

PRELIMINARY DEVELOPMENT OF THE
CHILD IMPAIRMENT RATING SCALE

By

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TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS	iii
LIST OF TABLES	vi
ABSTRACT	vii
CHAPTER	
1 INTRODUCTION	1
2 METHOD	7
Phase 1	7
Phase 2	8
Participants	8
Procedure	10
Statistical Analyses	11
3 RESULTS	15
Reliability	15
Internal Consistency	15
Test-Retest Reliability	16
Discriminative Validity for the Total Child Impairment Rating Scale	17
Discriminative Validity for the Adaptive Functioning Subscale	18
Discriminative Validity for the Academic Functioning Subscale	19
Discriminative Validity for the Social Functioning Subscale	20
Discriminative Validity for the Home/Family Functioning Subscale	20
Construct Validity	21
4 DISCUSSION	24
APPENDIX	
A CHILD IMPAIRMENT RATING SCALE	32
B DEMOGRAPHIC INFORMATION SHEET	35

LIST OF REFERENCES.....	37
BIOGRAPHICAL SKETCH	39

LIST OF TABLES

<u>Table</u>	<u>page</u>
2-1 Demographic Data.....	14
2-2 Medication Usage.....	14
3-1 Intercorrelations between C-IRS Subscales	22
3-2 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and ADHD Groups	22
3-3 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and Combined type ADHD Groups.....	22
3-4 Comparison of C-IRS Mean Scale Scores between the Inattentive and Combined type ADHD Groups.....	23
3-5 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and Inattentive type ADHD Groups.....	23
3-6 Correlations Between Symptom Severity Ratings as Indexed by the Conners' Parent Rating Scale (CPRS) and C-IRS Measures of Impairment.....	23

Abstract of Thesis Presented to the Graduate School
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In diagnosing children with ADHD, the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV), requires documentation that the child's inattentive and hyperactive-impulsive symptoms result in clinically significant impairment in school/academic or social functioning. While evidence of impairment in at least one of these two areas is essential, the ADHD literature also provides support for impairments in other domains such as family functioning and adaptive behavior. It is important to note that while an assessment of impairment is required for diagnosis of ADHD, there are few well-established measures of impairment. Broad goals of this project included the development of a parent-report child ADHD impairment rating scale possessing subscales related to adaptive, academic, social and home/family functioning and the collection of preliminary data to test the scale's psychometric properties. Preliminary results supported the measure's internal consistency, test-retest reliability, and discriminative and construct validity. Potential long-term implications for the

development of a psychometrically sound impairment rating scale include improving the accuracy of ADHD diagnoses, enhancing our understanding of the impact of ADHD, and providing a more adequate assessment of treatment outcome.

CHAPTER 1 INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is one of the most commonly diagnosed childhood behavioral disorders, occurring in approximately 3 to 5 per-cent of the general population (American Psychiatric Association, 1994). Barkley (1998) suggests that children with this disorder also make up approximately 40% of referrals to child guidance clinics. Just as teachers find behaviors related to ADHD difficult to handle in the classroom, parents have their own set of challenges to face at home. Although the media has spotlighted ADHD in recent times and professionals have made strides to understand and treat this disorder, controversy and confusion about its nature and impact remain (Anastopoulos & Shafer, 2001). Since the diagnostic process is an important first step in conceptualizing ADHD, clinicians and researchers should seek out multi-dimensional, empirically supported, and systematic assessment techniques.

Health care professionals in the United States commonly use the guidelines defined in the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV), to make decisions about the presence or absence of ADHD. Current criteria rely heavily on observable behaviors of the child and highlight symptoms related to two dimensions; inattention and hyperactivity/impulsivity. Subtypes for the disorder are derived on the basis of these two dimensions and include the predominantly inattentive type, the predominantly hyperactive/impulsive type, and the combined type, which is characterized by both inattentive and hyperactive/impulsive symptoms. In order to establish a diagnosis, the clinician must ensure that some symptoms causing impairment had an

onset before 7 years of age, exist across situations (e.g. at home and in school), and occur apart from other mental disorders. Notably, the criteria also call for an assessment of clinically significant impairment in social, academic, or occupational functioning. The requirement for the existence of impairment in two or more settings is an important addition over previous diagnostic criteria.

While the assessment of impairment is essential to proper diagnosis, most measures relevant to the assessment of ADHD focus on core symptoms rather than impairment. Indeed, there are few comprehensive and psychometrically sound measures to assess ADHD-related impairment in children. Measures that can be used to assess general child impairment for clinical or research purposes include the following. The Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) consists of teacher, parent, and self-report rating scales that cover dimensions such as Social Skills, Leadership, and Adaptability. While responses on these scales might assess impairment, the BASC items encompass a broad range of behavioral and personality characteristics and covers much more than the construct of interest. In contrast, the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) are specific to adaptive functioning. The items within these scales cover Communication, Daily Living Skills, Socialization, and Motor Skills and are administered in an interview format. Due to its exclusive focus on adaptive behavior, the Vineland is most often used when considering a diagnosis of developmental delay or mental retardation, as opposed to externalizing disorders of childhood. An additional instrument that evaluates child impairment is the Diagnostic Interview Schedule for Children (NIMH DISC-IV), a highly structured interview designed to aid in diagnostic decision-making for common disorders, including ADHD.

This interview schedule inquires about global distress experienced by the child, parent, and teacher as a result of the child's hyperactive and/or inattentive behaviors and generally restricts responses to "yes," "no," or "some of the time." Considering the broad nature of the questions and the limited response set, however, clinicians using the DISC-IV may not get detailed information about the nature and degree of impairment experienced by a child with ADHD. Furthermore, the lengthy administration time makes this measure less than optimal for use in most clinical situations.

Overall, the instruments outlined above do not seem to provide an adequate and efficient means of assessing impairment in children with ADHD seen in clinical settings. Indeed, it is surprising that while there are many measures, such as the Revised Conners' Rating Scales (Conners, 1997), the Behavior Assessment System for Children (BASC), and the Child Behavior Checklist (Achenbach, 1991), that assess the core symptoms of ADHD, relatively little attention has been paid to the assessment of impairment in children and adolescents with this disorder. As a result of the apparent paucity of adequate impairment scales, clinicians have traditionally relied upon the overall judgment of teachers and parents. However, due to the special educational services now available for children with ADHD, many schools have called for more systematic and thorough assessment of children's every-day, functional abilities in the home and school environments (Gaub & Carlson, 1997). Notably, Fabiano and Pelham (2002) have recently described the development of an Impairment Rating Scale, which asks teachers and parents to rate the impact of a child's problems across several areas of functioning (relationships with peers, family and teachers; academic achievement; self-esteem) and to produce a written description of the child's problems. A preliminary evaluation of both

the parent and teacher scales (Fabiano & Pelham, 2002) supported the test-retest reliability of these measures, their ability to discriminate between ADHD and nonclinical groups, and their correlations with other measures that assess the same construct using different methods of measurement. It should be noted that while the rating portion is very brief (it contains a total of only 6 or 7 questions depending on whether the parent or teacher form is used), the lengthier narrative portion may hinder the scale's applicability, especially in clinical settings where brief, easy-to-administer, quantitative indices are typically preferred.

Thus, there is a continuing need to efficiently assess domain-specific impairment of children with ADHD. The DSM-IV already specifies the importance of assessing impairment in the social and academic realms. Anastopoulos and Shafer (2001) illustrate some of the ways that ADHD may impact children in these various domains. For example, with regard to academic performance, affected children often demonstrate less persistence and often fail to complete their assignments. Likewise, problems with inattention may result in failure to progress academically over time. In the social realm, children with ADHD often display an inability to attend to social cues and respond appropriately in social situations, which often leads to rejection by their peers and subsequent isolation. Lahey et al. (1998) found that social and school-related impairment emerged in children with ADHD, even when controlling for symptoms of ODD, CD and internalizing disorders. In this study, teachers rated children with ADHD as being less popular with their classmates, less prosocial, less cooperative and less assertive than a comparison group. Children with ADHD themselves reported having more problems with friends than the comparison group. With respect to the school domain, children with

ADHD exhibited underachievement in mathematics and were more likely to receive special education services for their academic problems. Biederman et al. (1999) found that girls with ADHD showed school-related impairment in that they were more likely to need in-school tutoring or special services. Compared to female controls, these girls were also more likely to repeat a grade.

Research indicates the potential for psychosocial impairment in other areas as well. For example, children with ADHD tend to have trouble assuming age-appropriate levels of responsibility and adaptive, independent behaviors and display difficulties functioning harmoniously as a member of the family. According to Sparrow, Balla and Cicchetti (1984), adaptive functioning refers to the “performance of daily activities required for personal and social responsibility.” This construct involves how well a child performs typical tasks related to the daily routine (self-help skills, for example) and encompasses independent behaviors, such as functioning well at home or in the community without supervision (Shelton et al., 1998). Several studies have found that children with ADHD receive lower parental ratings of global adaptive functioning than control groups (Biederman et al., 1999; Lahey et al., 1998). In addition, Shelton et al. reported that children with aggressive-hyperactive-impulsive-inattentive behavior displayed delays in adaptive functioning far below that expected in terms of the children’s intelligence levels. According to the authors, these children were more likely than non-adaptively disabled children to develop more serious behavioral problems, conduct disorders, and mood disturbances. In the arena of family functioning, Gerdes, Hoza, and Pelham (2003) reported that mothers and fathers of boys with ADHD perceived their relationships with their children more negatively than parents of a normal group of boys. Specifically,

parents of affected children tended to initiate more controlled, structured and demanding interactions. Dupaul, McGoey, Eckert, and VanBrakle (2001) discovered similar findings concerning functioning in the home. Parents of children with ADHD child reported more stress and less adaptive coping styles in dealing with their children.

The findings outlined above suggest that there are a variety of ways to conceptualize impairment. Within this study, impairment is defined in terms of deficits in important aspects of psychological/behavioral functioning (including adaptive behavior, social functioning, academic functioning, and functioning in the home and family environment) that presumably result from ADHD symptoms. The purpose of the study, then, was to develop a relatively brief parent-report measure that evaluates impairment in all four of these domains and to investigate its internal consistency, test-retest reliability, ability to differentiate between children with and without ADHD, and its correlation with the related construct of symptom severity as indexed by the Conners' Parent Rating Scale. The development of a reliable and valid measure of this type could prove to be of value not only for making an accurate diagnosis of ADHD, but also for assessing the real-world impact of this disorder on children. Importantly, many parents of children with ADHD would probably not seek out treatment unless their child was experiencing difficulties in functional areas such as peer and family functioning and academic achievement. Finally, such a measure should also be useful in evaluating the success of behavioral/pharmacological interventions in clinical and research settings.

CHAPTER 2 METHOD

Phase 1

After reviewing the pertinent literature, the domains of adaptive, academic, social and home/family functioning were determined to be most relevant to the assessment of ADHD-related impairment. The following criteria were developed by the authors in order to guide item generation for the Child Impairment Rating Scale (C-IRS): items should not directly reflect symptoms of ADHD or other commonly occurring comorbid conditions, such as oppositional defiant disorder and conduct disorder; the items under each subscale should touch on the major areas of functioning within each domain; items tapping each of the major domains should be worded such that they are able to be rated by the parent; and finally, it was assumed that covering major areas within domains might result in the need to have more general, rather than overly specific items. The initial list of 64 items was generated by surveying available measures that relate to the individual domains of impairment, by including items generated by the investigators, and by obtaining input from clinical child and pediatric psychologists and clinical child and pediatric psychology graduate students regarding items that may reflect ADHD domain-specific impairment.

After the generation of an initial item pool, items were reviewed by 3 clinical child and pediatric psychology faculty as well as 7 graduate students enrolled in an advanced ADHD seminar in an attempt to minimize item overlap, ambiguous item content, and to eliminate items that were not viewed as relevant to the specific domains being assessed.

It was determined that if four or more faculty or graduate students found a specific item to be inadequate, redundant or unclear, the item was discarded. Fourteen items were deleted according to the above criteria. Of the remaining items, the authors retained the 8 most representative and non-redundant items within each of the 4 subscales, for a total of thirty-two items on the C-IRS. Half of the items under each of the four domains are worded in the positive direction, for example “Meets academic time demands,” and the other half of the items are worded in the negative direction, as in the example “Has frequent unexcused absences.” The format of the scale asks the parent to determine how often their child experiences the described circumstances on a continuum: 0 (almost never), 1 (sometimes), 2 (often), 3 (almost always). This four-point scale is thought to be beneficial because it contains a range of values without overwhelming the rater with an array of fine-grained choices (Reynolds & Kamphaus, 1992). When scored, the C-IRS yields four indices of impairment, which correspond to the domains of adaptive, academic, social and home/family functioning. The scores for each domain are obtained by summing the impairment ratings for each item within that domain, after the positively worded items are reverse scored (to reflect impairment). An overall index of impairment is obtained by summing all of the items, after reverse scoring the positively worded items, within the scale. The C-IRS is presented in Appendix A.

Phase 2

Participants

The participants consisted of 38 parents (35 mothers, 3 fathers) of children with ADHD and 46 parents (40 mothers, 2 fathers) of children without the disorder. The ages of the parents in the ADHD group ranged from 23 to 83 ($M = 38.58$, $SD = 12.36$), while the ages of the parents in the non-ADHD group ranged from 25 to 51 ($M = 37.20$, $SD =$

6.99). Regarding ethnicity, 63.2% ($n = 24$) of the participants within the ADHD group were Caucasian, 34.2% ($n = 13$) were African American, and 2.6% ($n = 1$) identified themselves as mixed ethnicity. Within the non-ADHD group, 71.7% ($n = 33$) of parents were Caucasian, 21.7% ($n = 10$) were African American, and 6.5% ($n = 3$) were Hispanic. The average annual household income in the ADHD group was \$55,752 ($SD = \$31,385.38$). Within the non-ADHD group, the average annual household income totaled \$40,765.52 ($SD = \$34,007.61$). The average level of education attained for the parents of children with ADHD and the parents of children without ADHD was “some college.”

The parents in the ADHD group completed the C-IRS regarding children (8 females, 30 males) between 5 to 13 years of age ($M = 8.34$, $SD = 2.51$). The children classified as having ADHD met DSM-IV (American Psychiatric Association, 1994) diagnostic criteria for the disorder but did not meet diagnostic criteria for mental retardation, a psychotic disorder, or a pervasive developmental disorder. Information regarding ADHD subtype was gathered from the child’s medical records. Twenty-six children carried a diagnosis of ADHD combined subtype, 8 children were diagnosed as ADHD inattentive subtype, and 4 children had an unknown subtype of ADHD. Of the 38 children in the clinical group, 24 were currently taking medications to treat ADHD symptoms while 14 were not on medication.

The parents of the non-ADHD comparison group completed the C-IRS with respect to children (26 females, 20 males) also between 5 and 14 years of age ($M = 8.41$, $SD = 2.23$). According to their parents’ reports, the children in this non-ADHD group did not meet DSM-IV diagnostic criteria for a psychological disorder. Demographic data, in

addition to information regarding child medication usage within the total ADHD group and across subtypes, is presented in Tables 1 and 2.

All of the children with ADHD were drawn from cases seen for evaluation by the Department of Clinical and Health Psychology Psychology Clinic and/or from the University of Florida Interdisciplinary ADHD program. When an ADHD patient was seen in either context, the parent was approached to establish whether or not he or she would be interested in participating in the present study. Out of 39 parents who were approached, one individual declined to participate. Parents of non-ADHD cases were recruited through flyers posted on bulletin boards near parking garages of a major teaching hospital, through the hospital's newsletter, and at a recruitment booth located at an after-school program of a university-related developmental research school. As these parents were not approached directly, it was not possible to determine participation rates for the non-ADHD group. No exclusions were made on the basis of sex/gender or racial/ethnic group for either group of parents.

Procedure

After obtaining an informed consent, parents in the ADHD group were given a demographic information sheet and the Child Impairment Rating Scale to complete. For purposes of this study, the informed consent incorporated permission from the parent to use data from their child's routine clinical assessments, including information related to the diagnosis as well as scores from the Conners' Parent Rating Scale, a well-established measure of symptom severity containing indices related to inattention and hyperactivity/impulsivity. The demographic sheet asked parents for general information (such as name, address, phone numbers, child's date of birth and gender), the type of ADHD diagnosis (if known), and whether the child has been formally diagnosed with any

other psychological condition (See Appendix B). If they expressed a willingness to complete a second impairment measure, they were given another copy of the C-IRS to complete and send in after an interval of 2-3 weeks. This second copy of the rating scale, as well as a self-addressed, stamped envelope, was given to the parents so that they could return the materials at no extra cost. Parents in the ADHD group received monetary compensation of 5 dollars for their participation.

Parents in the non-ADHD comparison group were given an informed consent explaining the nature of the study and issues of confidentiality, a copy of the C-IRS, and a demographic information sheet. Parents who expressed their willingness to participate in the study were given the materials directly either at the local after-school program or at the hospital. Since parents of non-ADHD children were not seen in the context of routine clinical care, such individuals were asked to participate in return for monetary compensation of 10 dollars.

Statistical Analyses

The first specific aim of the study was to evaluate the internal consistency of the overall scale as well as that of the individual subscales (Adaptive, Academic, Social, and Home/Family Functioning) within the C-IRS. Thus, statistics related to reliability (including coefficient alphas and item-total correlations) were obtained from the entire sample, including parents of both ADHD and non-ADHD children. Item-total correlations range from 0 to 1, with the latter value reflecting maximal item discriminating power. Due to the current sample size and the restriction of range on the four-point Likert scale, it was expected that these correlations would most likely fall around .5 or .6. It was also predicted that all of the items in the Child Impairment Rating Scale, as well as the items within each sub-domain, would exhibit a high degree of

homogeneity as measured by the respective alphas. Specifically, it was anticipated that these values would fall within the acceptable range of .85 to .95, a criterion that most standardized tests meet. For the test-retest phase of the study, which utilized responses from parents of children with ADHD, a Pearson's product moment correlation coefficient for the scores over the 2-3 week interval was calculated. It was expected that the scores from the first administration would be significantly correlated with the scores from the second administration.

A secondary aim involved an assessment of the discriminative validity of the C-IRS by comparing responses of parents of ADHD children to responses of parents of non-ADHD children using analyses of variance (ANOVAs). It was predicted that mean scores from the four individual subscales and the total scale would be significantly higher for clinical cases than for the non-ADHD cases. For exploratory purposes, a *t*-test was conducted to determine if there were significant differences between groups in terms of child age. The children with ADHD and the children without ADHD did not differ significantly in terms of age, $t(82) = .137, p = .891$; therefore, this variable was not included as a covariate in subsequent analyses. Given that there were more boys ($n = 30$) than girls ($n = 8$) in the ADHD group, preliminary ANOVAs were conducted to examine potential significant differences in C-IRS scores by gender. Within the ADHD group, no significant differences in subscale or total scores emerged between boys and girls. Similarly, there were no significant differences in scale scores between boys and girls within the non-ADHD group. However, because these findings were tempered by evidence of low power, child gender was included in the discriminative validity analyses in order to explore its potential contribution as a covariate. In separate analyses, ADHD

subtype was entered as a between-subjects factor in order to evaluate significant differences in C-IRS scores with respect to this variable. It was hypothesized that total and subscale scores would be significantly higher for children with a diagnosis of ADHD Combined subtype compared to children with ADHD Inattentive type and to children without a diagnosis.

An additional aim of this study was to evaluate whether or not C-IRS scores for children with ADHD on medication differed from scores for children with ADHD not on medication. It was predicted that scores from parents of children who were on medication would be significantly lower than scores for children not on medication. In order to determine whether scores for children on medication differed significantly by ADHD subtype, further analyses were conducted with both ADHD subtype and medication status as between-subjects factors.

A final goal of the study was one of construct validity and involved assessing the relationship between scores from a well-established parent-report measure of symptom severity, the Conners' Parent Rating Scale, and parental ratings of children with ADHD on the C-IRS. It was predicted that the symptom severity scores reflecting inattention and hyperactivity/impulsivity (The Conners' ADHD Index, the DSM-IV Inattentive subscale, the DSM-IV Hyperactive-Impulsive subscale, and the DSM-IV Total subscale) would be significantly related to C-IRS indices of impairment.

Table 2-1 Demographic Data

	n	M	SD
Child Age			
Non-ADHD	46	8.41	2.23
ADHD (Total)	38	8.34	2.51
ADHD (Subtypes)			
Combined	26	8.58	2.56
Inattentive	8	7.50	1.20
Unknown	4	8.50	4.12
Child Gender			
Non-ADHD			
Boys	20		
Girls	26		
ADHD			
Boys	30		
Girls	8		
Parent Respondent			
Non-ADHD			
Mothers	46		
Fathers	2		
ADHD			
Mothers	35		
Fathers	3		

Table 2-2 Medication Usage

ADHD Group	Medication	No Medication
Total	24	14
Combined	19	7
Inattentive	2	6
Unknown	3	1

CHAPTER 3 RESULTS

Reliability

Internal Consistency

Intercorrelations between the four C-IRS subscales ranged from .59 to .73 (See Table 3). Corrected item-total correlations, which reflect how well items discriminate between respondents with a low score and respondents with a high score, were calculated for the total scale (containing 32 items) as well as for the four individual subscales (each consisting of 8 items). The mean corrected item-total correlation for the total Child Impairment Rating Scale was .55 (range = .32 - .80). The item with the best discriminating ability for the full scale was “Performs well on academic tasks,” while the item with the smallest discriminating ability was “Shows appropriate concerns for safety.” Cronbach’s coefficient alpha for the total scale, calculated from 67 fully completed measures, was .94. It should be noted that the final item on the C-IRS inquires about how well the participant’s child gets along with his/her siblings, and 17 parents did not respond to this question, indicating that it was not applicable to their family. The reliability analyses were conducted in a manner such that responses from participants with missing data points were dropped listwise, thereby reducing the total *N* for both the overall scale and for the Home/Family Functioning scale (both of which contain this item). For exploratory purposes, this “sibling” item was dropped from the analyses, and the pattern of findings was virtually identical to what is reported here.

The mean corrected item-total correlation for the Adaptive Functioning subscale was .43 (range = .28 - .63). The item with the highest ability to discriminate between respondents with a high and low score was “Shows appropriate levels of independent behavior,” while the item with the lowest discriminating ability was “Shows appropriate concerns for safety.” Responses from eighty-four measures were used to calculate Cronbach’s coefficient alpha, which was .74 for this subscale.

With respect to the Academic Functioning subscale, the mean corrected item-total correlation was .58 (range = .36 - .70). The item “Performs well on academic tasks” had the best discriminating power while the item “Has unexcused absences” demonstrated the poorest discriminating ability. Analyses of 83 measures resulted in a coefficient alpha of .84.

Within the Social Functioning subscale, the mean item-total correlation was .57 (range = .42 - .74). The items corresponding with the high and low ends of this range were “Has good relationships with peers” and “Shows lack of respect for the property of peers,” respectively. Cronbach’s coefficient alpha for this subscale, based on 84 fully completed measures, equaled .84.

The mean corrected item-total correlation for the Home/Family functioning subscale was .61 (range = .38-.76). The item with the highest discriminating power was “Shows lack of respect for parents or other family members,” while the item with the lowest discriminating ability was “Behavior causes difficulty between parents.” The coefficient alpha, calculated from 68 measures, was .86 for this subscale.

Test-Retest Reliability

A small sample of eighteen parents of children with ADHD returned a second copy of the C-IRS after an interval of 2-3 weeks. The test-retest reliability coefficient was .92

for the overall total scale, .87 for the Adaptive Functioning subscale, .78 for the Academic Functioning subscale, .90 for the Social Functioning subscale, and .81 for the Home/Family Functioning subscale (all $p < .01$).

Discriminative Validity for the Total Child Impairment Rating Scale

An Analysis of Covariance (ANCOVA) was conducted, with child gender as a covariate, to evaluate whether or not scores from the total C-IRS differentiated between parents of children with ADHD and parents of children without ADHD. Significant differences emerged between these two groups, $F(1,64) = 32.94$, $p < .001$, such that parents of children with ADHD ($M = 37.87$, $SD = 14.61$) indicated higher levels of overall child impairment than parents of children without ADHD ($M = 17.17$, $SD = 10.67$). The effect size, measured using Cohen's d , was 1.62, and statistical power was 1.00. No significant effect was found for child gender. An additional ANCOVA was conducted to test for differences in total impairment ratings as a function of group membership: parents of children with combined type ADHD, parents of children with inattentive type ADHD, parents of children with unknown type (i.e. ADHD subtype was not specified in their medical records), and parents of children without ADHD. As before, a significant main effect of group membership was found, $F(3,62) = 14.74$, $p < .001$, and the effect of child gender was not significant. To decompose the significant main effect, pairwise comparisons were performed using Bonferroni corrections to control for alpha inflation. Here, parents of children with combined type ADHD reported significantly higher levels of impairment than parents of children without ADHD ($p < .05$).

Please refer to Table 4 for contrasts between the ADHD and comparison group and to Tables 5, 6, and 7 for contrasts across all relevant subtypes. Information contained in

the latter 3 tables compare two groups at a time, even though multiple comparisons were conducted, in order to make the findings as clear as possible (also note that data regarding group differences on the total scale as well as on the four individual subscales is presented within these tables; descriptions of the group differences on each of the four subscales are provided in the following sections). Overall, parents of children with ADHD reported significantly higher levels of impairment than parents of children without ADHD. Children with combined type ADHD received significantly higher impairment scores than their non-ADHD counterparts. Although no significant differences emerged between children with combined and inattentive type ADHD or between children with ADHD inattentive type and non-ADHD children, effect sizes were generally high, suggesting that significant differences may emerge with larger sample sizes (refer to the subsequent “Discriminative Validity for the Social Functioning Subscale” section for an exception).

Further analyses found that mean total impairment scores for parents of children with ADHD who were taking medication did not differ significantly from parents of children with ADHD who were not taking medication. Moreover, these analyses were not significant when the children with ADHD were characterized according to subtype. It should be noted that these and all subsequent analyses involving medication effects suffered from low power due to the relatively small number of participants in the ADHD group.

Discriminative Validity for the Adaptive Functioning Subscale

An ANCOVA was one again conducted with child gender as a covariate to determine whether or not parents of children with ADHD and parents of children without ADHD differed in terms of their scores on the Adaptive Functioning subscale of the C-

IRS. The ANCOVA yielded significant results, $F(1,81) = 39.52, p < .001$, Cohen's $d = 1.54$, power = 1.00, with parents of children with ADHD ($M = 11.60, SD = 3.87$) displaying significantly higher mean scores on adaptive impairment than parents of children without the disorder ($M = 6.17, SD = 3.12$). Child gender was a non-significant covariate. A subsequent ANCOVA analysis yielded an overall significant effect for group membership (as defined earlier), $F(3,79) = 14.16, p < .001$. Post-hoc analyses using Bonferroni's correction indicated that parents of children with combined type ADHD reported higher levels of child impairment related to adaptive functioning than parents of children without ADHD ($p < .05$). There were no significant differences in adaptive impairment scores between parents of children with ADHD inattentive type and parents of children without ADHD. Again, no significant group differences emerged in terms of child gender. Likewise, further analyses revealed that the medication effects were non-significant.

Discriminative Validity for the Academic Functioning Subscale

With child gender included as a covariate, an ANCOVA found that parents of children with ADHD ($M = 9.76, SD = 4.26$) showed significantly higher scores related to academic impairment when compared to parents of children without ADHD ($M = 3.83, SD = 3.58$), $F(1,80) = 36.75, p < .001$, Cohen's $d = 1.51$, power = 1.00. As in the previous analyses, child gender was not a significant covariate. An ANCOVA exploring the effect of group membership on Academic Functioning scores yielded a significant main effect, $F(3,78) = 13.28, p < .001$. Decomposition analyses using Bonferroni corrections indicated that parents of children with ADHD combined type endorsed significantly higher levels of academic impairment than parents of children without ADHD ($p < .05$). No other comparisons were found to be significant. Furthermore,

additional analyses showed that medication status did not differentiate between the ADHD groups.

Discriminative Validity for the Social Functioning Subscale

An ANCOVA found that mean scores on the Social Functioning scale significantly differentiated between parents of children with ADHD ($M = 8.08$, $SD = 5.06$) and parents of children without the disorder ($M = 4.48$, $SD = 4.57$), $F(1,81) = 9.97$, $p < .01$, Cohen's $d = .75$, power = .88. No significant effect was found for the covariate, child gender. An additional ANCOVA found a significant effect for group membership, $F(3,79) = 6.20$, $p < .01$. According to pairwise post-hoc analyses utilizing Bonferroni corrections, parents of children with combined type ADHD reported higher levels of impairment in social functioning than parents of children with ADHD inattentive type ($p < .05$) and parents of children without ADHD ($p < .05$). There were no significant differences in social impairment scores between parents of children with ADHD inattentive type and parents of children without ADHD. Interestingly, the effect size was small (see Table 6), suggesting that similar findings are likely to be obtained, even with a larger sample size. As in the previous analyses involving other subscales, no significant differences emerged in terms of child gender. Once again, scores for parents of children with ADHD who were taking medication were not significantly different from parents of children with ADHD who were not taking medication. These findings were not altered when the ADHD group was broken down by subtype.

Discriminative Validity for the Home/Family Functioning Subscale

An ANCOVA conducted with child gender as a covariate found that parents of children with ADHD ($M = 8.38$, $SD = 4.78$) reported significantly higher child impairment in the home/family domain as compared to parents of children without

ADHD ($M = 4.08$, $SD = 3.48$), $F(1,65) = 12.11$, $p < .01$, Cohen's $d = 1.03$, power = .93. Consistent with the previous findings outlined above, child gender was a non-significant covariate. An ANCOVA exploring the effect of group membership on Home/Family Functioning scores yielded a significant main effect, $F(3,63) = 4.81$, $p < .01$. Post-hoc analyses using Bonferroni corrections indicated that parents of children with ADHD combined type endorsed significantly higher levels of academic impairment than parents of children without ADHD ($p < .05$). As before, child gender was non-significant; and additional analyses found that medication status did not differentiate between the ADHD groups.

Construct Validity

Pearson product-moment correlation coefficients were calculated in order to determine the strength and direction of the relationship between scores on selected scales of the Conners' Parent Rating Scale (The ADHD Index, DSM-IV Inattentive scale, DSM-IV Hyperactive-Impulsive scale, DSM-IV Total scale) and the C-IRS. As indicated in the preceding chapter, it was expected that elevations on these scales, reflective of ADHD symptom severity, would be significantly related to increased levels of impairment. Data from completed Conners' Parent Rating Scales were available for 25 parents of children with ADHD. Scores from the Academic Functioning subscale of the C-IRS correlated positively with scores on the Conners' ADHD Index ($r = .44$, $p < .05$), the DSM-IV Inattentive subscale ($r = .41$, $p < .05$), the DSM-IV Hyperactive-Impulsive subscale ($r = .44$, $p < .05$), and the DSM-IV Total subscale ($r = .54$, $p < .01$). In other words, an increased level of inattentive and hyperactive-impulsive symptomatology was significantly associated with higher levels of academic impairment. Scores from the Social Functioning subscale of the C-IRS, in contrast, only correlated positively with

scores on the DSM-IV Hyperactive-Impulsive ($r = .40, p < .05$) and DSM-IV Total ($r = .48, p < .05$) scales. Thus, a higher degree of hyperactive-impulsive symptomatology was significantly associated with elevated levels of social impairment. No significant correlations were found between scores on the C-IRS Adaptive and Home/Family Functioning scales and Conners' Parent Rating Scale measures. Please refer to Table 8 for a listing of the bivariate correlation coefficients and their associated p -values.

Table 3-1 Intercorrelations between C-IRS Subscales

Subscale	1	2	3	4
1. Adaptive	--	.73**	.63**	.61**
2. Academic		--	.59**	.60**
3. Social			--	.60**
4. Home/Family Functioning				--

** $p < .01$

Table 3-2 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and ADHD Groups

	Non-ADHD		ADHD		F(1)	d	(1- β)
	M	SD	M	SD			
Total	17.17	10.67	37.87	14.61	32.94***	1.62	1.00
Adaptive	6.17	3.11	11.61	3.87	39.52***	1.55	1.00
Academic	3.94	3.58	9.76	4.26	36.75***	1.48	1.00
Social	4.48	4.57	8.08	5.06	9.97**	.75	0.88
Home/Family Functioning	4.08	3.48	8.38	4.78	12.11**	1.03	0.93

*** $p < .001$; ** $p < .01$

Cohen's d = Effect size

(1- β) = Power estimate

Table 3-3 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and Combined type ADHD Groups

	Non-ADHD		Combined type ADHD		Mean difference	d
	M	SD	M	SD		
Total	17.78	12.43	38.98	12.50	21.20*	1.70
Adaptive	6.28	3.57	11.86	3.57	4.65*	1.56
Academic	4.02	4.02	10.34	4.03	6.32*	1.57
Social	4.44	4.82	9.44	4.81	5.00*	1.04
Home/Family Functioning	4.30	4.23	8.36	4.27	4.06*	.97

* $p < .05$

Note. Calculations were made using Bonferroni corrections for multiple comparisons

Table 3-4 Comparison of C-IRS Mean Scale Scores between the Inattentive and Combined type ADHD Groups

	Inattentive type ADHD		Combined type ADHD		Mean difference	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Total	26.47	12.00	38.98	12.50	12.51	1.02
Adaptive	9.73	3.46	11.86	3.57	2.13	.61
Academic	7.98	3.89	10.34	4.03	2.36	.60
Social	4.13	4.66	9.44	4.81	5.31*	1.12
Home/Family Functioning	6.27	4.11	8.36	4.27	2.09	.50

**p* < .05

Note. Calculations were made using Bonferroni corrections for multiple comparisons

Table 3-5 Comparison of C-IRS Mean Scale Scores between the Non-ADHD and Inattentive type ADHD Groups

	Non-ADHD		Inattentive type ADHD		Mean difference	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Total	17.78	12.43	26.47	12.00	8.68	.71
Adaptive	6.28	3.57	9.73	3.46	3.45	.98
Academic	4.02	4.02	7.98	3.89	3.96	1.00
Social	4.44	4.82	4.13	4.66	.31	.07
Home/Family Functioning	4.30	4.23	6.27	4.11	1.97	.49

**p* < .05

Note. Calculations were made using Bonferroni corrections for multiple comparisons

Table 3-6 Correlations Between Symptom Severity Ratings as Indexed by the Conners' Parent Rating Scale (CPRS) and C-IRS Measures of Impairment

C-IRS	Symptom Severity (CPRS)			
	ADHD Index	DSM-IV Inattentive	DSM-IV Hyperactive- Impulsive	DSM-IV Total
Total	.24	.19	.36	.33
Adaptive	.35	.22	.29	.29
Academic	.44*	.41*	.44*	.54**
Social	.35	.36	.40*	.48*
Home/Family Functioning	-.09	-.16	.12	-.01

Note. *N* = 25** *p* < .01; * *p* < .05

CHAPTER 4 DISCUSSION

Current diagnostic criteria (DSM-IV: American Psychiatric Association, 1994) highlight the importance of assessing impairment in children suspected of having ADHD. The criteria explicitly state that, in addition to developmentally inappropriate levels of hyperactive-impulsive and/or inattentive behavior, children must display evidence of clinically significant impairment (usually in school/academic and/or social functioning in at least two settings) in order for a diagnosis of ADHD to be given. To gain a sense of how a child's functioning is affected by his/her symptoms, clinicians usually rely on the subjective verbal reports of parents and teachers, while researchers often adapt scales from a range of measures thought to assess dimensions of impairment in children. Indeed, as Wolraich and Baumgaertel (1997) noted, there are few efficient, well-established measures designed to specifically address impairment in children with ADHD.

The goal of the study, therefore, was to develop a clinically useful Child Impairment Rating Scale to assess the impact of inattention and hyperactive-impulsive symptoms on child functioning in several key areas. These areas included those specified by the DSM-IV diagnostic criteria (academic and social functioning) as well as two additional areas emphasized by the ADHD literature, adaptive and home/family functioning. A major focus of the current study was on obtaining preliminary information on the psychometric properties of this new measure.

As indicated earlier, refinement of an initial item pool led to the development of a 32-item measure (the C-IRS), consisting of four eight-item scales designed to assess impairment in the four areas described above.

Data obtained thus far suggests that each of the four C-IRS impairment indices reliably differentiate between children with and without ADHD. Cronbach's alpha for the entire scale equaled .94, and alpha levels for the Adaptive behavior, Academic, Social, and Home/Family Functioning subscales were high (range = .74 - .86). As Cortina (1993) noted in an article examining the appropriate uses of coefficient alpha, this statistic, which provides information about the interrelatedness of items, is highly influenced by the number of items in a measure (i.e. the more items, the higher the reliability tends to be). The results obtained in the current study are especially promising in that, in addition to the total scale, even the individual subscales, comprised of 8 items each, displayed high alpha levels. High alphas should not be taken to mean that the instrument is unidimensional, however (Cortina, 1993; Schmitt, 1996). In fact, although ADHD-related impairment is thought to be the underlying construct of the C-IRS, the measure was created with four distinctive dimensions of impairment in mind. The correlations between these subscales, depicted in Table 3, demonstrate that these domains are related, yet distinct; that is, the correlations between them are not perfect. Future studies should utilize factor analytic techniques with larger sample sizes in order to more clearly elucidate the underlying dimensions of the C-IRS.

Also with respect to reliability, item-level analyses revealed that the C-IRS items adequately discriminated between children with low total scores and children with high total scores on this measure. The items with the best discriminating abilities tended to be

those thought to broadly tap each subdomain (e.g. “Shows appropriate levels of independent behavior,” “Performs well on academic tasks,” “Has good relationships with peers,” and “Shows lack of respect for parents or other family members”). The items with the lowest discriminating power, in contrast, appeared to specify a particular aspect of functioning within a domain (e.g. “Has unexcused absences”; “Shows appropriate concerns for safety”). This should not be taken to mean that the items with relatively lower item-total correlations are not useful indicators of impairment, however. Indeed, all item-total correlations exceeded .20. In order to bolster the generalizability of the findings, replication studies with larger sample sizes are needed. Although beyond the scope of the current study, statistical techniques based on Item Response Theory (Lord & Novick, 1968) present an alternative way to assess the reliability of measures such as the C-IRS at the item level of analysis. Such models highlight the relationship between an individual’s responses to items and the underlying latent trait assessed by the instrument (impairment, in this case) and have the benefit of not being contingent on the specific sample from which responses are generated. Lastly, in terms of reliability, the results demonstrated significant test-retest reliability over a 2-3 week interval for the parents of children with ADHD. Thus, these preliminary findings with the C-IRS appear to demonstrate evidence of satisfactory temporal stability, albeit with a relatively small sample.

As noted above, the results of the current study provided evidence that the C-IRS adequately distinguished between parents of children with ADHD and parents of children without the disorder. Mean scores from the total scale and from each of the individual scales were significantly higher for measures completed by parents of children with

ADHD. In addition, analyses were conducted with ADHD subtype as an independent variable. Here, impairment ratings from parents of children with ADHD combined type were significantly higher in comparison to impairment ratings from parents of non-ADHD children. This was true for the total scale score and for all subscale scores (effect sizes, as displayed in Table 5, were all large). Children with the ADHD inattentive type, in contrast, did not show significant differences in levels of impairment on the total scale or on any of the individual subscales when compared to children without this disorder. It should be noted that the effect sizes associated with these comparisons (except on the Social Functioning subscale) were quite large, suggesting that some of the non-significant differences between groups may turn out to be significant with a larger sample size.

When responses from parents of children with ADHD combined type were compared to responses from parents of children with ADHD inattentive type, children with the combined subtype displayed significantly higher levels of social impairment. No other comparisons between these groups on other subscales or on the total scale were found to be significant, although effect sizes were in the moderate to high range.

Contrary to the hypothesis, impairment scores from parents of children with ADHD on medication did not differ significantly from scores for children with ADHD who were not on medication. Johnson and Reader (2002) found similar, non-significant results when comparing indices of family stress between parents of ADHD and non-ADHD children and suggested that children who are prescribed medication may exhibit a higher degree of initial symptom severity and impairment than do children not on medication. Thus, although medication may work to reduce some of these symptoms and thereby reduce ADHD-related impairment, it may not sufficiently bring levels of impairment

below those that are found in non-medicated children. It is also the case that for many children taking medication, the effects of the drug may only last for the duration of the school day. In these instances and in instances when the child is not given medication on weekends, parents' observations of their child's functioning may primarily occur at times when the child's behavior is not likely to be significantly influenced by medication effects. Since parent ratings of impairment in such cases may be based on observations of their child's behavior when he/she is basically off medication, perhaps it is not surprising that no differences between children on and off medication were found. As Johnson and Reader have indicated, more research is needed before firm conclusions can be made regarding this specific hypothesis.

The relatively small sample size utilized in determining reliability and validity estimates is one of the primary limitations of the present study. The fact that there were so few children with the inattentive subtype of ADHD ($n = 8$) also limited the power of detecting significant differences between groups. Moreover, there were several children ($n = 4$) for whom an ADHD subtype was not ascertained. Although data from parents of these children were included in the analyses, these scores unfortunately did not yield interpretable information about how impairment in ADHD groups differed according to subtype. As previously stated, additional studies designed to evaluate the reliability and validity of the C-IRS are needed. Nevertheless, the results of this study provide support for the potential usefulness of this measure in assessing the "real-world impact" of ADHD within the important domains of functioning that are highlighted in the literature (Anastopoulos & Shafer, 2001; Lahey et al., 1998; Biederman et. al., 1999; Dupaul, McGoey, Eckert, & VanBrackle, 2001). The results regarding differences in ratings

across ADHD subtype are particularly noteworthy in that even with a small sample size, scores of social impairment derived from parents' ratings of children with ADHD combined type were significantly higher than those scores from parents of children with ADHD inattentive type. Furthermore, indices of symptom severity resulting from inattentive and hyperactive-impulsive symptomatology were significantly correlated with academic and social impairment; whereas, inattentive symptomatology by itself was only significantly correlated with academic impairment. It is important to note that the DSM-IV explicitly indicates that there must be evidence of academic and/or social impairment for a child to be given a diagnosis of ADHD. A potential implication, therefore, may involve a consideration of how the inclusion of a formal assessment of impairment improves the accuracy of diagnostic decision-making in children suspected of having ADHD.

A second potential limitation centers on the fact that the study did not recruit parents of children with pure ADHD, but allowed the inclusion of children with ADHD and comorbid disorders. This may be a limitation in the sense that the indicated levels of impairment may be at least partially due to the comorbid symptoms rather than the ADHD-related symptoms alone. It must be taken into account, however, that ADHD is often found to occur in conjunction with comorbid disorders like oppositional defiant and conduct disorder; therefore, the sample is most likely to be representative of the type of cases most often seen in clinical settings. An additional limitation relates to the disproportionate number of male versus female children represented in the ADHD group (30:8) and the number of males versus females in the normal comparison group (20:26). The analyses performed in the discriminative validity portion of the study were designed

to test for significant gender differences between groups; however, this variable did not emerge as a significant covariate. Such a finding suggests that differences in impairment rating scores between the ADHD and non-ADHD groups are not likely influenced by child gender.

In summary, the results of this study support the continued development of the Child Impairment Rating Scale for potential use in ADHD assessment as well as in ADHD research. In comparison to existing measures of general child impairment, the C-IRS is likely to be more suitable for assessing impairment in children with ADHD. Moreover, the C-IRS can be completed in a short period of time (approximately 6 minutes), thus making it very efficient for use in clinical practice. With regard to future implications, the development of a similar teacher report form (containing all subscales except Home/Family functioning) would likely provide valuable information about ADHD-related impairment experienced by children in classroom situations that might not be readily apparent to parents. In the future, the C-IRS might also allow for a more comprehensive assessment of treatment outcome in children with ADHD who suffer from high levels of impairment. In order for these future goals to be realized, efforts should be made to acquire additional reliability and validity data from studies with larger sample sizes. Studies using factor analytic techniques to assess the multidimensional nature of this measure of impairment are also a high priority. Importantly, the rating scale's usefulness as a clinical measure depends on the acquisition of normative data, which would allow for the development of cut-off scores to help differentiate between children with clinical and non-clinical levels of impairment. Indeed, targeting children who are at-risk across several functional domains holds the possibility of being an

important step in providing early, appropriate, and meaningful intervention for children with ADHD.

APPENDIX A
CHILD IMPAIRMENT RATING SCALE

Participant # _____ Date: _____

Child Impairment Rating Scale (C-IRS)

Please rate on the following scale, **Hardly ever = 0; Sometimes = 1; Often = 2; Almost always =3**, how often your child experiences the following:

Adaptive Functioning

	Hardly ever	Sometimes	Often	Almost always
1. Needs close supervision	0	1	2	3
2. Shows appropriate levels of independent behavior	0	1	2	3
3. Adapts poorly to new situations	0	1	2	3
4. Shows inappropriate level of self-care	0	1	2	3
5. Is persistent in dealing with difficult tasks	0	1	2	3
6. Shows good common sense	0	1	2	3
7. Shows poor planning abilities	0	1	2	3
8. Shows appropriate concerns for safety	0	1	2	3

Academic Functioning

	Hardly ever	Sometimes	Often	Almost always
9. Is disorganized in dealing with academic tasks	0	1	2	3
10. Meets academic time demands	0	1	2	3
11. Fails to complete or turn in assigned homework	0	1	2	3
12. Requires discipline at school	0	1	2	3
13. Shows respect for school property	0	1	2	3
14. Has unexcused absences	0	1	2	3
15. Performs well on academic tasks	0	1	2	3
16. Has good relationships with teachers	0	1	2	3

Social Functioning

	Hardly ever	Sometimes	Often	Almost always
17. Is ignored or rejected by peers	0	1	2	3
18. Shows respect for the feelings of others	0	1	2	3
19. Displays good social skills	0	1	2	3
20. Seems socially immature	0	1	2	3
21. Shows lack of respect for the property of peers	0	1	2	3
22. Has good relationships with peers	0	1	2	3
23. Has problems participating in groups/games	0	1	2	3
24. Relates poorly to adults	0	1	2	3

Home and Family Functioning

	Hardly ever	Sometimes	Often	Almost always
25. Shows lack of respect for parents or other family members	0	1	2	3
26. Argues with other family members	0	1	2	3
27. Behavior causes difficulty between parents	0	1	2	3
28. Shows respect for family property	0	1	2	3
29. Ignores family rules	0	1	2	3
30. Fails to participate in family activities	0	1	2	3
31. Shows affection toward family members	0	1	2	3
32. Gets along well with siblings	0	1	2	3

APPENDIX B
DEMOGRAPHIC INFORMATION SHEET

Participant # _____

Date _____

Please provide only the information that applies to your child for the purpose of the study in which you are a participant. Do not put your name or the name of your child on this or any other study materials.

Information About You and Your Family

Age _____ Sex _____ Race _____ Marital Status _____

Occupation _____ Gross Annual Family Income _____

Highest Level of Education _____ Relationship to Child _____

Information About Your Child

Age _____ Sex _____ Race _____ Grade _____

Name of School _____ Regular Class? **Y N** Special Class? **Y N**

If your child is in a special class please indicate the nature of this educational placement:

Has your child ever been diagnosed with any type of psychological disorder(s)? **Y N**

If Yes, indicate the nature of the diagnosis(es) given.

Has your child ever been diagnosed with any type of chronic physical disorder(s)? **Y N**
If Yes, indicate the nature of the diagnosis(es) given.

Is your child currently receiving ongoing treatment for any type of physical or psychological disorder? **Y N**

If Yes, indicate the nature of the condition he/she is being treated for:

If Yes, indicate the type of treatment (i.e. medication, therapy):

If your child is currently on medication, please provide as much information as possible:

Type of medication	Reason for	When started	Dosage	Frequency
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THANK YOU.

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BIOGRAPHICAL SKETCH

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