%
WDL-S	-0.15	-0.11	1.21%
SSK-S	-0.57	-0.15	2.25%
Function 2			
ADH-S	-0.09	0.53	28.09%
DLQ-S	0.12	0.51	26.01%
FAM-S	-0.06	0.28	7.84%
RLT-S	0.55	0.78	60.84%
SOM-S	-0.21	0.14	1.96%
DIS-S	-0.03	0.48	23.04%
WDL-S	0.12	0.59	34.81%
SSK-S	0.64	0.86	73.96%
Function 3			
ADH-S	-1.331	-0.51	26.01%
DLQ-S	0.71	-0.04	0.16%
FAM-S	0.27	0.27	7.29%
RLT-S	0.21	0.07	0.49%
SOM-S	0.21	0.10	1.00%
DIS-S	-0.07	0.06	0.36%
WDL-S	0.55	0.40	16.00%
SSK-S	-0.29	-0.14	1.96%

Note. ADH-S = Impulsivity and Distractibility – Short; DLQ-S = Delinquency – Short; FAM-S = Family Dysfunction – Short; RLT-S = Reality Distortion – Short; SOM-S = Somatic Concern – Short; DIS-S = Psychological Discomfort – Short; WDL-S = Social Withdrawal – Short; SSK-S = Social Skill Deficit – Short
 ODD = Oppositional Defiant Disorder

Table 12*Group Centroids without ODD*

<i>Diag. Group</i>	<i>Function 1</i>	<i>Function 2</i>	<i>Function 3</i>
Acad.-cog. Diff.	-0.43	-0.51	0.10
ADHD	0.39	0.04	-0.57
CD	1.05	0.23	0.34
PDD	-0.93	1.14	0.07

Note. Acad.-cog. Diff. = Academic Cognitive Difficulties; ADHD = Attention-Deficit-Hyperactivity Disorder; ODD = Oppositional Defiant Disorder; CD = Conduct Disorder; PDD = Pervasive Developmental Disorder