Diagnosing ADHD in Adolescence: An Analysis of Symptom Presentation and Comorbidity.

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DIAGNOSING ADHD IN ADOLESCENCE: AN ANALYSIS OF SYMPTOM PRESENTATION AND COMORBIDITY

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Psychology

by

Larissa Kay Kern
B.S., University of Alabama, 1990
M.A. in Psychology, Louisiana State University, 1994
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The diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) in adolescents poses a challenge for clinicians and researchers. Given the decline in hyperactivity and increased behavioral inhibition in adolescence, the differential diagnosis between ADHD and internalizing disorders becomes difficult. In addition, the high comorbidity rates found in adolescents with ADHD further complicate diagnostic decisions. The present study examines the diagnostic efficiency of the DSM-IV criteria for ADHD in a large sample of adolescents aged 11 to 17 years. The results suggest that Inattentive symptoms are more useful for classifying ADHD in adolescents than Hyperactive/Impulsive symptoms. However, Inattentive symptoms also misclassify a substantial proportion of adolescents having an internalizing disorder as having ADHD. When comorbid cases are included, the ability of these symptoms to accurately classify subjects further deteriorates. Information about which individual ADHD symptoms best discriminate between ADHD and Internalizing disorders is provided. In addition, the impact of other factors related to diagnostic decisions such as parent versus self-report, gender, and age, are also explored. Implications for future assessment with this population are discussed.
INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a developmental disorder characterized by age inappropriate levels of inattention, poor impulse control, and excessive motor activity. ADHD has been associated with several additional adjustment problems including poor academic functioning (Fischer, Barkley, Edelbrock, & Smallish, 1990; Barkley, Anastopoulos, Guevremont, & Fletcher, 1991), peer rejection (Hinshaw, 1991; Landau & Moore, 1991), parent-child conflict (Anderson, Hinshaw, and Simmel, 1994; Barkley, Anastopoulos, Guevremont, & Fletcher, 1992), low self-esteem (Conners, 1985; Hoy, Weiss, Minde, & Cohen, 1978), and conduct problems (Abikoff & Klein, 1992; Biederman, Newcorn, & Sprich, 1991). Although ADHD was originally conceptualized as a maturational lag which would remit by adolescence, recent literature supports the persistence of many of these symptoms and associated difficulties into adolescence and adulthood (Klein & Mannuzza, 1991; Hechtman, Weiss, & Perlman, 1984; Gittleman, Mannuzza, Shenker, & Bonagura, 1985; Fischer, Barkley, Fletcher, & Smallish, 1993). Given the stability and pervasiveness of the disorder and its profound impact on social and occupational functioning, the significance of research in this area is obvious. Unfortunately, the majority of the literature
with ADHD focuses on school-aged children, and may not apply or generalize to adolescents. Therefore, the purpose of this review is to explore characteristics of ADHD in adolescents with a focus on the evolution of diagnostic criteria, associated problems, and features of adolescent ADHD which may complicate diagnostic decisions. **Evolution of the ADHD Diagnosis**

The prevalence of ADHD has been estimated at 3 to 5% of school-age children with more males receiving the diagnosis than females (DSM-IV, American Psychiatric Association, 1994). However, prevalence rates are highly dependent on the diagnostic classification used (Newcorn, Halperin, Schwartz, Pascualvaca, Wolf, Schmeidler, & Sharma, 1994). Despite the widespread recognition of the disorder, there has been a great deal of controversy regarding its definition and conceptualization. In fact, Goodman and Poillion (1992) argue that the field has redefined ADHD to a broader, more inclusive, and more subjective category which has resulted in more children "receiving a label which has less meaning" (p. 38).

The first appearance of a category reflecting children with the characteristics associated with ADHD was in the Diagnostic and Statistic Manual of Mental Disorders-II (APA, 1968). In this edition, these children were diagnosed with Hyperkinetic Reaction to Childhood and
Adolescence emphasizing the role of excessive motor activity for making the diagnosis (APA, 1968). The publication of the DSM-III (APA, 1980) marked a dramatic improvement over previous conceptualizations of the disorder. First of all, the new diagnostic criteria provided a specific symptom list, numerical cutoff scores for symptoms, and guidelines for age of onset and duration of symptoms (APA, 1980). In addition, it broadened the definition by placing greater emphasis on inattention and impulsivity (Barkley, 1990). The DSM-III outlined subtypes of the disorder including Attention Deficit Disorder with Hyperactivity, ADD without Hyperactivity, and ADD-residual which described those youngsters who have outgrown many of the characteristics of the disorder (Goodman & Poillion, 1992). Although this edition was an improvement over the DSM-II, there was little or no empirical evidence to support these subtypes.

The DSM-III-R (APA, 1987) marked the first attempt to establish empirically the reliability and validity of the ADHD diagnosis and discriminating power of symptoms and cutoff scores, rather than relying solely on expert committee consensus (Spitzer, Davies, and Barkley, 1990). Although factor analytic studies of ADD symptoms were beginning to support the validity of subtypes of this disorder the Committee decided there was not sufficient
evidence for their inclusion in the DSM-III-R (McBurnett, Lahey, & Pfiffner, 1993). Thus, a single list of 14 symptoms evolved, requiring the presence of eight of these symptoms for a diagnosis to be made. The DSM-III-R did not make provisions for children demonstrating significant attention problems in the absence of hyperactivity. Instead, a vague residual category was included, Undifferentiated Attention Deficit Disorder, which represented a heterogeneous category with no specific diagnostic criteria (McBurnett et. al, 1993).

Like the DSM-III-R, the DSM-IV is empirically based; however, substantial contemporary research guided the revised manual. The results of factor analytic studies of the ADHD symptoms consistently revealed a two factor solution consisting of an inattention factor and a hyperactive-impulsive factor (McBurnett et al.,1993). Thus, the DSM-IV re-establishes subtypes of ADHD, specifying that cases exhibiting at least six inattentive symptoms, but less than six hyperactive-impulsive symptoms be diagnosed as ADHD, Predominantly Inattentive Type; cases exhibiting at least six hyperactive-impulsive symptoms, but less than six inattentive symptoms be diagnosed as ADHD, Predominantly Hyperactive-Impulsive Type; and cases exhibiting at least six symptoms in both inattentive and hyperactive-impulsive areas be classified
as ADHD, Predominantly Combined Type. The DSM-IV criteria for ADHD are included in Table 1.

The proposed DSM-IV symptoms underwent large field trials in order to establish the utility of individual symptoms for making the diagnosis (Frick, Lahey, Applegate, Kerdyck, Ollendick, Hynd, Garfinkel, Greenhill, Biederman, Barkley, McBurnett, Newcorn, & Walden, 1994). These field trials resulted in the inclusion of only those symptoms with high positive and negative predictive values. Frick et al. (1994) found little variation in the symptom utility patterns in younger versus older children or across gender. However, it is important to note that the age groups compared collapsed children across many developmental stages; i.e., 4 to 13 years versus 14 to 17 years. In addition, over 50% of the adolescents included in this investigation were placed in residential facilities for juvenile offenders. Thus, more research is required to determine whether the utility of symptoms in this study apply to a more representative adolescent sample.

Since ADHD was largely assumed to remit with age, little research has addressed diagnostic issues in the assessment of ADHD in adolescents, particularly with regard to symptom utility, validity of cutoff scores, and comorbidity. Barkley, Fischer, Edelbrock, & Smallish
Table 1
DSM-IV Criteria for Attention Deficit Hyperactivity Disorder

A. Either (1) or (2):

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

**Inattention**

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
(b) often has difficulty sustaining attention in tasks or play activities
(c) often does not seem to listen when spoken to directly
(d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
(e) often has difficulty organizing tasks and activities
(f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
(g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
(h) is often easily distracted by extraneous stimuli
(i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

**Hyperactivity**

(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected

(table con’d)
(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
(d) often has difficulty playing or engaging in leisure activities quietly
(e) is often "on the go" or often acts as if "driven by a motor"
(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed
(h) often has difficulty awaiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

(1990) investigated the prevalence of the Disruptive Behavior Disorders and symptoms in adolescents in an eight year prospective follow-up study. These researchers found that a cutoff score of six rather than eight symptoms was more appropriate for adolescents and represented two standard deviations above the normal mean (Barkley et al., 1990). In addition, they reported significant differences in the prevalence of ADHD, ODD, and CD symptoms during adolescence in ADHD subjects who had been diagnosed as children compared to normal controls (Barkley et al., 1990). Despite the significance of this study in highlighting the importance of age and developmental stage in the diagnosis of ADHD, important weaknesses were noted. First, the authors did not assess for comorbid anxiety and depression which has been demonstrated to often coexist with ADHD in adolescents and may impact symptom presentation. Second, a psychiatric control group was not included in the analysis, thus limiting the conclusions that can be made. Specifically, it cannot be determined whether these developmental differences are unique to ADHD or characteristic of any clinical group. More research is warranted in the assessment of ADHD in adolescence, particularly in light of recent literature which consistently demonstrates the persistence of behavioral
and emotional problems and adjustment difficulties in adolescents with ADHD.

ADHD in Adolescence

Although many behavior problems will remit with age, current research indicates that 30-50% of children diagnosed with ADHD continue to be impaired or meet diagnostic criteria for ADHD at adolescence (Gittleman et al., 1985; Keller, Lavori, Beardslee, Wunder, Schwartz, Roth, & Biederman, 1992). In addition, results of follow-up and retrospective studies indicate that as adolescents, children with a history of ADHD have many associated problems. Difficulties reported include substance abuse and antisocial behavior (Hechtman et al., 1984; Gittleman et al., 1985; Windle, 1993), academic and socioemotional difficulties (Nussbaum, Grant, Roman, Poole, & Bigler, 1990), lower levels of reading ability (McGee, Partridge, Williams, & Silva, 1991), lower social competence scores on the Child Behavior Checklist (Fischer et al., 1993), low self-esteem (Conners, 1985), and decreased academic achievement (Fergusson, Horwood, & Lynskey, 1993). While these results highlight the stability of problem behaviors and the importance of early intervention, several methodological problems limit the conclusions that can be drawn.
First, many of these studies failed to include a psychiatric control group. Therefore, it is not possible to determine whether differences between the ADHD group and the normal control group are specific to ADHD or just to clinical groups in general. For example, Barkley et. al. (1990) found that the rate of occurrence of each DSM-III-R symptom was significantly greater in the hyperactive than normal groups of children. However, since this study failed to include a psychiatric control group it is not possible to determine whether the symptoms would discriminate hyperactive children from other clinical samples or whether the symptoms are attributable to another disorder. Another problem with follow-up studies is that they do not account for factors occurring between the time patients are initially evaluated and the time they are reevaluated as adolescents (Brown & Borden, 1986).

A third limitation of many follow-up studies is that they may not reflect the pattern or severity of symptoms or comorbid problems seen in cases referred to clinics (Barkley et. al., 1991). Indeed, the most common presenting problems in ADHD adolescents is poor self-management and organizational skills required for homework and independent study (Conners, 1985). Given this type of vague referral where a number of factors may be
contributing to poor work completion and disorganization, the need for a differential diagnosis is apparent and may complicate the assessment of ADHD in adolescents. Several other features of the assessment of ADHD in adolescents that pose problems for clinicians include symptom presentation, high comorbidity rates, various assessment methods, and interpreting data from multiple informants. These issues will be discussed below.

Assessment Issues in Adolescents

Symptom Presentation. Most researchers agree that adolescents with ADHD generally continue to exhibit significant behavioral and emotional problems, although there typically is a decrease in motor activity (Green, Loeber, & Lahey, 1991; Conners, 1985). The research of Halperin, Matier, Bedi, Sharma, and Newcorn (1992) highlights the significance of changes in symptom presentation to assessing ADHD in adolescents. These researchers reported that motor activity was best able to discriminate ADHD from Psychiatric controls in children (Halperin et. al., 1992). Therefore, the decline of these symptoms makes differential diagnosis more difficult, especially, considering that symptoms of inattention, restlessness, and poor concentration are characteristic of other psychiatric disorders such as depression and anxiety (Halperin et. al., 1992). DSM-IV (APA,1994) also
recognized this problem and recommended ruling out other disorders before a diagnosis of ADHD is made to avoid mislabeling cases. It is important to note, however, that the presence of another psychiatric disorder does not preclude a diagnosis of ADHD. Indeed, the literature supports a high rate of comorbidity of other disorders with ADHD further complicating assessment of this disorder (Keller et. al., 1992; Klein & Mannuzza, 1991).

Comorbidity. Comorbidity refers to the co-existence of two or more psychiatric disorders or syndromes in the same individual (McConaughy & Skiba, 1993). High rates of comorbidity between the disruptive behavior disorders have been consistently reported. Rates of comorbidity between ADHD and Conduct Disorder have ranged from 17% (Keller et. al., 1992) to 60% by adolescence (Barkley, 1990). Similarly, Keller et. al. (1992) found that 39% of ADHD cases also met criteria for Oppositional Defiant Disorder.

The co-existence of Internalizing disorders in ADHD patients has not been as consistently documented. Indeed, Barkley et al. (1990) stated that they did not include information on comorbid internalizing disorders in their study because Gittleman et al. (1985) did not find a higher incidence of Internalizing disorders between ADHD subjects and normal controls. However, other investigators have documented high rates of Internalizing
disorders in ADHD subjects. Biederman et. al. (1991) reported a range of comorbidity between ADHD and mood disorders of 15% to 75% of cases. Angold and Costello (1993) also found a wide range of co-existence between ADHD and Internalizing disorders (0% to 57%).

Robins (1985) reported that structured interviews may be more likely to help identify multiple diagnostic categories in a subject than the standard clinical assessment. The primary advantage of the structured interview is that it provides a standardized format to ascertain information about frequency, intensity, and duration of symptoms, as well as data regarding age of onset (DuPaul, Guevremont, & Barkley, 1991). In addition, structured interviews, like the Diagnostic Interview for Children and Adolescents-Revised (DICA-R; Reich, Shayka, & Taibleson, 1991), assess the diagnostic criteria for all disorders included in the DSM; thus, identifying comorbid diagnoses is part of the assessment.

There are two important reasons to identify comorbid diagnoses: differences in associated problems and implications for treatment. The co-existence of certain disorders are differentially related to other problems. For example, Fergusson et. al. (1993) found that conduct disorders without attention deficits are associated with future criminal behavior but not future academic problems;
whereas, attention deficit disorders without conduct problems are associated with future academic weaknesses but not future law offending. These results suggest that comorbid Conduct Disorder may mediate the association between ADHD and antisocial behavior. In addition, comorbid Conduct Disorder accounted for a large portion of the variance in school suspensions, expulsions, and dropouts (Barkley et al., 1990). ADHD with comorbid anxiety problems, on the other hand, was associated with less impulsivity and longer reaction times (Pliska, 1992). Furthermore, Brent, Perper, and Goldstein (1988) reported that adolescents who committed suicide had higher rates of ADHD than did those who attempted suicide.

In addition to different problems associated with different comorbid diagnoses, the co-existence of various disorders has important treatment implications. Hinshaw (1991), for example, found that ADHD children with comorbid aggression were less effectively treated with stimulant medication than those who were not aggressive. The author indicates that children with comorbid aggression may require higher doses of methylphenidate. DuPaul, Barkley, and McMurray (1994) reported that children who exhibit comorbid symptoms of ADHD and internalizing disorders also are less likely to respond to Ritalin during academic tasks. In addition, the children
are at risk for adverse reactions to medication (DuPaul et. al., 1994). Overall, high comorbidity rates point to the heterogeneity of Attention Deficit Hyperactivity Disorder samples. This heterogeneity certainly has implications for treatment and therefore must be considered in the assessment of ADHD adolescents.

Methods of Assessment. Due to the complexity of making a diagnosis of ADHD in adolescents, many researchers recommend using a multi-method, multi-informant assessment approach (DuPaul et. al., 1991; Barkley, 1987). Advocates for a multiple informant approach indicate that each informant may provide additional and unique information not available from other sources (DuPaul et. al., 1991). Thus, obtaining data from several sources across various measures ensures a more comprehensive evaluation and increases the probability of an accurate diagnosis. The most commonly cited methods for assessing ADHD are structured interviews, behavioral rating scales, laboratory tests, and direct observation.

Structured interviews provide a list of symptoms to be presented to parents and adolescents with guidelines for probing and recording responses (Edelbrock & Costello, 1984). Reich et. al. (1991) developed the Diagnostic Interview for Children and Adolescents- Revised (DICA-R) based on the DSM-III-R criteria. The DICA-R has three
interview formats to be administered independently to a child, adolescent, and parent. Although the item formats are similar and they yield the same diagnostic information, the wording is modified to be developmentally appropriate (Reich et. al., 1991).

Several advantages of structured interviews have been cited in the literature (DuPaul et. al., 1991; Reich & Earls, 1987; Schacher, 1991). The first and most important for research purposes is that the standard format and specificity of the questions are likely to provide more reliable and accurate information than data collected from an unstructured clinical interview (DuPaul et. al., 1991). Another benefit is the wealth of information that structured interviews elicit. They provide information with regard to the number of symptoms present, age onset, and symptom duration. Additionally, Schacher (1991) suggests that standardized interviews may provide a higher threshold for the diagnosis, producing more conservative decisions and controlling for examiner bias.

Another extremely useful assessment tool is behavioral rating scales. Guevremont, DuPaul, and Barkley (1990) cite several benefits of rating scales. These advantages include ease of administration, wide sampling of behavior obtained, ability to objectify the occurrence
of behaviors across informants and settings, ability to determine developmental and statistical deviance of the subject's problems compared to same-age peers, and the possibility of measuring change over time using repeated assessments (Guevremont et. al., 1990).

There are several scales and checklists available which have been demonstrated to possess excellent psychometric properties (Barkley, 1987). Two of the most commonly used instruments are the Child Behavior Checklist (Achenbach & Edelbrock, 1991a) and the Conners Rating Scales (Goyette, Conners, & Ulrich, 1978). Both of these measures have different forms to assess problem behavior across informants. The Child Behavior Checklist (CBCL), Teacher Report Form (TRF) (Achenbach & Edelbrock, 1992), and Youth Self Report (YSR) (Achenbach & Edelbrock, 1991b) all have similar formats, yield the same subscale scores, and are designed to assess general psychopathology in children and adolescents (Achenbach & Edelbrock, 1991a). The Conners Rating Scales has two versions: Parent and Teacher Report. These Scales contain a separate Impulsive-Hyperactive subscale which has been demonstrated to discriminate ADHD children from normals (Goyette et. al., 1978). In addition, the Conners Rating scales are briefer than the CBCL and more easily repeated over short
time intervals making it useful for treatment evaluation (Barkley, 1987).

Despite these advantages, there are some limitations to the use of rating scales for diagnostic purposes. First, prevalence rates based on ratings may be arbitrary depending on the representativeness of the normative sample (Schacher, 1991). Second, ratings are subject to informant bias (Barkley, 1987). As a result, the scores may simply reflect adult opinion or tolerance level rather than actual behavior. In addition, scores will vary across respondents in how they interpret the anchor points, i.e., "not at all, pretty much, very much". A fourth problem, particularly in making a diagnosis, is the high intercorrelation between subscales "measuring" attention, hyperactivity, and conduct problems (Schacher, 1991). These findings may reflect an artifact of scoring or the inclusion of items that do not adequately discriminate these constructs (Schacher, 1991). Finally, rating scales do not ascertain the breadth of information that structured interviews do such as family history, contextual information, and age of onset which are necessary in determining diagnosis.

Direct observation and clinical tests have also been used in ADHD assessment. Although these measures may provide valuable information which is less susceptible to
reporter bias, several disadvantages limit their utility. First, these tests are expensive both in time and cost. Second, classification decisions based on clinic tests have been shown to disagree with ADHD diagnoses based on interview and rating scale data (DuPaul, Anastopoulos, Shelton, Guevremont, & Metevia, 1992). In addition, the ecological validity of clinic based tests has been questioned (Barkley, 1991). Direct observation in the natural setting, on the other hand, has high ecological validity and may provide important information about the contextual variables that may be contributing to or maintaining problem behaviors (Barkley, 1987). However, several factors must be considered when conducting direct observations. These variables include the selection of target behaviors, adequacy of sampling, reliability and validity of the coding procedures, and training required to make observations (Guevremont et. al., 1990).

Summarizing Multiple Informant Data. As discussed above, there is consensus in the field that assessment should include information from multiple sources. However, it can be difficult to summarize the data and address discrepancies in informant reports. The problem is particularly important in adolescents where a greater emphasis is placed on self-report. Unlike young children, adolescents are recognized as more valid reporters of
symptoms and may provide further information not available from other sources (DuPaul, Guevremont, & Barkley, 1991). Indeed, many researchers have suggested that adolescents are the best reporters of internalizing disorders, as well as covert conduct problems such as substance abuse and stealing (Loeber, Green, Lahey, & Stouthamer-Loeber, 1991; Reich & Earls, 1987). Conners (1985) recommends increased emphasis on adolescent-report due to the change in relationship between adolescents, parents, and teachers. As less time is spent with parents and teachers, these adults may be less accurate reporters of thoughts and emotions than the adolescents.

Despite the increased emphasis on adolescent self-report, information from parents and teachers is still considered invaluable. Hart, Lahey, Loeber, & Hanson (1994) reported that teachers were accurate informants of children's attention deficits and hyperactivity; whereas, children were less accurate informants. However, teachers appear to report fewer internalizing symptoms than do mothers and children, suggesting teachers may be less able to recognize these problems or children may not clearly display these symptoms in the school setting (Stanger & Lewis, 1993). In addition, Frick et al. (1994) suggested that teachers' perceptions of adolescent behavior may be less accurate due to the relative lack of close contact
between students and teachers in middle and high schools as compared to elementary students.

Parents are the most commonly used source of information for child and adolescent behavior problems. Like teachers, parents are considered to be more accurate reporters of externalizing behaviors than adolescents (Kolko & Kazdin, 1993). However, parents are slightly better than teachers at identifying internalizing disorders in adolescents, represented by modest correlations with adolescent reports as opposed to no correlation found between teacher- and adolescent-report for these symptoms (Stanger & Lewis, 1993).

Overall, correlations among various evaluators are generally low with somewhat higher correspondence for overt rather than covert behavior (Hart et al., 1994). In addition, there is evidence suggesting that information from different informants should be weighted differently for different types of problems (Loeber, Green, & Lahey, 1990). Specifically, greater weight should be given to adolescent-reported internalizing problems, such as anxiety and depression, and more attention to parent perceptions of externalizing problems (Reich & Earls, 1987).
Summary and Rationale

The literature identifies several variables which complicate diagnostic decisions regarding ADHD in adolescence. The first problem is developmental changes in symptoms from childhood to adolescence. Adolescents tend to exhibit fewer symptoms characteristic of ADHD than younger children, and they demonstrate increased behavioral inhibition which is considered the hallmark of ADHD in children. In addition, adolescents with ADHD tend to have high rates of comorbid diagnoses. Given the overlap in many of the symptoms between the various internalizing and externalizing disorders, a differential diagnosis or need for additional diagnoses may be difficult to ascertain.

One way to address this issue is to examine the diagnostic utility of the ADHD symptoms. Although a few studies have investigated the symptom utility of individual symptoms in ADHD, a major weakness of these studies is the failure to utilize psychiatric control groups (particularly those with Internalizing disorders) and to not examine these issues specifically in adolescents (Barkley et al., 1990; Frick et. al., 1994). Although researchers consistently have demonstrated differences between ADHD adolescents and normal controls, this methodology precludes an analysis of differences
between clinical groups. Thus, the findings are limited to conclusions between clinical and nonclinical groups, and may not provide information specific to ADHD in adolescents.

Therefore, the purpose of the present study was to extend the current literature by examining the symptom utility of the DSM-IV diagnostic criteria of ADHD for making the diagnosis in adolescents. Specifically, an analysis of the ability of the ADHD symptoms to accurately classify subjects into diagnostic groups was conducted. Given the overlap of ADHD inattentive symptoms with symptoms characteristic of internalizing disorders, differential diagnosis for these disorders can be difficult. An exploratory analysis of the utility of individual symptoms as well as clusters of symptoms for making a diagnosis of ADHD in adolescents was also conducted to provide professionals with guidelines for an efficient, yet effective, assessment.

A second purpose was to determine whether symptom presentation is consistent across age. An analysis of symptoms in early (11-13 years) versus late (14-17 years) adolescence was included in order to ascertain whether a change in symptom presentation in these age groups exists comparable to that identified in the literature between children and adolescents; e.g., decreased motor activity
and persistence of attention problems and restlessness (Green et. al., 1991). These age groups were chosen given that they represent relatively different developmental stages, yielding a comparison between junior high versus high school level adolescents. The high school period poses unique challenges for ADHD adolescents due to the increased demands on organization and expectations for independence (Conners, 1985).

A third and final purpose was to examine the comorbidity of diagnoses in adolescents with ADHD by presenting descriptive statistics regarding the number and type of comorbid diagnoses presenting in adolescents with ADHD. Again, subjects were classified into early versus late adolescence to determine whether there were developmental differences across adolescence. In addition, an examination across ADHD subtypes was conducted to provide information about the frequency and types of comorbid disorders occurring in subjects diagnosed ADHD-Inattentive Type versus ADHD-Combined Type.

The present study extends the current literature in several ways. First, it highlights critical assessment issues unique to adolescents which complicate diagnostic decisions. Second, it investigates the validity of the DSM-IV diagnostic criteria for ADHD for predicting the diagnosis in an all adolescent population. Similarly, the
study examines the discriminative power of the ADHD symptoms in making a diagnosis of ADHD. Finally, the study incorporates data from multiple informants in order to maximize the accuracy of a diagnosis while recognizing the importance of adolescent self-report for particular symptoms.

Based on the goals of this study and the current literature the following hypotheses were made and investigated:

(1) It was hypothesized that the ADHD Inattentive symptoms would misclassify many subjects with an internalizing disorder as having ADHD.

(2) It was hypothesized that the hyperactive and impulsive symptoms would discriminate between the ADHD subtypes (i.e., ADHD-Inattentive Type and ADHD-Combined Type) providing support for the validity of these subtypes.

(3) It was hypothesized that the late adolescent group would have fewer hyperactive/impulsive symptoms than the early adolescent group.

(4) It was hypothesized that the ADHD-Inattentive Type would have more comorbid internalizing disorders and the ADHD-Combined Type would have more comorbid externalizing disorders.
METHOD

Subjects

One hundred and twenty adolescents between the ages of 11 and 17 years and their mothers participated in the study. Clinical subjects were recruited via Baton Rouge area inpatient psychiatric units, outpatient psychology/psychiatry clinics, and newspaper advertisements. Subjects were consecutive consenting referrals meeting the age range requirement. Nonclinical subjects were recruited with the help of undergraduate students who received extra credit for getting an adolescent within the age range and their mother to participate. Subjects were excluded if they exhibited pervasive developmental disorder, an IQ estimate less than 70, psychosis by presentation or history, or clear neurological disorder. The sample consisted of 67 females (56%) and 53 males (44%) with a mean age of 13.13 years (SD=1.85). The sample included primarily middle-class Caucasian families (88% Caucasian, 12% ethnic minorities). Using the Hollingshead Four-Factor Index (Hollingshead, 1975), the mean socioeconomic status was estimated at 46 (SD=11). Psychiatric diagnoses were established using the Diagnostic Interview for Children and Adolescents-Revised (DICA-R-Parent and Adolescent Forms; Reich et. al., 1991). The distribution of subjects by diagnosis is presented in
Table 2. Specific diagnostic decision rules are outlined in the procedure. As seen in the table, subjects presented with a broad spectrum of disorders. In addition, a large portion of subjects met criteria for multiple diagnoses (N=59), and only a small number met criteria for an anxiety disorder only (N=4) or a depressive disorder only (N=2). Most subjects with an internalizing disorder presented with comorbid anxiety and depression. Signed statements of informed consent were obtained from both the parent and the adolescent prior to participation.

Procedure

Once informed consent was obtained, the adolescent and his/her mother participated in separate structured interviews utilizing the Diagnostic Interview for Children and Adolescents-Revised-Parent and Adolescent forms (DICA-R-P; DICA-R-A; Reich et. al; 1991). The parent interviews averaged 69.4 minutes (SD = 23.69) with a range of 30 to 125 minutes. The adolescent interviews tended to be somewhat shorter overall with a mean of 59.5 minutes and standard deviation of 22.38. Similar to the parent interviews there was a great deal of variability in interview length (Range 25-144 minutes). The large range was expected given that some subjects presented with no psychiatric diagnoses while others met criteria for
multiple diagnoses. All interviews were conducted by graduate students trained in its administration, and 20% of the subjects' interviews were audiotaped and independently coded by another interviewer to establish reliability. Reliability checks were conducted across interviewers throughout the study to ensure consistency. In addition to the interview, parents were asked to complete a demographic questionnaire and the ADHD Rating Scale.

Measures

Diagnostic Interview for Children and Adolescents-Revised—Parent and Adolescent forms (DICA-R-P; DICA-R-A). The DICA-R (Reich et. al., 1991) is a structured diagnostic interview based on criteria set forth in the Diagnostic and Statistical Manual of Mental Disorders-3rd Edition-Revised (DSM-III-R; American Psychiatric Association, 1987). The interview is designed for use with children between the ages of 6 and 17 years. There are parallel forms for adolescents and parents which include the same questions presented in the same order with similar wording. Reich and Earls (1987) indicate that items on the DICA-R are worded in a concrete, unambiguous way which has resulted in higher parent-child agreements. The interviews were primarily designed for use by trained lay persons, and therefore, the items as
Table 2  
Distribution of Subjects by Diagnosis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD-Combined Type</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>ADHD-Inattentive Type</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Comorbid ADHD/INT</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Comorbid Anxiety/Depression</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Anxiety Only</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Depression Only</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ODD/CD Only</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>No DSM-IV Diagnoses</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>120</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Note:** Comorbid ADHD/INT = ADHD cases with comorbid internalizing disorder; ODD/CD = Oppositional Defiant Disorder and/or Conduct Disorder.
well as structured probes are explicitly stated in the interview (Reich & Earls, 1987). These properties are intended to reduce interviewer bias. Eight items were added to the Attention Deficit Hyperactivity Disorder section of these interviews to contain additional criteria included in the most recent revision of the Diagnostic and Statistical Manual (DSM-IV; American Psychiatric Association, 1994). Items added are included in Appendix A. The new items were worded in order to be similar in length and format to the other DICA-R questions. Specific probes were also included in order to gain information about the intensity and pervasiveness of the symptom if present. The DICA-R ascertains all information necessary for making a diagnosis (i.e., symptoms, onset, and duration of symptoms), and therefore, were used to establish psychiatric diagnoses.

In addition, the current literature suggests that structured interviews provide more accurate, reliable, and conservative diagnoses (DuPaul et. al., 1991; Schacher, 1991). Reich and Earls (1987) delineate specific rules for summarizing data from various sources on structured interviews which further guided decision making. These authors suggest that for affective disorders such as Major Depression, Separation Anxiety, and Overanxious disorder, a diagnosis may be made on the adolescent-report alone if
criteria are met. They also stipulate that diagnoses of internalizing disorders should not be made from parent report alone. Reich and Earls (1987) also indicate that parents are better reporters of externalizing symptoms. These findings have been supported by several other investigators (Gittleman & Mannuzza, 1985; Loeber et. al., 1990).

Thus, diagnoses were made based on the interviews using different informants for different diagnoses as recommended in the literature. For example, a diagnosis of ADHD or Oppositional Defiant Disorder was based on parent-report of symptoms on the DICA-R. In addition to the DSM-IV criteria for ADHD, a duration of at least 12 months was required for an ADHD diagnosis to be made. This more stringent criteria was added to ensure an accurate diagnosis based on recommendations by Barkley (1991). In order to receive a diagnosis of an internalizing disorder, the subject must have met DSM-IV diagnostic criteria for at least one Internalizing disorder within the past six months (i.e., Major Depression, Dysthymia, Separation Anxiety, Avoidant, Overanxious, Obsessive-Compulsive, and Post Traumatic Stress disorder) based on adolescent-report on the DICA-R. A diagnosis of substance abuse or Conduct disorder was
given when a subject met DSM-IV criteria for either of these disorders based on parent- or adolescent-report.

**ADHD Rating Scale.** The ADHD Rating Scale is a parent-report measure of ADHD symptoms directly adapted from the DSM-III-R symptom list (DuPaul, 1991). For the present study, additional items were added to the original questionnaire to conform to the DSM-IV diagnostic criteria (APA, 1994). The revised ADHD Rating scale consists of 22 items which are rated on the same four-point Likert scale employed on the original ADHD Rating scale (0=not at all; 3=very much). Items rated as occurring "pretty much" or "very much" were considered as present for the symptom. These scoring procedures correspond to the criteria utilized for scoring the original ADHD Rating Scale (DuPaul & Stoner, 1994). Parent-report on the ADHD Rating Scale was utilized because the literature indicates that parents are better reporters of overt behavioral symptoms than are adolescents (Kolko & Kazdin, 1993). All of the DSM-IV ADHD symptoms (Inattentive and Hyperactive/Impulsive) are directly observable events. Thus, parent-report was judged to be the most valid indicator of these difficulties.
RESULTS

**Inter-rater Reliability**

Reliability checks were conducted randomly on 20% of the subjects' structured interviews. These interviews were independently coded by an interviewer who was blind to group membership and original interview ratings. Occurrence reliability was computed for presence of diagnoses and symptoms (across disorders) to determine level of agreement between the independent raters. Reliability was calculated by adding the total number of agreements of the two independent raters and dividing that number by the total number of agreements plus the total number of disagreements, multiplied by 100. Only diagnoses and symptoms indicated by at least one rater were included in the calculations so as not to artificially inflate the estimate. Reliability estimates averaged 99.4% (Range 96-100%) and 93.3% (Range 75-100%) for diagnoses and individual symptoms, respectively. These agreement estimates are highly acceptable and suggest good reliability between interviewers.

**Demographic Variables**

Analyses of variance and chi-squares were performed on continuous and categorical data, respectively, to determine whether significant relationships existed between diagnosis and age, socioeconomic status, gender,
grade, family size, and grades failed. For these analyses, subjects were classified into 5 mutually exclusive groups based on diagnoses obtained from the DICA-R using the diagnostic rules outlined previously. Groups included were ADHD-Inattentive Type (N= 15), ADHD-Combined Type (N= 18), Internalizing Disorders (N= 19) (Depressive and Anxiety disorders were collapsed due to the relative small numbers of these disorders in the sample), Comorbid ADHD/Internalizing Disorders (N= 24) (adolescents who met criteria for both ADHD and an internalizing disorder), and Normals (N= 26) (subjects who did not meet criteria for any psychiatric diagnosis and had never sought mental health services). The data suggested no significant differences between groups with respect to age \( [F(4,101)=2.09, p>.05] \), family size \( [F(4,101)=1.52, p>.05] \), grade \( [F(4,100)=1.60, p>.05] \), and grade failure \( [F(4,101)=1.72, p>.05] \). Although significant socioeconomic differences were detected between the ADHD-Combined group and normals with the ADHD group scoring significantly lower than normals on the Hollingshead Index, there were no significant socioeconomic differences between the psychiatric groups \( [F(3,70)=1.73, p>.05] \). A significant main effect for group was found for gender \( [X^2(4)=11.09, p<.05] \). The ADHD groups had significantly
more males than the Internalizing group which is consistent with prevalence rates.

**Concordance of Rating Scale and Interview Diagnoses**

Subsequent analyses utilized the ADHD symptoms endorsed on the ADHD Rating Scale and DICA-R. Thus, it is important to determine the concordance of these two measures for assessing ADHD. An analysis of the correspondence of an ADHD diagnosis based on interview data and an ADHD diagnosis based on rating scale information was conducted. In order for a subject to be classified ADHD based on the interview data, the adolescent must currently exhibit sufficient symptoms to meet criteria according to the DSM-IV diagnostic criteria according to mother’s report. This included endorsement of required number of symptoms, onset of symptoms prior to age 7, duration of symptoms of at least 12 months, and interference with current academic and/or social functioning. For a subject to be coded as ADHD on the ADHD Rating Scale, mother must have endorsed at least six Inattentive or six Hyperactive/Impulsive symptoms as problematic for the adolescent. The concordance rates are presented in Table 3. As shown in the table, there is a very high rate of agreement between the two measures for the presence of the diagnosis (77%) as well as the absence of the diagnosis (86%). The rating scale diagnosed more
subjects as ADHD than the interview suggesting that the structured interview may be a more conservative measure for making diagnostic decisions. Individual subjects identified by the rating scale data as meeting criteria for ADHD that were not confirmed by the interview were examined. The reasons for the discrepancy between the two methods are included in Table 4. Age of onset was the most common reason diagnoses made based on rating scale information were not confirmed by interview data. That is, although a subject had sufficient symptoms to meet criteria based on both interview and rating scale, the adolescent was not coded as ADHD based on the interview because the onset of the symptoms was not prior to age 7. Since the interview has the onset requirement, fewer adolescents were classified using this method rather than using the rating scale data. Other sources of discrepancy were pervasiveness of symptoms and onset of symptoms corresponding with acute stressors or another psychiatric diagnosis. In general, these data indicate that the breadth of information obtained by the structured interview may lead to more conservative and accurate diagnostic decisions.

Symptom Utility Analyses

Discriminant Function Analyses. To assess the ability of the DSM-IV diagnostic criteria for ADHD to
Table 3
Concordance between Interview and Rating Scale Diagnoses of ADHD

<table>
<thead>
<tr>
<th>Parent Rating Scale Dx</th>
<th>Diagnosis Based on Parent Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>ADHD: 50 (77%)  No ADHD: 15 (23%)  Total: 65 (100%)</td>
</tr>
<tr>
<td>No ADHD</td>
<td>ADHD: 7 (13%)  No ADHD: 44 (86%)  Total: 51 (100%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>57  59  116</td>
</tr>
</tbody>
</table>

Note: Dx= ADHD Diagnosis
<table>
<thead>
<tr>
<th>Reason</th>
<th>Subjects failing interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Onset</td>
<td>9 (60%)</td>
</tr>
<tr>
<td>Sxs better explained by another disorder</td>
<td>3 (20%)</td>
</tr>
<tr>
<td>Sxs did not interfere with functioning</td>
<td>3 (20%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15 (100%)</strong></td>
</tr>
</tbody>
</table>

*Note: Sxs = Symptoms*
significantly discriminate psychiatric groups, discriminant function analyses were performed using the number of Attention and Hyperactive/impulsive symptoms endorsed by mothers on the ADHD Rating Scale as predictor variables. For these analyses subjects were grouped in two different ways. First, the groups consisted of 1) "pure ADHD group" (N= 33) defined as subjects who met criteria for ADHD on the DICA-R (parent) and did not meet criteria for an internalizing disorder on the DICA-R (adolescent); subjects in this group may also have had a comorbid externalizing disorder (N= 22); 2) "Internalizing group" (N=18) including subjects that met criteria for a depressive and/or anxiety disorder based on the DICA-R (adolescent) but did not meet criteria for ADHD on either the parent or adolescent interview; 3) "Normal group" (N=26) consisting of subjects who did not meet diagnostic criteria for any disorder on either the parent or adolescent structured interview and these subjects had never sought mental health services.

A direct discriminant function was performed using the number of Inattention symptoms endorsed on the ADHD Rating Scale as the predictor of group status. One discriminant function was calculated \[X^2 (2)=78.02, p<.0001\]. Inattention symptoms correctly classified 76% of the subjects according to initial group membership,
which is higher than that correctly classified by chance alone (33%). The percentage of subjects classified according to their initial group membership by Inattention symptoms is presented in Table 5.

The results suggest that the DSM-IV ADHD Inattentive symptoms accurately classified 88% of the ADHD subjects with the remaining four ADHD subjects being equally misclassified between the Internalizing and Normal groups. In addition, 89% of the "Normal" subjects were correctly classified. Only 39% of the Internalizing subjects were classified appropriately. Importantly, one-third of the Internalizing subjects were misclassified as ADHD subjects consistent with the hypothesis that many internalizing subjects would be misclassified as ADHD using symptom counts as the sole criteria.

When comorbid cases (e.g., subjects diagnosed with ADHD + an internalizing disorder) were included in the analysis, 93% of the ADHD subjects were accurately classified with the remaining ADHD subjects being misclassified as "Normal" subjects. These results suggest that the ADHD Inattentive symptoms are sensitive to a diagnosis of ADHD with or without a comorbid internalizing disorder. However, these symptoms do not appear to be specific to ADHD as 61% of the Internalizing subjects were misclassified as comorbid ADHD/Internalizing. Table 6
Table 5  "Pure" Cases Predicted by ADHD Inattention Symptoms on the ADHD Rating Scale (Parent Report)

<table>
<thead>
<tr>
<th>Actual Group</th>
<th># of cases</th>
<th>Predicted Group Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD (inattentive/</td>
<td>33</td>
<td>29</td>
</tr>
<tr>
<td>combined subtype)</td>
<td></td>
<td>87.9%</td>
</tr>
<tr>
<td>Group 2</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Internalizing</td>
<td></td>
<td>33.3%</td>
</tr>
<tr>
<td>Group 3</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Normals</td>
<td></td>
<td>3.8%</td>
</tr>
</tbody>
</table>

Percent of cases correctly classified: 76.62%

Note: ADHD cases with a comorbid internalizing disorder were excluded from the analysis.
Table 6
Cases Predicted by ADHD Inattention Symptoms on the ADHD Rating Scale (Parent Report)

<table>
<thead>
<tr>
<th>Actual Group</th>
<th># of cases</th>
<th>Predicted Group Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ADHD cases</td>
<td>56</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>92.9%</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61.1%</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normals</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.7%</td>
</tr>
</tbody>
</table>

Percent of cases correctly classified: 77.00%
presents the classification table which describes the percentage of cases (including comorbid ADHD cases) predicted by the number of ADHD-Inattentive symptoms on the ADHD Rating Scale (Parent report).

Discriminant function analysis was also performed using the number of Hyperactive/Impulsive symptoms endorsed by mothers on the ADHD Rating Scale as the predictor of group status. Groups were "Pure ADHD" subjects (cases with comorbid internalizing disorders were excluded), "Internalizing" subjects, and "Normal" subjects. One discriminant function was calculated, \( \chi^2 (2) = 40.19, p < .0001 \). Percentage of subjects classified using the Hyperactive/Impulsive symptoms as the predictor is displayed in Table 7. The correct overall classification rate was 63.6% which is somewhat lower than that achieved when the Inattentive symptoms were used as predictors. Indeed, only 70% of the ADHD subjects were correctly classified by the Hyperactive/Impulsive symptoms compared to 88% accurately classified by the Inattentive symptoms. Additionally, 30% of the "Pure ADHD" subjects were misclassified as "Normal" subjects. These results support the hypothesis that the ADHD-Inattentive symptoms may be more important than the Hyperactive/Impulsive symptoms for making a diagnosis of ADHD in adolescents. Additionally, one-third of the Internalizing subjects were
still misclassified as ADHD. However, using the Hyperactive/Impulsive symptoms as a predictor was extremely effective in classifying "Normal" subjects with 100% accurate classification rate for this group. In addition, using the Hyperactive/Impulsive symptoms none of the ADHD subjects were misclassified as Internalizing. Overall, the results of the discriminant function analyses suggest that the Inattentive symptoms may be more sensitive to a diagnosis of ADHD. However, using the Inattentive symptoms alone may result in overdiagnosis of ADHD. That is, adolescents with an internalizing disorder are likely to be misclassified as ADHD using symptom counts as the sole criteria.

Chi Squares. In order to ascertain more specific information about the utility of individual ADHD symptoms for discriminating between psychiatric groups and to assess whether the Hyperactive/Impulsive symptoms discriminate between ADHD subtypes as hypothesized, a series of Chi Squares were performed. The presence or absence of each ADHD symptom on the ADHD Rating Scale was coded with a Likert rating of 0 or 1 on the questionnaire being coded as no symptom and Likert rating of 2 or 3 being coded as having the symptom, as suggested by Dupaul & Stoner (1994). Then, chi square analyses were conducted to determine whether group differences existed between symptom
Table 7
"Pure" Cases Predicted by ADHD Hyperactive/ Impulsive Symptoms on the ADHD Rating Scale (Parent Report)

<table>
<thead>
<tr>
<th>Actual Group</th>
<th># of cases</th>
<th>Predicted Group Membership</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Group 1 ADHD (inattentive/</td>
<td>33</td>
<td>23</td>
<td>0</td>
<td>10</td>
<td>69.7%</td>
</tr>
<tr>
<td>combined subtype)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>30.3%</td>
<td></td>
</tr>
<tr>
<td>Group 2 Internalizing</td>
<td>18</td>
<td>6</td>
<td>0</td>
<td>12</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>66.7%</td>
<td></td>
</tr>
<tr>
<td>Group 3 Normals</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>26</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Percent of cases correctly classified: 63.64%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ADHD cases with a comorbid internalizing disorder were excluded from the analysis.
presentation on the ADHD Rating Scale and diagnosis on the DICA-R-P. The results are presented in Table 8. As seen in the table, all but three of the ADHD symptoms successfully discriminated between ADHD and Internalizing subjects when all ADHD subjects regardless of subtype were included in the analysis. The symptoms which failed to distinguish between these disorders were "often has difficulty organizing tasks and activities"; "is often forgetful in daily activities"; and "often talks excessively". It is important to note that ADHD cases with a comorbid internalizing disorder were not included in these analyses in order to maximize group differences. These results suggest that the DSM-IV diagnostic criteria are generally effective in distinguishing between ADHD and Internalizing disorders.

When comparing subjects diagnosed ADHD-Inattentive Type to Internalizing subjects, only four of the DSM-IV ADHD symptoms distinguished the groups. The symptoms were "Often makes careless errors in schoolwork or work" \(X^2(1)= 4.63, p<.05\); "Does not seem to listen" \(X^2(1)= 5.66, p<.05\); "Difficulty sustaining attention" \(X^2(1)= 13.75, p<.01\); and "Difficulty following instructions" \(X^2(1)= 5.66, p<.05\).

An examination of symptom presentation between the ADHD subtypes (Inattentive versus Combined type) indicates
Table 8
Chi Square Summary- Discriminating Power of ADHD Symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>ADHD vs. Int</th>
<th>Inat vs. Int</th>
<th>Inat vs. Comb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X²</td>
<td>p</td>
<td>X²</td>
</tr>
<tr>
<td>Inattention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Careless/Detail</td>
<td>6.56</td>
<td>.01* *</td>
<td>4.63</td>
</tr>
<tr>
<td>Sustained Attn</td>
<td>18.58</td>
<td>.00* *</td>
<td>13.75</td>
</tr>
<tr>
<td>Listen</td>
<td>11.43</td>
<td>.00* *</td>
<td>5.66</td>
</tr>
<tr>
<td>Instructions</td>
<td>9.65</td>
<td>.00* *</td>
<td>5.66</td>
</tr>
<tr>
<td>Disorganized</td>
<td>3.02</td>
<td>.08</td>
<td>3.75</td>
</tr>
<tr>
<td>Avoids effort</td>
<td>4.71</td>
<td>.03* *</td>
<td>3.48</td>
</tr>
<tr>
<td>loses things</td>
<td>5.23</td>
<td>.02* *</td>
<td>3.64</td>
</tr>
<tr>
<td>Distracted</td>
<td>6.55</td>
<td>.01* *</td>
<td>1.78</td>
</tr>
<tr>
<td>Forgetful</td>
<td>1.20</td>
<td>.27</td>
<td>.109</td>
</tr>
</tbody>
</table>

Hyperactivity

| Fidgets       | 6.89         | .01* *       | .509          | .48          | 8.57         | .00* *       |
| Out of Seat   | 7.95         | .01* *       | .071          | .79          | 22.03        | .00* *       |
| runs/Climbs   | 6.69         | .01* *       | 1.60          | .20          | 4.33         | .04* *       |
| Plays quietly | 6.89         | .01* *       | .489          | .48          | 8.62         | .00* *       |
| Driven by motor | 8.13     | .00* *       | 1.33          | .25          | 6.79         | .01* *       |
| Talk excessive| 2.20         | .14          | 1.38          | .24          | 18.99        | .00* *       |

Impulsivity

| Blurts out    | 9.21         | .00* *       | 1.22          | .27          | 8.80         | .00* *       |
| Awaits turn   | 4.96         | .03* *       | .434          | .51          | 18.84        | .00* *       |
| Interrupts    | 5.02         | .03* *       | .119          | .73          | 8.57         | .00* *       |

Note: ADHD cases with a comorbid internalizing disorder were excluded from the analysis. Analyses based on Parent Report on the ADHD Rating Scale. Int= Internalizing disorder; Inatt= ADHD- Inattentive Type; Comb= ADHD- Combined Type.
* Significant at the .05 level.
that the Hyperactive/Impulsive symptoms significantly
discriminate between the groups. There were no
significant differences between these subtypes on the
presence or absence of the Inattentive symptoms. These
findings were expected given that the Inattentive symptoms
are included when diagnosing both groups. An analysis of
Hyperactive/Impulsive subtype was not possible since so
few subjects (N= 2) met criteria for the disorder. The
results of the chi square analyses suggest that overall
the DSM-IV criteria discriminate between ADHD and
Internalizing subjects as well as the ADHD subtypes.
However, the DSM-IV symptoms do not discriminate well
between ADHD-Inattentive Type and Internalizing disorders
highlighting the similarity between these disorders in
symptom presentation.

Logistic Regression Analyses. The Chi Square
analyses presented above provide important information
about the utility of individual symptoms for
discriminating between diagnostic groups. However, these
data do not indicate which individual symptoms or
combination of symptoms would best predict a diagnosis of
ADHD. Models of prediction typically used in the social
science literature are Discriminant functions and Multiple
Regression analyses. Both of these models, however,
require the use of continuous dependent (in multiple
regression) and/or independent (in discriminant functions) variables. Logistic regression is an alternative statistical procedure which provides prediction and classification information when the independent and dependent variables are discrete. In this study, Logistic regression analysis was utilized to determine which individual symptoms or groups of symptoms were the best predictors of a diagnosis of ADHD. Separate logistic regression analyses were performed to ascertain which symptoms best predicted ADHD (all subtypes), ADHD-Inattentive Type, and ADHD-Combined Type. Table 9 displays the groups of symptoms which best predict each diagnosis as well as the percentage of subjects accurately classified using the model. Diagnoses were based on meeting the DSM-IV diagnostic criteria on the DICA-R parent interview. Predictor variables consisted of the presence (Likert rating of 2 or 3) or absence (Likert rating of 0 or 1) of the 18 DSM-IV ADHD symptoms as rated by mothers on the ADHD Rating Scale.

As seen in the table, "Often does not follow through on instructions", "Often avoids or is unmotivated to complete school work or tasks", and "Often talks excessively" are the best predictors of ADHD regardless of subtype \[X^2 (3) = 53.58, p < .01\], accurately classifying 80.34% of subjects. This model resulted in 25% false
<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>SIGNIFICANT PREDICTORS</th>
<th>% ACCURATELY PREDICTED BY MODEL</th>
</tr>
</thead>
</table>
| ADHD (All subtypes) | 1) Difficulty following instructions  
                      2) Avoids effort  
                      3) Talks excessively | 80.34% |
| ADHD- Inattentive Type | 1) Sustaining Attention  
                        2) Avoids effort  
                        3) Talks excessively | 80.34% |
| ADHD- Combined Type | 1) Leaves seat  
                        2) Difficulty awaiting turn  
                        3) Blurs out | 92.31% |
positives and 15% false negatives. The model obtained for ADHD-Inattentive Type had a similar classification rate. Using "Often has difficulty sustaining attention to tasks", "Often avoids or is unmotivated to complete school work or tasks", and "Often talks excessively" as the predictors, 87% of ADHD-Inattentive Type subjects were correctly classified. However, this model misclassified 26% of subjects without ADHD-Inattentive Type as having the disorder. These results suggest that although these clusters of symptoms may be useful in making a diagnosis of ADHD, they may lead to over-diagnosis.

The predicted model for ADHD-Combined Type consisted of three symptoms: Leaves seat, Difficulty awaiting turn, and Blurts out $[X^2 (3)=57.38, p<.001]$. Interestingly, all of these symptoms are Hyperactive/Impulsive symptoms. Using this model, 92.31% of subjects were accurately classified. Additionally, this model decreased Type I errors (6%), but increased Type II errors (18%) compared to the model predicted for the ADHD-Inattentive Type. Thus, although this model may serve to increase the specificity in making a diagnosis of ADHD, sensitivity may be sacrificed. Therefore, although clusters of symptoms may be help to focus the assessment, use of the symptom clusters must be used cautiously as they may result in unacceptable false positive or false negative rates.
Symptoms by Age. An analysis of ADHD symptoms in early (11-13 years) and late (14-17 years) adolescents with ADHD was made to determine if there was a decline in hyperactive and impulsive symptoms with age consistent with the existing literature. It was hypothesized that the late adolescent group would have fewer hyperactive/impulsive symptoms than the early adolescent group. The results suggest that there were no group differences between these age groups with respect to the frequency of inattentive symptoms [F(1, 55) = 1.12, p > .05] or the frequency of hyperactive/impulsive symptoms [F(1, 54) = .08, p > .05]. To evaluate individual differences in the developmental course of symptom presentation an analysis of parent report of lifetime versus current ADHD symptoms on the DICA-R was made. The results are presented graphically in Figures 1-4. As shown in Figure 1, the inattentive symptoms appear to remain relatively stable over time. That is, 89.5% of ADHD subjects were rated as having greater than six inattentive symptoms in the past, and 75.5% continued to have greater than six inattentive symptoms currently. Although there is a decrease in the number ADHD subjects having nine inattentive symptoms, the majority of ADHD subjects meeting criteria for ADHD based on parent report of
lifetime symptoms continue to meet criteria for ADHD currently.

The Hyperactive symptoms, on the other hand, were less stable with a large portion of ADHD subjects (45.6%) exhibiting 5 or 6 hyperactive symptoms in the past; however, an analysis of the current symptom prevalence suggests a shift toward fewer to no hyperactive symptoms (See Figure 2). Only 14% continued to have 5 or 6 hyperactive symptoms based on parent report of current symptoms and 21% of ADHD subjects no longer exhibited any hyperactive symptoms. Similar trends are observed with the impulsive symptoms (See Figure 3). Specifically, based on parent report of lifetime symptoms, 38.6% of ADHD subjects exhibited all three of the impulsive symptoms, 29.8% had at least two of the impulsive symptoms, and only 17.5% had no impulsive symptoms. Parent report of current impulsive symptoms demonstrate a substantial decline in impulsive symptoms with 33.3% of ADHD subjects exhibiting no impulsive symptoms presently.

Combining the hyperactive/impulsive symptoms consistent with the DSM-IV diagnostic rules further highlights the change in symptom presentation with age. As seen in Figure 4, 47.4% of subjects had greater than 6 hyperactive/impulsive symptoms in the past compared to 21.8% of subjects rated as having greater than 6
Figure 1
Stability of ADHD-Inattentive Symptoms Comparing Lifetime and Current Symptoms Based on Parent Interview Report
Sum of Hyperactive Symptoms Endorsed on Parent Interview

Figure 2
Stability of ADHD-Hyperactive Symptoms Comparing Lifetime and Current Symptoms Based on Parent Interview Report
Figure 3
Stability of ADHD-Impulsive Symptoms Comparing Lifetime and Current Symptoms Based on Parent Interview Report
Figure 4
Stability of ADHD-Hyperactive/Impulsive Symptoms Comparing Lifetime and Current Symptoms Based on Parent Interview Report

Sum of Hyperactive/Impulsive Symptoms on Parent Interview

- Darker bars represent Lifetime Symptoms
- Lighter bars represent Current Symptoms

Bar chart showing the number of ADHD subjects with different sums of hyperactive/impulsive symptoms.
hyperactive/impulsive symptoms currently. These data suggest a decline in hyperactive/impulsive symptoms consistent with longitudinal studies reported in the literature (Barkley et al., 1990; Fischer et al., 1993).

Comorbidity

Percentage of various comorbid diagnoses in ADHD subjects were calculated to determine the prevalence of these disorders in ADHD adolescents and to identify differences in the frequency and type of comorbid disorders based on ADHD subtypes. It was hypothesized that the ADHD-Inattentive Type would have more comorbid internalizing disorders and the ADHD-Combined Type would have more comorbid externalizing disorders. Data on the frequency of comorbid diagnoses in adolescents diagnosed with ADHD is presented in Table 10. The results are presented separately for the ADHD subtypes.

Overall, the data suggest that only a small portion of the ADHD subjects (19%) had no comorbid diagnoses. The majority of ADHD subjects had at least one comorbid diagnosis with subjects diagnosed with ADHD-Inattentive Type having significantly more comorbid diagnoses than subjects with ADHD-Combined Type [F(1, 57) = 11.53, p < .01]. The types of diagnoses co-existing in the ADHD subtypes also were examined. The percentages of ADHD subjects with the various disorders are displayed in Table 11. Subjects
<table>
<thead>
<tr>
<th># of Comorbid Dxs</th>
<th>ADHD-Comb. Type</th>
<th>%</th>
<th>ADHD-Inatt. Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>30</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>52</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>13</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>4+</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>17</td>
</tr>
</tbody>
</table>

*Note: Dxs = Diagnoses; Ss = subjects.*
were not classified as ODD if they also met criteria for CD, consistent with the DSM-IV diagnostic criteria.

A series of chi-square analyses were performed to determine whether significant differences existed between ADHD subtypes and each type of comorbid diagnosis. The results suggest that adolescents with ADHD-Inattentive Type had significantly more anxiety disorders \(X^2 (1) = 6.37, p < .05\) and Internalizing (anxiety + depression) disorders \(X^2 (1) = 12.28, p < .01\) than adolescents with ADHD-Combined Type. These findings partially support the hypothesis, in that, subjects diagnosed ADHD-Inattentive Type did tend to have more comorbid Internalizing disorders. However, the ADHD-Combined Type did not have significantly more externalizing disorders than the Inattentive group. Although the group differences did not reach statistical significance, the ADHD-Combined Type group did have higher percentages of externalizing disorders than the Inattentive group.
Table 11
Types of Comorbid Diagnoses in ADHD Subtypes

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th># of Ss</th>
<th>%</th>
<th># of Ss</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD ONLY</td>
<td>7</td>
<td>28</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>+ ODD</td>
<td>13</td>
<td>52</td>
<td>14</td>
<td>45</td>
</tr>
<tr>
<td>+ CD</td>
<td>8</td>
<td>32</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>+ DYSTH</td>
<td>4</td>
<td>16</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>+ M-DEP.</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>+ OVERAX</td>
<td>4</td>
<td>16</td>
<td>15</td>
<td>42*</td>
</tr>
<tr>
<td>+ SEP.AX</td>
<td>1</td>
<td>4</td>
<td>11</td>
<td>31*</td>
</tr>
<tr>
<td>+ OCD.</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+ PTSD</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>+ AVOID</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>+ SUBST. ABUSE</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

+ INT        | 4       | 16 | 25      | 69*|
+ DEP        | 4       | 16 | 14      | 39 |
+ ANX        | 4       | 16 | 17      | 47*|
+ EXT        | 16      | 70 | 21      | 58 |
+INT & EXT   | 3       | 13 | 13      | 36 |

Note: ODD= Oppositional Defiant Disorder; CD= Conduct Disorder; DYSTH= Dysthymia; M-DEP= Major Depression; OVERAX= Overanxious Disorder; SEP.AX= Separation Anxiety Disorder; OCD= Obsessive-Ccompulsive Disorder; PTSD= Post Traumatic Stress Disorder; AVOID= Avoidant Disorder; SUBST. ABUSE= Any substance abuse or dependence diagnosis; INT= Any internalizing disorder; DEP= Any depressive Disorder; ANX= Any anxiety disorder; EXT= Any externalizing disorder.
* Significant Chi Square (p ≤ .05)
DISCUSSION

Attention Deficit Hyperactivity Disorder has been extensively investigated in the empirical literature. The purpose of the present study was to explore factors related to the symptom presentation and diagnosis of ADHD in adolescence. An examination of the individual DSM-IV ADHD symptoms support the utility of the diagnostic criteria to discriminate between ADHD subjects (Pure + Comorbid) and subjects with Internalizing disorders. When comparing these groups, all but three of the DSM-IV symptoms successfully discriminated the groups. The symptoms which failed to discriminate between these groups were "difficulty organizing tasks or activities", "often forgetful", and "often talks excessively". The first two of these symptoms represent difficulties with concentration which is often associated with internalizing disorders as well. Thus, it is not surprising that these symptoms failed to distinguish between the two groups. The third symptom (e.g., "talks excessively") is less characteristic of internalizing disorders, however, it is possible, particularly with anxious adolescents, that they may "talk excessively" about the source of their anxiety or "talk excessively" in order to mask their anxiety. The relationship between this symptom and internalizing disorders warrants further investigation.
In addition to distinguishing between ADHD and Internalizing disorders, all of the hyperactive/impulsive symptoms were able to discriminate between ADHD subtypes (ADHD-Inattentive Type versus ADHD-Combined type). None of the inattentive symptoms discriminated between the subtypes. These results were expected given that by definition both subtypes (ADHD-Inattentive and Combined) are required to have at least six of the inattentive symptoms, but only the Combined subtype is required to also have six hyperactive/impulsive symptoms. Unfortunately, only two subjects in the sample met criteria for ADHD-Hyperactive/Impulsive subtype precluding an analysis of symptom presentation across all three subtypes. However, these data provide preliminary support for the utility of the DSM-IV diagnostic criteria for making a diagnosis of ADHD in adolescents.

However, when the ADHD-Inattentive Type subjects were compared to the Internalizing subjects only four of the ADHD symptoms discriminated groups. The discriminating symptoms were "often fails to give close attention to details or makes careless mistakes in schoolwork"; "difficulty sustaining attention"; "does not seem to listen"; and "does not follow through on instructions". Subjects who met criteria for ADHD-Inattentive type were more likely to exhibit these symptoms than Internalizing
subjects. Generally, these symptoms reflect the ability to focus attention for extended periods of time and act appropriately on the information presented. The results suggest that the adolescents diagnosed with ADHD may have more difficulty with these tasks than adolescents with an internalizing disorder. The remaining five inattentive symptoms and nine hyperactive/impulsive symptoms failed to discriminate between ADHD-Inattentive type and Internalizing disorders. These findings highlight the similarity in the presentation of these two very different disorders and emphasize the need for a thorough evaluation in order to clarify the etiology and onset of the inattentive symptoms.

Unfortunately, lengthy assessments are often not practical or feasible, therefore, clinicians are pressured to gather information as efficiently as possible. The logistic regression analyses conducted in this study suggest that there may be groups of symptoms which are most predictive of ADHD and the ADHD subtypes. The data indicate that clusters of symptoms accurately predict a large portion of ADHD subjects regardless of subtype (80.34%), as well as ADHD-Inattentive Type (80.34%), and ADHD-Combined Type (92.31%). Although these models appear to be sensitive to a diagnosis of these disorders and may serve as a focus for assessment, they do not preclude a
more comprehensive evaluation of other disorders which are also characterized by these same symptoms. For example, "talks excessively" is one of the best predictors of a diagnosis of ADHD-Inattentive or ADHD (regardless of subtype), however, this symptom fails to discriminate between adolescents diagnosed ADHD and subjects diagnosed with an internalizing disorder. Similarly, "often avoids effort" was identified as a powerful predictor of ADHD, and it also fails to distinguish between ADHD-Inattentive type and internalizing disorders. Thus, although these clusters may be useful in identifying adolescents with ADHD, using them in isolation is likely to result in a high false positive rate for the diagnosis. The hyperactive/impulsive symptoms identified as the best predictors of ADHD-Combined type appear to be sensitive as well as specific and may result in fewer false positives. However, these symptoms would not be helpful in making a diagnosis of ADHD-Inattentive type.

An additional factor which serves to complicate diagnostic decisions is the change in symptom presentation across time. An analysis of group differences between early versus late adolescence was examined with regard to symptom presentation to determine whether the hyperactive/impulsive symptoms declined with age consistent with other studies. The results yielded no
statistically significant differences between the groups. There are several plausible explanations for these unexpected findings. First, the restricted age range (11-17 years) in this study may preclude an analysis of group differences. It is also possible that the decline in hyperactive/impulsive symptoms occurs prior to age 11 or is gradual, and thus, differences could not be detected. Additionally, looking at this question cross-sectionally (across groups) does not allow an examination of individual differences in symptom presentation. To address these problems an analysis of parent-report of lifetime versus current symptoms was made. Although this examination is not the strongest methodologically because it depends on parent retrospective report, the results suggest a decline in the hyperactive/impulsive symptoms consistent with longitudinal studies reported in the literature (Barkley et. al., 1990).

The changes in symptom presentation are significant clinically in that they indicate that the inattentive symptoms rather than the hyperactive/impulsive symptoms may be more important diagnostically in adolescents. The discriminant function analyses suggest that the inattentive symptoms were superior at classifying ADHD subjects in this sample, accurately classifying 87.9% of ADHD subjects compared to 69.7% correctly classified using
the hyperactive/impulsive symptoms. However, one-third of the subjects diagnosed with an Internalizing disorder were misclassified as ADHD. These results indicate that the inattentive symptoms may be more sensitive to a diagnosis of ADHD in adolescents, but they are not specific to the disorder. When comorbid cases (ADHD + Internalizing disorders) were included, 61% of the Internalizing subjects were misclassified as ADHD using the inattentive symptoms as predictors. These findings are alarming as they indicate that ADHD may be over-diagnosed and Internalizing disorders may be overlooked if clinicians rely solely on parent-report of current inattention symptoms.

In this study, an examination of comorbid diagnoses suggests 81% of ADHD adolescents have at least one comorbid diagnosis. There were some significant differences between ADHD subtypes and comorbid diagnoses. Overall, the ADHD-Inattentive Type subjects had significantly more Internalizing disorders, especially anxiety disorders such as Overanxious and Separation Anxiety disorders. Although the ADHD-Combined group tended to have more Externalizing disorders, these results did not reach statistical significance. These findings have important treatment implications. Current research suggests that ADHD subjects with a comorbid Internalizing
disorder or Conduct disorder may be less responsive to stimulant medication (DuPaul et al, 1994; Hinshaw, 1991). Thus, the high comorbidity rates in this study suggest that adolescents with ADHD tend to also have significant additional problems which complicate diagnostic decisions and treatment planning.

The present study highlights the difficulties in assessing ADHD in adolescents. The results are consistent with other studies documenting a decline in hyperactive/impulsive symptoms in this age group. These data further suggest that the inattentive symptoms may be more sensitive to a diagnosis of ADHD in adolescents than the hyperactive/impulsive symptoms characteristic of childhood ADHD. However, the inattentive symptoms are not specific to the disorder and relying solely on these symptoms may result in misclassifying many adolescents with emotional problems as ADHD. Therefore, several recommendations for increasing the accuracy of a diagnosis can be made for clinicians based on the findings of this study.

First, it appears important to gather information related to age of onset of symptoms, circumstances around symptom onset, and the level of interference across settings. This information typically cannot be ascertained through questionnaire data, and therefore,
inclusion of a thorough clinical interview is essential to assessment. Similarly, clinicians should be aware of the high comorbidity rates that may occur in adolescents with ADHD. Thus, it is important for clinicians to consider and assess for comorbid diagnoses or alternative diagnoses which may better explain the presenting symptoms. The differential diagnosis between ADHD-Inattentive Type and Internalizing disorders is especially difficult due to the overlapping symptomology. The inclusion of a measure of emotional lability has been shown to be helpful in discriminating ADHD subjects from those with internalizing disorders when inattentive symptoms did not distinguish between these two groups (Adams et. al., unpublished manuscript). Thus, although symptom presentation and comorbidity confuse the clinical picture, by using a multi-trait, multimethod assessment along with the suggestions made in this paper clinicians can gather the essential information while focusing the assessment in an efficient manner.

The current study possesses several methodological strengths which contribute to its clinical importance. First, the use of structured diagnostic interviews with adolescents and parents affords a wealth of information for making differential diagnoses and comorbid diagnoses. Also, the study utilized diagnostic decision rules based
on the Diagnostic Interview for Children and Adolescents-Revised which have been supported in the literature (e.g., Reich et al., 1987) increasing the confidence in the accuracy of the diagnoses. In addition, the present study analyzed the data with and without ADHD cases having comorbid diagnoses in order to determine how comorbidity may impact symptom presentation. This information has been lacking in the current literature and is important given the high rates of coexisting disorders in adolescents. A third advantage of this study is the inclusion of a large sample having a broad array of diagnoses consistent with those presenting for psychological services. Most studies examining the utility of the diagnostic criteria compare ADHD subjects to Normal controls yielding information about differences between clinical and nonclinical groups limiting conclusions that can be made about specific disorders. A fourth and final strength of the study is the analysis of the utility of the most recent revision of the DSM criteria for ADHD in an all adolescent sample. The study highlights the need for additional research in this area.

Despite the clinical relevance and advantages of the study, several limitations of the study must be recognized and addressed in future research. The first and most important limitation is the limited sample size. The
small number of subjects in certain groups precluded a more micro-analysis of the ADHD subtypes (e.g., ADHD-Hyperactive/Impulsive Type), Internalizing disorders (e.g., independent effects of Anxiety and/or Depression), and different age groups. In addition, the sample was relatively homogeneous with the majority of subjects being middle-class, Caucasian adolescents. Since minority groups and lower SES families were not well represented in the study, generalization of the results to these groups cannot be made without further investigation. Another limitation of the study is that data on past symptoms relied on parent retrospective report. Although this method of data collection may not be the most reliable, it is consistent with assessment procedures in clinical practice. Additionally, the results of changes in symptom presentation from past to present is consistent with longitudinal data documented in the literature (Barkley et al., 1990).

Overall, the present study attempted to address limitations of the current literature by investigating the diagnostic utility of the DSM-IV criteria for ADHD with an all adolescent sample and evaluate the potential impact of comorbidity on diagnostic decision making. The results suggest that the presentation of ADHD in adolescents can be substantially different from childhood ADHD and
warrants further investigation. The paucity of research on adolescent ADHD has forced clinicians to apply the childhood literature to adolescents. The current study challenges the validity of that application.

The decline of hyperactivity and impulsivity and subsequent emphasis on inattentive symptoms in this population poses unique difficulties for clinicians assessing these patients. The overlap in symptoms between ADHD and Internalizing disorders must be considered in the assessment as well as the possibility of comorbid disorders. It is recommended that future researchers continue to identify differences between ADHD as it presents in childhood and precedes to adolescence. An important next step will be to replicate the current study using a larger, more representative sample. Similarly, an analysis of the differential diagnosis of ADHD and Anxiety disorders versus Depressive disorders would be interesting and may have important treatment implications. Also, the current study emphasizes the need to develop sensitive and specific assessment methods. Based on the findings in this study, it is important that these methods ascertain information about age of onset, pervasiveness of the disorder, etiology of the presenting symptoms, and presence of coexisting disorders which may impact treatment planning.
REFERENCES


APPENDIX A
DSM-IV ADHD SYMPTOMS ADDED TO DICA-R

1. Have you ever failed to give close attention to details often?
   Probe: Have you ever had frequent difficulties with hearing all parts of an instruction? Did you often fail to complete tasks thoroughly because you weren’t paying attention to instructions?

2. Have you ever been disorganized often?

3. Have you ever made careless mistakes or errors in schoolwork or work often?
   Probe: Have you ever often ignored a sign in a math problem or failed to complete assignments as directed?

4. Have you ever been forgetful often?
   Probe: Did you often forget to bring home necessary materials to do your homework?

5. Have you ever daydreamed often when you should have been paying attention?
   Probe: Did your teacher ever complain that you stare off in space or look around when you should be doing your work? (If YES, how often?)

6. Have you ever felt unmotivated to complete schoolwork or tasks at home often?
   Probe: When asked to do something by a friend, teacher, or your parent, did you "just not feel like doing it" often?

7. Have you ever ran about often or climbed excessively?
   Probe: Was your activity level much greater than that of your same-age peers?

8. Have you ever acted as if you were "driven by a motor" often and could not remain still?
   Probe: Were you always on the go, doing something?
## APPENDIX B
### PARENT RATING SCALE

DIRECTIONS: Circle the number in the **one** column which best describes your child.

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Just A Little</th>
<th>Pretty Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Often fidget or squirms in seat.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Has difficulty remaining seated.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Is easily distracted.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Has difficulty awaiting turn in groups.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Often blurts out answers to questions.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Has difficulty following instructions.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Has difficulty sustaining attention to tasks.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Often shifts from one uncompleted activity to another.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Has difficulty playing quietly.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. Often talks excessively.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. Often interrupts or intrudes on others.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. Often does not seem to listen.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. Often loses things necessary for tasks.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
14. Often engages in physically dangerous activities without considering consequences.

15. Often fails to give close attention to details.

16. Often disorganized.

17. Often makes careless errors in schoolwork or work.

18. Often forgetful.

19. Often daydreams when he/she should be attending to something.

20. Often unmotivated to complete schoolwork or tasks.

21. Often runs about or climbs excessively.

22. Often acts as if "driven by a motor" and cannot remain still.

Note: From the ADHD Rating Scale: Normative Data, Reliability, and Validity by G.J. DuPaul, 1990, unpublished manuscript, University of Massachusetts Medical Center, Worcester. Reprinted with permission of the author. This form may be reproduced for personal use.
VITA

Larissa Kay Kern was born on April 22, 1969 in New Orleans, Louisiana. She received her Bachelor of Science degree in Psychology at the University of Alabama in December 1990. She received her Masters degree in Psychology at Louisiana State University in May 1994. She currently resides in Providence, Rhode Island, where she is completing her predoctoral internship. She is pursuing a doctoral degree in Clinical Psychology through Louisiana State University.
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Major Field: Psychology

Title of Dissertation: Diagnosing ADHD in Adolescence: An Analysis of Symptom Presentation and Comorbidity

Approved:

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Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

March 12, 1996