CORRELATES, ANTECEDENTS, AND CONSEQUENCES OF READING DISABILITIES IN 11-YEAR-OLD CHILDREN WITH ADHD AS A MAJOR CORRELATE

DISSERTATION

Presented to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements For the Degree of

DOCTOR OF PHILOSOPHY

By

Stewart Pisecco, B.A., M.A.
Denton, Texas
August, 1996
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The purpose of this study was to follow the development of children with reading disabilities only, reading disabilities and ADHD, ADHD only, and a comparison group from the ages of 3 to 18. Differences were examined on the following variables: (a) Antecedent variables—Reynell Developmental Language Scales, Temperament, and Family Adversity; (b) School-age variables—behavioral and academic self-concept ratings; and (c) Psychological adjustment variables at age 18—self-reports of delinquency. Children from the reading disabled groups exhibited receptive language deficits, were from families who during the early childhood years had less resources to cope with problem situations, exhibited difficult temperamental characteristics, and had negative academic self-concepts. Distinctions were also noted between a "pervasive" and "situational" presentation of behavioral problems. During late adolescence the reading disabled groups exhibited similar levels of delinquency as their non-disabled peers.
The implications of this study and directions for future research are discussed.
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CHAPTER I

INTRODUCTION

Currently it is estimated that learning disorders afflict approximately two percent to 10% of American school age children (APA, 1994). The term learning disorder refers to disabilities of reading, mathematics, and written expression. Consequently, this diagnostic category consists of a very heterogeneous group of children. Research which has attempted to differentiate between the groups has met with mixed success. For instance, one consistent finding which seems to differentiate between reading and mathematics disorders is that children with reading disorders experience difficulties related primarily to auditory-processing tasks (Geary, 1993). In contrast, children with mathematics disorders tend to experience problems primarily related to visuospatial deficits (Geary, 1993). The third group of children, those with spelling disorders are thought to differ from the other two groups in that they experience deficits in motor skills which would hypothetically affect their ability to master spelling (Bradley, 1981). In a study to test that hypothesis Share, Silva, and Adler (1987) investigated differences between two groups of children, those with reading and spelling problems and those with only spelling difficulties. Results of their study showed
that children with spelling problems only, performed worse on the WISC-R Arithmetic and Coding subtests in comparison to a non-disabled group. However, the spelling disabled only group did not exhibit any type of language, motor, or neurological deficits. Although this study failed to support Bradley's (1981) hypothesis, the fact that the spelling problems only group did not exhibit language problems is noteworthy. This finding is important since it differentiates children with spelling disorders from children with reading problems.

One point which becomes obvious when reviewing the learning disorder literature is that much more is known about reading problems than the other two disorders. This emphasis on reading disorders may be a result of the fact that reading disabilities are thought to afflict four percent of the school age population while mathematics disorders reportedly afflicts only one percent of the school age population (APA, 1994). Prevalence estimates for written expression disorder were not reported in the DSM-IV since "... it is difficult to establish because many studies focus on the prevalence of learning disorders in general without careful separation into specific disorders" (p. 52; APA, 1994). This study, as do most, focuses on the development of children with reading disabilities.

Although a seemingly homogeneous syndrome, Rutter and Yule (1975) were the first to suggest that specific
developmental reading disorder consists of two distinct subtypes. These subtypes are defined by the following criteria: (a) General reading backwardness (GRB) which is a reading achievement level that is significantly behind the level expected on the basis of a child’s age and (b) Specific reading retardation (SRR) which is a reading achievement level that is significantly behind the level predicted by the child’s intelligence. Rutter and Yule (1975) noted distinctions between the two groups in that children with GRB tended to have lower verbal IQs, a higher prevalence of neurological disorder and motor and praxic abnormalities. In contrast, children with SRR performed worse on tests of reading and spelling and were more often boys than girls. Subsequent research has partially supported Rutter and Yule’s claim in that children with GRB seem to have a long-term history of both cognitive and motor delays (Silva, McGee, & Williams, 1983), and that their cognitive deficits cover a broader range of areas in comparison to children with SRR (Jorm, Share, Maclean, & Matthews, 1986). At school entry, children with GRB are also more likely than children with SRR to present with behavioral problems, mainly those relating to attentional deficits (Jorm, Share, Matthews, & Maclean, 1986). In contrast, children with SRR tend to show a more limited area of deficits, mainly those relating to early literacy and
phonological processing skills (Jorm, Share, Maclean, et al., 1986).

Although researchers have not been able to replicate all of Rutter and Yule's original findings (Share, McGee, McKenzie, Williams, & Silva, 1987; Silva, et al., 1983), Hinsaw (1992) makes the point that the separability of the two groups is at least partially validated. This body of research is of importance in that it suggests that reading disorders fall along a continuum of severity and that children at different points along the continuum may exhibit a variety of different cognitive symptoms and behaviors.

The nature of these symptoms and behaviors has become a point of interest to researchers and clinicians alike. Data regarding reading disorders have been collected from both clinically referred and epidemiological samples. Consequently, this area of research includes the results from both cross-sectional and longitudinal studies. Based upon the findings from this research a great deal has been discovered about the characteristics of children with reading disabilities. Of particular interest to this paper are the apparent correlates, antecedents, and consequences of reading disabilities.

Correlates, Antecedents, and Consequences of Reading Disabilities

One well documented finding, is that children with reading disabilities are distinctive from their non-
disordered peers in that they present with phonological processing deficits (Blachman, 1994; Hurford, Schauf, Bunce, Blaich, & Moore, 1994; Share & Silva, 1987; Silva, Justin, McGee, & Williams, 1984; Silva, et al., 1983; Silva, Williams, & McGee, 1987). Silva and colleagues have been following a cohort of children for the past 21 years. Based on that dataset Silva, et al. reported that at age 3, children with general language delays were at heightened risk for lowered IQ and reading difficulties later in life. However, before attributing poor reading scores to language delays it is important to consider the role of intelligence. For instance, children with low IQs are likely to exhibit reading difficulties regardless of language delays. Such factors were considered in a later study by Silva, Justin, et al. in which they reported that a normal IQ/delayed speech group when compared with a low IQ/delayed speech group performed better on a measure of reading. However, reading performance was significantly worse for the normal IQ/speech delayed group when compared with the performance of the normal IQ/normal speech group.

Hurford, et al.'s (1994) study supports the relationship between language delays and later reading difficulties. In their study they were able to predict reading group membership at the end of second grade based upon phonological processing scores obtained at the start of school. More specifically, they were able to accurately
classify all children with reading disabilities as well as those identified as being poor readers. Other researchers have also documented the stability of individual differences in the phonological processing skills of young children and the relationship between such deficits and reading disorders (Torgesen, Wagner, & Rashotte, 1994; Pennington, Groisser, & Welsh, 1993).

In addition to early language difficulties, children with reading disabilities frequently present with other childhood disorders (Hinsaw, 1992; Konstantareas & Homatidis, 1989, McGee, Williams, Share, Anderson, & Silva, 1986; McGee, Williams, & Silva, 1984; Semrud-Clikeman, Biederman, Sprich-Buckminster, Lehmann, Faraone, & Norman, 1992; Stanton, Feehan, McGee, & Silva, 1990; Toro, Weissberg, Guare, & Liebenstein, 1990; Williams & McGee, 1994; Waldie & Spreen, 1993). Williams, Anderson, McGee, & Silva (1990) examined the relationship between risk factors and behavioral and emotional disorders in 11-year-old children. In their study, Williams, et al. (1990) reported that reading problems successfully predicted the co-existence of another psychiatric disorder in 11-year-old children. The most common long-term association with reading difficulties are behavioral disorders (McGee, Share, Moffitt, Williams, & Silva, 1988). In that there are a variety of behavioral disorders, it is important to distinguish between the type of disorder and its association
with reading difficulties. In one such attempt Anderson, Williams, McGee, and Silva (1989) failed to find a relationship between aggressive conduct disorders and poor reading. However, in an earlier study McGee, et al. reported an association between conduct disorder and reading difficulties when conduct disorder was paired with ADHD.

More recently, researchers have found that for most boys and girls early academic achievement does not appear to be directly related to later juvenile delinquency. However, there does seem to be a relationship between reading disorders and later conduct disorder for those boys with the most serious reading difficulties (Williams & McGee, 1994). Consequently, in most cases conduct disorder is more likely to be associated with reading difficulties when it co-occurs with ADHD. The association between reading disorders and ADHD has been well documented, with conservative comorbidity estimates of approximately 23% (Semrud-Clikeman, et al., 1992).

Researchers have also found that at varying ages the associated features which children with reading difficulties exhibit may change. For instance, hyperactivity-inattention is primarily associated with reading difficulties during the school-age years. Aggression, on the other hand, is usually only associated with reading problems when it co-occurs with a diagnosis of ADHD. However, during adolescence an apparent shift occurs at which point underachievement seems to be
related to antisocial behavior rather than ADHD (Frick, Kamphaus, Lahey, Loeber, Christ, Hart, & Tannenbaum, 1991; Hinsaw, 1992). Research which suggests that adolescents with learning disabilities are more likely than their non-disorder peers to use drugs (Maag, Irvin, Reid, & Vasa, 1994) and are at a heightened risk to become chemically dependent (Karacostas & Fisher, 1994) is consistent with the increasing occurrence of antisocial behavior.

With an apparent shift from attention related difficulties to delinquency comes the question of which mitigating variables, if any, initiate the shift in symptomatology. One possible factor, may be the reportedly lowered academic self-concepts of children with reading difficulties (Chapman, Lambourne, & Silva, 1990; Chapman, Silva, & Williams, 1984; Montgomery, 1994). In a recent study by Montgomery (1994), she reported that the academic and competence ratings of children with learning disabilities were lower than those of the non-disabled and high-achieving children. Her results are consistent with earlier reports that children with reading difficulties perceive their ability to be lower than the perceptions of non-disabled children (Chapman, et al., 1984). In a related study, Chapman, et al. (1990) examined the antecedents of academic self-concept and found that neither family background variables (e.g., mother's marital status at birth, family SES at the time of birth, and family
environment at ages 7 and 9) nor the mother’s emotional status, intelligence, or expectations for school performance were significantly related to academic self-concept. Also noteworthy is the fact that the child’s cognitive functioning at ages 3, 5, 7, and 9 was not related to later academic self-concept. The primary variable, other than past year academic self-concept ratings, to predict later ratings of academic self-concept was reading (Chapman et al., 1990). Which led them to conclude that academic self-concept is primarily a byproduct of the child’s performance at school. They also noted that any influence that background variables may have on academic self-concept is likely to be a result of their influence on school performance.

In regards to scholastic performance, children with learning disabilities are more likely to attribute academic outcome to external rather than internal factors (Grolnick & Ryan, 1990; Pintrich, Anderman, & Klobucar, 1994; Short, 1992). This is an interesting finding in that it suggests that children with learning disabilities not only attribute their successes to external factors but also their failures. Although this may protect the children’s sense of self-worth in that they are likely to see their failures as someone else’s fault, the school setting is likely to become a frustrating environment. In such an environment children may at first simply just try to put up with the situation; hence
the appearance of an inattentive and hyperactive student. As the child progresses through school and continually experiences problems, this frustration may result in disruptive behavior. However, caution is warranted in accepting such a hypothesis in that research involving the consequences of low academic self-concept are scarce.

Additionally relevant is family adversity and its association with reading disabilities (Toro et al., 1990; Pennington, Grossier, & Welsh, 1993). Toro et al.'s (1990) study found that children identified as learning disabled were more likely to come from families where there were economic and family difficulties and a lack of educational stimulation. In contrast, Pennington et al. (1993) found that problems in the family environment were more indicative of children diagnosed with a reading disorder and ADHD rather than the RD only group. Varying results between the studies may be explained by differences in the approaches taken to identify the samples of children studied. Pennington et al. used a researcher defined criterion in assigning the children to their respective groups (i.e., RD vs. no RD; ADHD vs. no ADHD; and a comorbid group). Toro et al. were dependent upon the school's classification of a child as either learning disabled or non-learning disabled. As Toro et al. noted, this classification approach may have resulted in a heterogeneous group children with a variety of difficulties. This is important in that Toro et al.'s
findings would be more consistent with the results from Pennington et al.'s study if they were compared to the ratings of the RD/ADHD group. Consequently, a more appropriate suggestion maybe that the families of reading disabled children are more likely to experience increased adversity when their children present with additional concerns.

Consideration of parental and family variables with regard to the course of a child’s disorder is rather common. Child temperament is also a pertinent variable since temperament may impact the functioning of the parent. In a study by Caspi, Henry, McGee, Moffit, and Silva (in press) it was found that temperament assessed at ages 3 and 5 was significantly related to parent and teacher reports of behavior problems at ages 9 and 11. At ages 13 and 15, they found that temperament continued to be correlated with parent reports. In total, they identified three dimensions which emerged from factor analyses of behavioral observations. The first dimension was labelled "Lack of Control", which they defined as an inability to appropriately regulate impulses and an increased sensitivity to frustration. The second dimension, "Approach" describes a child who responds well to novel situations. The last dimension, "Sluggishness," refers to a child who reacts in a very passive manner. The results of their study suggest that "Lack of Control" is a style commonly associated with
externalizing disorders. The "Sluggishness" dimension was weakly associated with anxiety and inattention, primarily in girls. Children with an "Approach" style had the most positive outcome and were typically perceived as competent. In explaining their findings they suggested that temperament may elicit certain reactions from others which affect the development of later disorders. For instance, a child who is best described by the "Lack of Control" style is likely to be very demanding and frustrating to their parents. Consequently, the parent may be slow to respond to the child as a result of the child’s high demands. This is then likely to result in fewer limits being imposed upon the child, with the end result being a child who is likely to exhibit increasingly disruptive behaviors. This is an important finding in that it acknowledges the effect that the child can have on his or her parents.

In summary, it appears that reading difficulties are associated with the following variables: early language delays, ADHD symptomatology during the school-age years, lowered academic self-concept, externalization of control, and increased delinquency during adolescence. Also important to note is that family adversity may impact the child negatively in the way that it affects the child’s school performance. In addition, a disruptive temperament may interact negatively with the child’s environment.
Causality Hypotheses Regarding the Development of Reading Disabilities

As was noted, the development of a child with reading disabilities may be affected by several different variables. The most common debate, in regards to the etiology of reading disabilities, has focused on the relationship between reading difficulties and externalizing disorders (Hinsaw, 1992; Jorm, et al., 1986; McGee & Share, 1988; McGee, et al., 1986; Waldie & Spreen, 1993; Williams, et al., 1990, Williams & McGee, 1994).

One leading argument is that reading disorders result in the development of ADHD (McGee & Share, 1988). In contrast, it has been reported that some researchers believe that ADHD leads to the development of reading disorders (Dupall & Stoner, 1994). Others have suggested that reading disorders are the result of other factors, such as genetic influences (Hinsaw, 1992).

These debates typify the three most common causality hypotheses. The first is the suggestion that disorder A causes disorder B. The second hypothesis is that disorder B causes disorder A. The third approach is to suggest that another factor is the cause of both disorders A & B. Pennington et al. (1993) have suggested that in some cases disorder A could cause symptoms of disorder B to manifest without the full occurrence of disorder B. They refer to this as the phenocopy hypothesis.
In a study which contrasted cognitive deficits in ADHD and reading disability, Pennington et al. (1993) found support for the phenocopy hypothesis. They compared and contrasted the performance of various groups (e.g., reading disabled only, ADHD only, ADHD and reading disability, & control groups) on two different domains. Domain A consisted of phonological processing measures and domain B consisted of executive functioning measures. They found that on the phonological processing domain the RD only and RD/ADHD groups performance was impaired compared to the ADHD only and control group. However, on the executive functioning measures the RD only and RD/ADHD groups performance was normal. In contrast, the ADHD only group performed worse on the executive measures when compared to the performance of the RD only and RD/ADHD groups. Since the performance of the RD/ADHD group was more consistent with the performance of the RD only group they concluded that the ADHD symptomatology is likely secondary to the reading disability. This is an interesting suggestion in that it could explain the high comorbidity of ADHD symptoms in the reading disability population while at the same time preserving the validity of the ADHD diagnosis.

This hypothesis could also explain why some children manifest the disorder earlier than others. For instance, McGee, Williams, and Feehan (1992) described groups of children with ADHD who had varying ages of onset; by 3
years, by 5-6 years, and by 7 years of age. In their study they found that the behavior profile for the group with a late onset differed from the profiles of the other two groups on parent, teacher, and self reports at age 11. The early onset groups exhibited significantly higher levels of inattention and hyperactivity on all reports, whereas the late onset group exhibited significantly higher levels of inattention and hyperactivity on only the teacher and self-reports. These findings would be consistent with the suggestion that there is a group of children, the boys from the early age onset groups, who exhibit the full syndrome of ADHD while at the same time supporting the phenocopy hypothesis in that there may be a group of children, with a late onset, who manifest ADHD symptomatology in response to their reading difficulties. The late onset of ADHD would be explained in that their behaviors do not completely represent the full blown syndrome but rather just symptoms of their reading difficulties. Although McGee et al. examined differences between the reading levels of each group, the inclusion of reading disorders was beyond the scope of their study. Consequently, the aforementioned hypothesis is theoretical. Future research regarding the validity of the phenocopy hypothesis is needed. For example, Pennington et al. diagnosed subjects with ADHD based on parent behavioral reports. Consequently, one might question why a group of children would exhibit elevated levels of
ADHD behaviors at home if their difficulties were primarily a byproduct of reading problems. In the future researchers may want to utilize both parent and teacher behavioral reports to further assess behavioral distinctions between such groups.

This area of research also highlights the need to determine which characteristics or variables are associated with reading problems and which are associated with ADHD. A four group mixed design where children are identified with reading disabilities only, reading disabilities and ADHD, ADHD only, and without any type of handicapping condition would be appropriate.

Purpose of the Study

The purpose of this study is to examine group differences between a series of variables considered correlates of reading difficulties. These variables will be grouped into three sections: (a) Antecedent variables including Reynell Developmental Language Scales, Temperament, and Family Adversity; (b) School-age variables including, behavioral and academic self-concept ratings; and (c) Psychological adjustment variables at age 18, including self-reports of delinquency. Since ADHD is considered a major correlate of reading problems the groups will consist of children identified at age 11 as having reading problems only (RD only), reading problems and Attention Deficit Hyperactivity Disorder (RD/ADHD group), Attention Deficit
Hyperactivity Disorder only (ADHD only), and a comparison group of normal readers without any type of psychiatric diagnosis. The general purpose of the four group mixed design is to determine which characteristics are attributable to reading difficulties and which are attributable to ADHD. Based upon a review of the literature the following differences are expected:

Antecedent Variables

(1) The RD only and RD/ADHD groups will differ significantly from the ADHD only and control groups on the phonological processing measures. More specifically, lower scores are expected for the RD only and RD/ADHD groups when compared to the ADHD and comparison groups.

(2) The RD/ADHD group will come from families with a higher index of family adversity when compared to the RD only, ADHD only, and comparison groups.

(3) Temperament of children with ADHD will be considered more difficult than the temperament of children from the RD only and comparison groups.

School-Age Variables

(1) The RD only and RD/ADHD groups will have a significantly lower academic self concept than the ADHD only and comparison groups.

(2) At home the behavioral ratings for the RD/ADHD, and ADHD only groups will be similar in nature and elevated relative to the comparison group’s ratings. At school the
behavioral ratings for the RD only, RD/ADHD, and ADHD only groups will be similar in nature and elevated in comparison to the comparison group ratings.

Psychological Adjustment Variables at Age 18

(1) On self-reports of delinquency the RD/ADHD and ADHD only groups will report significantly more delinquent behaviors than the RD only and comparison groups.
CHAPTER II

METHOD

Subjects

Subjects are children involved in the Dunedin (New Zealand) Multidisciplinary Health and Development Study. The cohort's history has been described by Silva (1990). The study is a longitudinal investigation of the health, development, and behavior of a complete cohort of consecutive births between April 1, 1972 and March 31, 1973, in Dunedin, New Zealand. Perinatal data were obtained and when the children were traced for follow-up at 3 years of age 1,139 children were deemed eligible for inclusion in the longitudinal study. Of these, 1037 (91%) were assessed. Since then, follow-ups have been conducted biannually. Data was collected for 991 subjects at age 5, 954 at age 7, 955 at age 9, 925 at age 11, 850 at age 13, 995 at age 15, and 993 at age 18. McGee (1985) has compared children who were lost to the study at each age with those remaining by age 11 and found no systematic differences in social class, IQ, or a variety of behavioral variables. When compared to the New Zealand general population, the cohort is slightly biased toward higher social class levels (Elley & Irving, 1972). The sample consists of subjects predominantly of European
ancestry (less than 2% Polynesian) and is therefore comparable to similar white samples from other English-speaking western cultures.

Instruments

Language development. At ages 3 and 5, the Reynell Development Language Scales (RDLS; Reynell, 1969) were used to assess expressive and receptive language skills. This measure was individually administered. Test reliabilities for the Reynell Expressive and Reynell Receptive scales were .92 and .95, respectively. In an attempt to establish the predictive validity of the RDLS Silva, Bradshaw, and Spears (1986) found that the receptive and expressive scales were strongly correlated with IQ scores from the WISC-R, .71 and .63 respectively.

Family adversity. A measure of factors related to social adversity was calculated for each data collection phase (ages 3, 5, 7, 9, 11, 13, and 15). The measure was based on the model of Rutter's adversity index (Rutter, 1978). It was calculated by adding 1 point for each of the following: low parental education (less three years of high school), low parental income (under $10,000 per year), semi-skilled or unskilled parental status, separation from parents for at least 1 year, large family size (five or more children), poor maternal mental health (below the sample tenth percentile, on the "Malaise Inventory" of Rutter et. al., 1970), low maternal IQ (below the sample tenth
percentile, Thurstone & Thurstone, 1973), and a low score on a measure of family social environment (below the tenth percentile on the Moos Family Relations Index, Moos, 1974). Because all of these variables were not available for every phase, all of the adversity indexes could not be calculated identically. Nevertheless, at least six of the 10 variables were included in the index at each assessment age. (Teen mother and maternal IQ were used only at the age when they were assessed).

**Temperament.** At ages 3 and 5 behavioral ratings were made by an examiner after observing the child in a data collection session that involved a standard set of cognitive and motor tasks. In total the examiner rated the child on 22 behavioral characteristics. Each rating was based on a 3 point scale with a higher rating indicating a higher level of that trait. Based on those ratings factor analyses were completed, which resulted in three dimensions: Lack of Control, Approach, and Sluggishness. The Lack of Control dimension is indicative of a child who is impulsive, easily frustrated, and often reacts to stress and challenge in a negative manner. The Approach dimension is indicative of a child who quickly adjusts to new situations, is friendly, and reacts to stimuli in a friendly and confident manner. The Sluggishness dimension is indicative of a child reacts in a passive manner to changing situations, seems uninterested in new situations, and who seldom initiates
action (for a complete description of each dimension and the factor analyses results see Caspi, et al., 1994). For the purposes of this study only the Lack of Control dimension was used.

**Reading ability.** At ages 7, 9, 11, 13, 15, and 18 the Burt Word Reading Test-Revised (New Zealand Council for Research in Education, 1981) was administered. The Burt Word Reading Test is a word-recognition reading test normed for New Zealand children. In format it resembles the Wide-Range Achievement Test of reading. The test consists of 110 words graded in approximate order of difficulty. The child is asked to read as many words from the test card until ten consecutive words are read incorrectly. At which point the child is given the opportunity to look at the remaining words to see if he or she can read any other words. The Burt Word Reading Test is considered an extremely consistent measure with test-retest reliability coefficients range from .95 to .99 and internal consistency coefficients ranging from .96 to .97. In addition, the Burt Word Reading Test has been found to correlate highly (.79 to .87) with tests of reading comprehension, such as the PAT: Reading Comprehension Test.

**Behavior ratings.** At ages 5 and 7 parents completed form A and teachers completed form B of the Rutter Child Scales (RCS: Rutter, Tizard, & Whitmore, 1970), respectively. The RCS-A consists of 31 items describing
three problem behaviors; aggressiveness, hyperactivity, and anxiety-worry. The items were coded by the parents describing the behavior as: does not apply (0), applies somewhat (1), or certainly applies (2). Alpha coefficients are .81 for the aggressiveness scale, .74 for the hyperactivity scale, and .59 for the anxiety-worry scale. The RCS-B consists of 26 items and covers the same areas of behaviors as the parent version and is completed in the same manner. Alpha coefficients for the aggressiveness, hyperactivity, and anxiety-worry scales are .83, .82, and .72, respectively. At ages 9 and 11, three items were included which measured additional inattentive and hyperactive behaviors (McGee, Williams, Bradshaw, Chapel, Robins, & Silva, 1985). The Rutter has also demonstrated good discriminatory validity by consistently distinguishing between children with and without psychological disorders (Rutter, Tizard, & Whitmore, 1970). At age 13, the teachers completed the RCS-B. However, the parents at 13 and 15 completed the Revised Behavior Problem Checklist (RBPC; Quay and Peterson, 1987), which contains more extensive and age appropriate items than the Rutter scales. The RBPC consists of 89 items of which 77 load on four major subscales. Each item is rated does not apply (0), applies somewhat (1), or certainly applies (2). The major subscales are Conduct Disorder (CD), Socialized Aggression (SA), Inattentive (IA), and Hyperactivity (HY). Each scale consists of 11 to 22
items and have yielded alpha coefficients ranging from .82 to .94 (Quay, 1983). In regards to validity, the RBPC has demonstrated good discriminatory validity by consistently distinguishing between children with and without psychological disorders (Lahey & Piacentini, 1985). For the purposes of this study the SA, IA, and HY scales of the RBCP were computed to examine the occurrence of aggressive and ADHD behaviors. In order to make cross measure comparisons, all scores were standardized.

Academic self-concept. At ages 9 and 11 the Student’s Perception of Ability Scale-Short Form (SPAS; Boersma & Chapman, 1987) was administered. Thirty-five of the 70 items in the SPAS comprise the Short Form. These items were selected on the basis of their subscale factor loadings. Half the number of items in each subscale, specifically those with the highest loadings, were included in the Short Form. The subscales are Perception of General Ability, Perception of Arithmetic Ability, General School Satisfaction, Perception of Reading and Spelling Ability, Perception of Penmanship and Neatness (each containing six items in the Short Form), and Confidence in Academic Ability (five items in the Short Form). The following internal reliability estimates (Cronbach’s alpha) were reported: .81-Full Scale, .65-General Ability, .75-Arithmetic, .53-School Satisfaction, .74-Reading/Spelling, .81-Penmanship/Neatness, .57-Confidence (Chapman, et al., 1983).
The SPAS has been found to discriminate between children with and without learning disabilities, correlates moderately with concurrent grades (.48) and is predictive of later scholastic success (.49; Boersma, Chapman, & Maguire, 1979). For this study only the Full Scale score was used.

Adjustment variables. At age 18 self reports of delinquency were obtained to evaluate frequency of delinquent behaviors. Information regarding the number of police contacts and convictions was also gathered.

The self-reported delinquency questionnaire. Nine-hundred-thirty subjects completed the self-reported delinquency questionnaire as part of the Phase 18 assessment. Subjects completed a standardized self-report delinquency questionnaire developed by Elliot and Huizinga (1989). Research regarding the reliability of self-reports of delinquency indicates that such measures are sound when the reporting period is 1 year or less and when the subjects believe that confidentiality will be maintained (Hirschi, Hindelang, & Weis, 1980; Moffitt, 1989). Test-retest reliabilities range from .75 to .98 for periods of 2 weeks and 6 months, respectively. Internal consistency alphas ranged between .65 and .92. The psychometric properties of this instrument are equalled when used in the New Zealand study (Moffitt, 1989).

Police contacts. This index consists of all police contacts that resulted in the filing of a standard incident
form. Records were obtained for 991 subjects from ages 10 to 16 from Youth Aid constables in police departments throughout New Zealand. Of the sample members, 12 had died and 34 moved outside of New Zealand resulting in missing data for 46 sample members. 18.8% of the males had police contact records with a range of 0 to 18. 9.8% of the females had police contact records with a range of 0 to 12.

Court convictions. Records were obtained for 932 subjects by searching the central computer system of the New Zealand police department. Resulting in records for all convictions in New Zealand and Australia with exception of minor traffic offenses. Informed consent for the search was obtained during the age 18 interviews. Therefore, subjects who did not participate in Phase 18 assessment were excluded. 14.9% of the males had one or more convictions with a range of 0 to 68. 5.5% of the females had one or more convictions with a range of 0 to 10.

Procedure

All children were categorized based upon their reading scores and behavioral ratings when they were 11-years-old.

Reading disabled only group (RD only). Typically the identification of reading disorders relies upon a discrepancy between the child's reading level and ability, with ability being represented by the child's score on an intelligence test (Semrud-Clikeman, et al., 1992). The basic assumption which drives such an approach is best illustrated
by Burt's (1937) argument that "...capacity must obviously limit content. It is impossible for a pint jug to hold more than a pint of milk and it is equally impossible for a child’s educational attainment to rise higher than his educable capacity" (p.477). Share, Mcgee, and Silva, (1987) tested that assumption and failed to find support for Burt’s hypothesis. In their study they found that rates of progress and levels of achievement clearly indicate that IQ does not set a limit on reading progress, even in children with extremely low IQs. Based on their findings they concluded that the use of IQ tests to determine achievement potential in reading appears unjustified. If a child can not read, they can not read and to ignore the problems that child faces because he or she also obtained a score on a test which indicates a low IQ seems discriminatory.

Consequently, a child was identified as reading disabled if they obtained a reading score which was at least 1.5 standard deviations below the sample’s average reading score. In addition, children in this group did not meet the diagnostic criteria for any type of psychiatric disorder. Since the reading disabled identification process of this study did not use the standard discrepancy approach, children in this group will be referred to as having a reading disability rather than a disorder.

Attention Deficit Hyperactivity Disorder (ADHD only). Three sources existed for the report of symptoms meeting
DSM-III criteria for ADD. These sources included self-reported symptoms as assessed with the Diagnostic Interview Schedule for Children-Child Version (DISC-C; Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982), and parent and teacher reports of inattention and hyperactivity from the Rutter Child Scales A and B. Each child was individually interviewed by a child psychiatrist with the DISC-C. An ADHD diagnosis was made if two of the three possible reporters provided independent consensus report of all DSM-III criteria, if one reporter met the full criterion and another met some of the criteria, or if one reporter alone provided all symptoms to meet the diagnostic criteria (for a complete description of this method and the results see Anderson, et al., 1987).

ADHD and reading disabled group (ADHD/RD group). Children in this group met the criteria for ADHD as described above and had a reading score which was at least 1.5 standard deviations below the mean of the sample.

Comparison group. Children in this group did not meet the criteria for either a reading disability or ADHD and were free from any other handicapping condition.

Identification of the Groups

Based upon the above criteria 43 children were identified with ADHD. Of those 43, 36 of the subjects were male and 7 were female. As a result of the low number of females with ADHD the subsequent analyses were limited to
males. Of those 37 males with ADHD, 19 were identified as reading disabled and 17 were identified as "normal" readers. Of the 19 subjects from the ADHD/RD group, 6 also met the criteria for either a conduct or oppositional defiant disorder. Of the 17 subjects with ADHD only, 8 also met the criteria for either a conduct or oppositional defiant disorder. Of the remaining members of the sample, 57 were identified as reading disabled and 269 qualified for the comparison group.
CHAPTER III

RESULTS

The purpose of this study was to examine group differences between a series of variables. These variables were grouped into three sections: (a) antecedent variables including Reynell Language Scales, Temperament, and Family Adversity; (b) school-age variables including behavioral and academic self-concept ratings; and (c) psychological adjustment variables at age 18 including self-reports of delinquency. The subjects of this study were classified into one of four groups. These groups included children identified at age 11 as being reading disabled only (RD Only), reading disabled and having Attention Deficit Hyperactivity Disorder (RD/ADHD), having Attention Deficit Hyperactivity Disorder only (ADHD only), and free of any handicapping condition. The general purpose of the four group mixed design was to determine which characteristics are attributable to reading difficulties and which are attributable to ADHD.

The results are presented in four sections: (a) description and comparison of the groups; (b) inter-group differences on the antecedent variables; (c) inter-group
differences on the school-age variables; and (d) inter-group differences on the psychological adjustment variables at age 18.

Description and Comparison of the Sample

In order to confirm distinctions between the groups a series of analyses were conducted with the Rutter A & B Hyperactivity scales and Burt Reading scores at age 11. On the Rutter A Hyperactivity scale, significant group differences were found, $F(3, 352) = 12.78; p < .001$. Post hoc comparisons, using the Scheffe method, revealed that the RD/ADHD group, with a mean of 2.22 and the ADHD only group, with a mean of 2.18, were described by their parents as significantly more hyperactive than the RD only and comparison groups, with means of .93 and .77 respectively. The parent hyperactivity scores for the RD/ADHD group and the ADHD only group were not significantly different. In addition, the parent hyperactivity scores for the RD only and comparison groups did not differ significantly. On the Rutter B Hyperactivity scale, significant group differences were found, $F(3, 357) = 65.32; p < .001$. Post hoc comparisons, using the Scheffe method, revealed that the RD/ADHD group, with a mean of 3.84, and the ADHD only group, with a mean of 3.82, differed significantly from the RD only group and the comparison group, with means of 1.37 and .72 respectively. Teachers also described the RD only group as significantly more hyperactive than the comparison group. On
the Burt Word Reading test significant between group
differences were found, \( F(3, 358) = 145.86; p < .001 \). Post hoc comparisons, using the Scheffe method, revealed that the RD only group, with a mean of 42.30 and the RD/ADHD group, with a mean of 39.11, scored significantly lower than the ADHD only and comparison groups, with means of 74.41 and 78.33 respectively. There were not significant differences on the Burt Reading test between the RD only and RD/ADHD groups or between the ADHD only and comparison groups.

In summary, the results of these comparisons confirm the assumption that the RD only and RD/ADHD groups were similar in regards to reading disability and that they exhibited different levels of hyperactivity. They also confirm the assumption that the ADHD only and RD/ADHD groups exhibited similar levels of hyperactivity and that they differed in regards to reading ability.

Inter-Group Differences on the Antecedent Variables

All raw data was transformed to Z-scores, so as to make interscale comparisons possible. Therefore, all data presented in the tables are Z-scores unless otherwise specified. All group contrasts were done using the Scheffe’ method.

Reynell Developmental Language Scales

To examine differences on the Reynell Developmental Languages Scales at ages three and five, a 4 x 2 repeated
measures multivariate analysis of variance (MANOVA) was performed. Means and standard deviations are presented in Table 1.

Results of the analyses indicate that a significant main effect for group on the Reynell Receptive scale (Wilks Lambda $\mathbf{F}(3, 342) = 10.30, p < .001$). Univariate analyses of variance (ANOVAs) revealed significant differences between the groups at ages three, $\mathbf{F}(3, 356) = 6.67, p < .001$, and five, $\mathbf{F}(3, 344) = 7.95, p < .001$. At both ages three and five, the RD/ADHD and RD only groups scored significantly lower than the comparison and ADHD groups. There was also a significant main effect for group (Wilks Lambda $\mathbf{F}(3, 341) = 8.91, p < .001$) on the Reynell Expressive scale. Univariate analyses revealed group differences at age three, $\mathbf{F}(3, 355) = 9.86, p < .001$. Children in the RD only and RD/ADHD groups scored significantly lower than the children in the comparison group. The main effect for time and the interaction effect for time and group were not significant.

**Family Adversity**

To examine differences on the family adversity index a 4 X 7 repeated measures MANOVA was performed. Means and standard deviations are presented in Table 2.

Results of the analyses indicate that there was a significant main effect for group (Wilks Lambda $\mathbf{F}(3, 322) = 4.58, p > .01$). At ages three, $\mathbf{F}(3, 356) = 5.80, p < .001$, and five, $\mathbf{F}(3, 356) = 6.56, p < .001$, the family adversity
index was significantly higher for children in the RD only and RD/ADHD groups than for children in the comparison group. At age seven, \( F(3, 361) = 3.69, \ p < .01 \), the family adversity index was significantly higher for children in the RD/ADHD group than for children in the ADHD only or comparison group. The main effect for time and the interaction effect for time and group were not significant.

**Temperament**

To examine differences on the Lack of Control dimension a 4 X 2 repeated measures MANOVA was performed. Means and standard deviations are presented in Table 3.

Results of the analyses showed that there was a significant main effect for group (Wilks Lambda \( F(3, 346) = 21.37, \ p < .001 \)). At age three, \( F(3, 358) = 13.22, \ p < .001 \), the RD/ADHD group was rated significantly higher on the Lack of Control dimension than the RD only, ADHD only, and comparison groups. In addition, the RD only group was rated significantly higher than the comparison group. At age five, \( F(3, 358) = 14.84, \ p < .001 \), the RD/ADHD group was rated significantly higher on the Lack of Control dimension than the RD only, ADHD only, and comparison groups. The main effect for time and the interaction effect for time and group were not significant.
Inter-group Differences on the School-Age Variables

Academic Self-Concept

To examine differences on the Student's Perception of Ability Scale (SPAS) a 4 x 2 repeated measures MANOVA was performed. Means and standard deviations are presented in Table 4.

Results of the analyses indicate that there was a significant main effect for group (Wilks Lambda $F(3, 227) = 11.32, p < .001$). At age nine, $F(3, 321) = 6.31, p < .001$, the RD only group's ratings of academic competence were significantly lower than the ratings of the comparison group. At age 11, $F(3, 261) = 12.72, p < .001$, the RD only and RD/ADHD groups' ratings of academic competence were significantly lower than the ratings of the comparison group. The main effect for time and the interaction effect for time and group were not significant.

Parent Behavioral Ratings

To examine differences on the parent ratings of ADHD and delinquent behaviors a 4 X 6 repeated measures MANOVA was performed. Means and standard deviations are presented in Table 5.

Analyses indicated that there was a significant main effect for group (Wilks Lambda $F(3, 294) = 19.57, p < .001$) on the index of ADHD behaviors. At age five, $F(3, 356) = 9.08, p < .001$, the ADHD only and RD/ADHD groups were
described as more hyperactive than the RD only and comparison groups. At age seven, $F(3, 347) = 7.68, p < .001$, children from the RD/ADHD group were described as significantly more hyperactive than children from either the comparison or RD only groups. At ages nine, $F(3, 347) = 12.56, p < .001$ and 11, $F(3, 355) = 12.78, p < .001$, the ADHD only and RD/ADHD only groups were described as significantly more hyperactive than the RD only or comparison groups. At age 13, $F(3, 322) = 19.76, p < .001$, the ADHD/RD group was described as significantly more hyperactive than the RD only or comparison groups. In addition, the ADHD only and RD only groups were described as significantly more hyperactive than the comparison group. At 15, $F(3, 348) = 19.79, p < .001$, the ADHD only and RD/ADHD groups were described as significantly more hyperactive than the RD only or comparison groups. The main effect for time and the interaction effect for time and group were not significant.

There was also a significant main effect for group (Wilks Lambda $F(3, 310) = 5.45, p < .001$) on the index of delinquent behaviors. At ages five, $F(3, 360) = 4.90, p < .01$; seven, $F(3, 356) = 7.41, p < .001$; nine, $F(3, 361) = 6.47, p < .001$; and 11, $F(3, 354) = 5.60, p < .001$, the RD/ADHD group was described as significantly more delinquent than the comparison or RD only groups. The main effect for
time and the interaction effect for time and group were not significant.

**Teacher Behavioral Ratings**

To examine differences on the teacher ratings of ADHD and delinquent behaviors a 4 X 5 repeated measures MANOVA was performed. Means and standard deviations are presented in Table 6.

There was a significant main effect for group (Wilks Lambda, $F(3, \, 302) = 55.43, \, p < .001$) on the index of ADHD behaviors. At age five, $F(3, \, 356) = 20.09, \, p < .001$, children from the RD/ADHD group were described as significantly more hyperactive than were children from the RD only, ADHD only, and comparison groups. At age seven, $F(3, \, 351) = 18.39, \, p < .001$, children from the RD/ADHD and ADHD groups were described as significantly more hyperactive than were children from the comparison group. In addition, the RD/ADHD group was described as significantly more hyperactive than the RD only group. At age nine, $F(3, \, 354) = 31.73, \, p < .001$, the RD only, RD/ADHD, and ADHD only groups were described as significantly more hyperactive than the comparison group. At age 11, $F(3, \, 360) = 65.32, \, p < .001$, the RD only, RD/ADHD, and ADHD only groups were described as significantly more hyperactive than the comparison group. In addition, the RD/ADHD and ADHD groups were described as significantly more hyperactive than the RD only group. At age 13, $F(3, \, 319) = 12.00, \, p < .001$, the RD only, RD/ADHD,
and ADHD only groups were described as significantly more hyperactive than the comparison group. In addition, the RD/ADHD group was described as significantly more hyperactive than the RD only group.

Results of the 4 X 5 repeated measures Manova also indicate that there was also a main effect for time (Wilks Lamba $F(4, 1208) = 10.46, p < .001$) and an interaction effect (Wilks Lamba $F(12, 1208) = 5.10, p < .001$) (See Figure 1). Further analysis suggests that the ADHD only group became increasingly hyperactive to age 11. The RD/ADHD group was rated as increasingly hyperactive from ages nine to 11. During that same time span, the RD only group was rated as decreasingly hyperactive. The RD/ADHD and ADHD only groups ratings of hyperactivity decreased from age 11 to 13.

Analyses of teacher delinquency ratings indicate that there was a significant main effect for group (Wilks Lamba $F(3, 312) = 35.35, p < .001$). At age five, $F(3, 358) = 15.13, p < .001$, the RD/ADHD group was rated as significantly more delinquent than the RD only, ADHD only, and comparison groups. In addition, the RD only group was rated as significantly more delinquent than the comparison group. At age seven, $F(3, 355) = 9.89, p < .001$, both the RD only and RD/ADHD groups were rated as significantly more delinquent than the comparison group. At age nine, $F(3, 361) = 17.05, p < .001$, the RD/ADHD group was rated as significantly more delinquent than the RD only and
comparison groups. The ADHD only group was also rated as significantly more delinquent than the comparison group. At age 11, $F(3, 360) = 39.50, p < .001$, both the RD/ADHD and ADHD only groups were rated as significantly more delinquent than the RD only and comparison groups. At age 13, $F(3, 319) = 8.80, p < .001$, the RD/ADHD, ADHD only, and RD only groups were rated as significantly more delinquent than the comparison group.

Results of the 4 X 5 repeated measures Manova also indicate that there was also a main effect for time (Wilks Lambda $F(4, 1248) = 3.30, p < .01$) and an interaction effect (Wilks Lambda $F(12, 1248) = 4.81, p < .001$) (See Figure 2). Analysis of the interaction suggests that the ADHD only group was rated as increasingly more delinquent until the age of 11. From ages 11 to 13, delinquency ratings for the ADHD only group decreased in severity. Delinquency ratings for the RD only group decrease in severity from ages nine to 11. However, their delinquency ratings increased from the ages 11 to 13.

Inter-Group Differences on the Psychological Adjustment Variables at Age 18

To examine differences on age 18 delinquency variables a MANOVA was performed. Means and standard deviations are presented in Table 7.

On the self report of delinquency a significant main effect was found for group (Wilks Lambda $F(3, 331) = 1.98, p$
< .01). Univariate analyses indicated that the groups differed on the number of juvenile arrests, \( F(3, 331) = 2.79, p < .05 \), and past year thefts, \( F(3, 331) = 2.79, p < .05 \). However, post hoc comparisons using the Scheffe' method failed to find any significant intergroup differences.
CHAPTER IV

DISCUSSION

The purpose of this study was to examine group differences between a series of variables considered correlates of reading difficulties. These variables were grouped into three sections: (a) Antecedent variables including Reynell Developmental Language Scales, Temperament, and Family Adversity; (b) School-age variables including behavioral and academic self-concept ratings; and (c) Psychological adjustment variables at age 18 including self-reports of delinquency. Since ADHD is considered a major correlate of reading problems the subjects were classified into one of four groups: Reading problems only, reading problems and ADHD, ADHD only, and a comparison group.

A discussion of the findings will be reviewed in following manner: (a) Inter-group differences on the antecedent variables; (b) Inter-group differences on the school-age variables; (c) Inter-group differences on the psychological adjustment variables at age 18; (d) Limitations of the study and future directions for research; and (e) Conclusions.
Inter-Group Differences on the Antecedent Variables

Results of this study partially supported the first antecedent hypothesis that the RD only and RD/ADHD groups would score significantly lower than the ADHD and comparison groups on the Reynell Developmental Language measure. Analyses of intergroup differences indicated that receptive language difficulties were the primary language problems that children with reading disabilities experienced. Although there were some differences between the groups on the expressive measure they were not as pronounced or as consistent as the differences on the receptive scale. These findings also showed that receptive language problems were more indicative of children with reading problems than ADHD. This is based on the fact that the reading disabled groups exhibited difficulties in this area while children from the ADHD only and comparison groups did not. Consequently, the receptive language difficulties which the RD/ADHD group exhibited are more likely associated with their reading problems rather than ADHD. Results which are consistent with past research (Hinsaw, 1992; Korkman, Marlit, & Pesonen, 1994; Pennington, et al., 1993).

In addition, the results suggest that receptive language difficulties are an antecedent rather than a consequence of reading problems. This is based on the fact that children with reading problems exhibited receptive language delays prior to the start of school. This
conclusion is consistent with previous research which points to the negative reading outcome of children with early receptive language problems (Hinsaw, 1993; Hurford, et al., 1994; Silva, et al., 1983; Silva, et al., 1984). Based on these results, early assessment and intervention programs developed for as early as three years of age may benefit children with receptive language problems.

A second antecedent variable to the development of reading difficulties that was considered was family adversity. Based upon previous research it was hypothesized that children from the RD/ADHD group would come from families with more adverse backgrounds than the RD only, ADHD only, and comparison groups. Partial support was found for that hypothesis. At ages three and five, the family adversity index was higher for children from the RD only and RD/ADHD groups. By age seven, the only significant difference was that the RD/ADHD group’s family adversity index was significantly higher than the index for the comparison and ADHD only groups. Although the F-value indicated group differences at ages nine, 11, and 13 post-hoc analyses using the Scheffe’ method failed to find significant group differences.

Before drawing any conclusions based on these results, it is important to consider the type of variables which constitute the family adversity index. At ages three and five, data for the Family Environment Scale were not
available. However, data were available regarding the families income level, the parent's field of work, and the mother's IQ, mental health status, and educational level. Consequently, the family adversity index at ages three and five provided information about the availability of both personal and financial resources, especially those of the mothers. Therefore, a heightened index of adversity at those ages is indicative of a family who is less likely to have adequate resources to deal with problem situations. In light of that conclusion the results of this study are generally consistent with the findings from Toro et al.'s (1990) research in which they noted that learning disabled children were more likely to come from families where there were economic difficulties. In addition, they pointed out that these families also tended to have increased incidences of family difficulties and a lack of educational stimulation.

The third hypothesis regarding antecedent variables focused on temperament. Based upon previous research it was hypothesized that children from the RD/ADHD and ADHD only groups would be rated significantly higher on the Lack of Control dimension than the RD only and comparison groups. The results of this study partially supported that hypothesis. At ages three and five the RD/ADHD group was rated significantly higher on the Lack of Control dimension than the RD only, ADHD only, and comparison groups. At age
three, the RD only group was also rated significantly higher on the Lack of Control dimension than the comparison group. The ADHD group was not considered more difficult than any other group at any age.

Two possible conceptualizations of temperament have been suggested. The first hypothesis is that temperament may be the early manifestation of later behavioral disorders (Rutter, 1987). The results of this study do not support that hypothesis. If that hypothesis was valid than the ADHD only group would have theoretically scored higher on the Lack of Control dimension than the RD only and comparison groups. That not being the case, the assessment of temperament in this study seems to tap a unique set of characteristics that may be predictive of a later behavioral disorder, in some cases, but not a necessary condition for the development of later problems. Others have also found that early temperamental difficulties, in and of itself, does not sufficiently account for the development of a later childhood disorder (Maziade, Cote, Bernier, & Boutin, 1989; Rennen-Allhoff & Reinhard, 1988). An alternate interpretation of temperament which may be more appropriate is Caspi et al.'s, (in press) suggestion that temperament is a consequence of early person-environment interactions. The fact that children from the reading disabled groups, at age three, scored lower on the Reynell Receptive scale than children from the ADHD only and comparison groups would
support this interpretation. Simply put, a child who exhibits receptive language problems is more likely to have a difficult time understanding parental rules than a child without receptive language delays. Consequently, this complication may lead them to be categorized as difficult to manage. The fact that children with reading disabilities were rated higher on the Lack of Control dimension is supportive of this interpretation. Therefore, the Lack of Control dimension is likely the representation of a temperamental characteristic. As Caspi et al. have suggested this characteristic is not necessarily equivalent to the early manifestation of a behavioral disorder but rather a response style that is the result of a person-environment interaction. This interpretation suggests that a multi-dimensional explanation for the manifestation of a childhood behavioral disorder is most appropriate.

Inter-Group Differences on the School-Age Variables

The focus of the first school-age hypothesis was on inter-group differences on academic self-concept ratings. Based upon previous research it was hypothesized that the RD only and RD/ADHD groups would have a significantly lower academic self concept than the ADHD only and comparison groups. Results of the analyses partially supported that hypothesis. At age nine, the self-concept ratings for the RD only group were significantly lower than the ratings for the comparison group. By age 11, both the RD only and RD/ADHD
groups rated their academic skills as significantly lower than the comparison group.

These results are generally consistent with previous research which has found that children with learning disabilities tend to have lower academic self-concepts than non-disabled children (Montgomery, 1994). These results also indicated that the RD/ADHD group's negative academic self-concept is a likely result of their reading difficulties rather than ADHD. This conclusion is consistent with previous research which has found that reading is the primary variable which contributes to a child's academic self-concept (Lambourne, et al., 1990).

The focus of the second school-age hypothesis was on parent and teacher behavioral ratings. Based upon previous research it was expected that at home the behavioral ratings for the RD/ADHD group would be similar in nature to the behavioral ratings for the ADHD only group. On parent reports of ADHD related behaviors, from the ages of five to 15, that hypothesis was generally supported. Typically the RD/ADHD and ADHD only groups ratings' were significantly higher than those of the RD only and comparison groups. The only exceptions were at ages seven and 13. At age seven, parent ratings for the RD/ADHD group were significantly higher than the ratings for the RD only or comparison groups. At age 13, parent ratings for the ADHD only group were not significantly higher than the ratings for the RD
only group but were significantly higher than the ratings for the comparison group. Overall, these results suggest that the ADHD behaviors exhibited, at home, by the RD/ADHD group are primarily attributable to their ADHD diagnosis.

The hypothesis that parent delinquency ratings for the RD/ADHD and ADHD only groups would be similar in nature was not supported. From ages five to 11, the RD/ADHD group was considered significantly more delinquent than the RD only and comparison groups. From ages 11 to 15 differences between the groups were not significant. These results suggest that the delinquent tendencies of the RD/ADHD group are unlikely to be solely attributable to their reading difficulties or their ADHD diagnosis.

Results of the analyses of inter-group differences on the teacher behavioral reports are more complex than the analyses for the parent ratings. At age five, teachers reported that the RD/ADHD group exhibited significantly more ADHD behaviors than any other group. By age seven, teacher’s ratings for both the RD/ADHD and ADHD only groups were higher than those of the comparison group. In addition, the RD/ADHD group’s ratings were higher than those of the RD only group. Differences between the ratings for the RD and ADHD only groups were not significant. At age 9, teacher ratings for the RD only, RD/ADHD, and ADHD only groups were higher than the ratings for the comparison group.
Differences between the RD only, RD/ADHD, and ADHD only groups' ratings were not significant. At age 11, teacher ratings for the RD only, RD/ADHD and ADHD only groups were higher than the ratings for the comparison group. Ratings for the ADHD groups were also significantly higher than the ratings for the RD only group. At age 13, teacher ratings for the RD only, RD/ADHD and ADHD only groups were higher than the ratings for the comparison group. However, only the RD/ADHD group's ratings were higher than the ratings for the RD only group. Based on these results it would be reasonable to suggest that for a particular group of children reading difficulties may lead to the manifestation or exacerbation of ADHD like symptoms. These results are consistent with previous research which suggests that ADHD symptomology is often secondary to reading difficulties (McGee and Share, 1988; Pennington, et al., 1993) and that the presentation of ADHD related behaviors may be affected by environmental influences (Barkley, 1991).

Teacher reports of delinquency indicated that at school the RD/ADHD group was consistently the most delinquent group of children. The RD only group exhibited more delinquent behaviors than the comparison group up to age seven. From ages seven to 11, the ADHD only ratings increased dramatically. At age 13, there was an increase in delinquent behaviors for the RD only group at which time their ratings along with the ratings of the ADHD groups were significantly
higher than the those of the comparison group. As was the case with teacher ADHD ratings, it would seem that for a particular group of children reading difficulties may lead to the manifestation or exacerbation of delinquent behaviors. In addition the results indicated that the presence of ADHD, at school, may lead to the manifestation or exacerbation of delinquency.

The general purpose of the four group mixed design was to determine which characteristics are attributable to reading difficulties and which are attributable to ADHD. In an attempt to answer that question it is important to consider distinctions between the groups at both home and school. ADHD related behaviors exhibited at home seem to be more indicative of a child with ADHD rather than reading problems. However in examining school related data, there seems to be ample evidence which suggests that reading problems lead to the manifestation or exacerbation of ADHD symptomatology. As Cohen, Becker, & Campbell (1990) noted in the past parent-teacher discrepancies were thought to be a function of low rating scale reliability. However, they go on to suggest that parent-teacher discrepancies are more likely a function of the heterogeneity of the population and varying diagnostic criteria used by clinicians and researchers. This interpretation and the results of this study are consistent with Pennington, et al.,’s (1993)
suggestion that there are likely two distinct sub-types of children with ADHD.

The first group consists of children who exhibited the full-blown syndrome. These children would meet a "pervasive" ADHD diagnostic criteria in that they exhibited symptomatology across a variety of situations which is an important consideration in making an appropriate diagnosis (APA, 1994). In this study that would consist of children from the RD/ADHD and ADHD only groups. However, Pennington et al. concluded that children from the RD/ADHD group, in their study, manifested ADHD symptomatology in reaction to reading problems. A conclusion which infers that these children do not suffer from the full-blown ADHD syndrome and clashes with the results of this study. Analyses of the behavioral data suggests that neither malady is the result of the other but rather children from the RD/ADHD group may actually be afflicted with both conditions. These children are likely to be representative of a small subtype, who Pennington et al. referred to as possessing both disorders. These results provide further evidence as to complexity of disentangling etiological factors in the ADHD + reading problem population.

As was mentioned the results of this study suggest that there is a second group of children who exhibited only behavioral symptoms of the disorder but not the complete ADHD syndrome. This second group would likely meet a
"situational" diagnostic criteria in that they only present with ADHD symptomatology in specific situations, primarily at school. These children would likely be similar in nature to the RD/ADHD group, in Pennington, et al.'s study who manifested ADHD symptomatology in reaction to their reading problems.

The distinction between a "situational" and "pervasive" presentation of behaviors is important and has been identified in the past (Schachar, Rutter, and Smith, 1981; Goodman and Stevenson, 1989). Schachar, Rutter, and Smith (1981) investigated differences between the characteristics of these two groups and found that the pervasive group were a greater clinically deviant group. Goodman and Stevenson's (1989) research supported Schachar et al.'s findings. Consequently, in both clinical practice and research it is important to obtain behavioral ratings from both the child's parents and teachers. For example, if a child exhibits clear ADHD symptomology at school but not at home than it would be especially important to rule out learning problems as a cause of the child's attentional difficulties. If a child exhibits clear ADHD symptomology at home but not at school than it would be important to rule out extracurricular difficulties as a source of the child's problem behavior. Agreement between the ratings would imply that the child's behavior is indicative of a "pervasive" ADHD diagnosis.
In regards to delinquency, these results suggested that such behaviors exhibited at home are not solely a function of an ADHD diagnosis or reading difficulties. This is based on the fact that both the RD only and ADHD only groups exhibited similar non-elevated levels of delinquency at home. However, at school both groups exhibited elevated levels of delinquency at varying times. Consequently, one possible interpretation would be that both reading problems and ADHD may lead to the development or exacerbation of delinquency at school but likely in reaction to different stimuli. For example, the children with reading difficulties may become more delinquent as a result of their inability to master academic tasks. In contrast, children with ADHD may exhibit delinquent behaviors in reaction to their inattentive, impulsive, and hyperactive tendencies. This conclusion would suggest that for a particular group of children the school environment may lead to the manifestation or exacerbation of delinquency.

Once again the distinction is made between a situational and pervasive condition. As was the case with ADHD symptomatology there seems to be a group of children, those with both reading problems and ADHD, who exhibited elevated levels of delinquency at both home and school. Their behavior is likely indicative of a "pervasive" behavioral disorder. This group of children would likely consist of individuals who Moffit (in press) referred to as
"life-course persistent delinquents". As mentioned earlier, it is unlikely that their behavior is solely attributable to reading problems or ADHD and the pervasive nature of their problems would rule out the solo influence of the school environment. Consequently, there are likely additional factors which place the child further at risk for the development of delinquency, such as neurological influences, temperament, family adversity, or other unidentified variables. As previously discussed, a child who exhibits difficult temperamental characteristics and is from a family who has less personal and financial resources is likely to be at risk for a greater incidence of disruptive behaviors. These findings seem to support that hypothesis.

Inter-Group Differences on the Psychological Adjustment Variables at Age 18

Results of the analyses did not support the hypothesis that the RD/ADHD and ADHD only groups would report significantly more delinquent behaviors than the RD only and comparison groups. The multivariate F-value was significant and univariate analyses indicated inter-group differences on the number of juvenile arrests and self-reports of past year thefts. However, group comparisons using the Scheffe’ method failed to find any significant inter-group differences. One possible explanation is related to large group standard deviation. As a result, the univariate F-value may have been artificially inflated by outliers. The same may be true of
the significant F-value for the number of past year thefts. Nonetheless, the lack of group differences is surprising in that past researchers have reported heightened levels of adolescent delinquency and substance abuse in students identified as learning disabled (Maag, et. al., 1994; Karacostas & Fisher, 1994). Another reason why this finding was unexpected was because the RD/ADHD group consisted of children who exhibited significantly elevated levels of delinquency since the age of five. Consequently, it was unexpected that this group would suddenly desist being delinquent.

An alternate explanation for the lack of group differences is that the other groups may have become more delinquent during adolescence. Previously, researchers have noted that an increase in delinquency is expected during adolescence (Moffit, in press). In her paper on limited versus life-course persistent antisocial behavior, Moffit noted that when plotting crime rates against age the highest peak occurs at age 17. This is relevant since the delinquency data collected at age 18 asked about delinquent behaviors at age 17. Therefore, the lack of differences may be a result of a normalized increase of delinquency. Future research should examine group differences at later ages, such as 21 or 25. Based upon past behavior it is likely that at those later ages the RD/ADHD group would continue to
exhibit elevated levels of delinquency while the other
groups have desisted.

Limitations of the Study and
Future Directions for Research

There are many advantages in using a longitudinal
design in the study of childhood development (see the review
by Loeber & Farrington, 1994). However, there are some
natural limitations which must be dealt with or accepted.
For instance, in a longitudinal study it can become
difficult to distinguish between aging, time period, and
cohort effects (Baltes, Reese, & Lipsitt, 1980). In
addition, when studying a natural cohort of children the
prevalence of childhood disorders is likely to follow
general population prevalence rates. In this study there
were significantly more boys than girls who met the full
criteria for an ADHD diagnosis (37 versus 7). Considering
the sample was drawn from the general population, the male
to female ratio was slightly larger than expected (APA,
1994). Even though the ratio was larger than expected, there
were not enough females meeting the ADHD criteria to include
in the study. This a common problem with ADHD research and
one which limits the generalizability of the findings to
males. An additional limitation of a longitudinal design is
that rating scales used at one point in the study may become
outdated as the study develops. For instance, in this study
the hyperactivity scale of the Rutter measure, used at ages 5
and 7, was not robust enough to capture all behaviors indicative of a modern diagnosis of ADHD. Consequently, at age 9 the Rutter was modified to include additional inattentive and hyperactive behaviors (McGee, et al., 1985).

The results of this study suggest that there are many avenues of pursuit for future research. In regards to phonological processing difficulties, researchers may want to focus on the later consequences or adjustment of children with early language delays. Researchers in the area of temperament should focus on identifying which early components contribute to the development of difficult temperamental characteristics. Based on the results of this study the contribution of receptive language deficiencies to temperament should also be considered. As mentioned earlier, future studies should also attempt to clarify distinctions between those children who exhibit situational and pervasive ADHD characteristics. Research in the treatment of ADHD may especially benefit from such distinctions. In addition, researchers should attempt to assess the adult adjustment of children with reading problems at multiple points using a variety of indices; such as social, work, family, and general life satisfaction variables. Finally, based on the results of this study, and others, there seems to be ample information to develop and test a path trajectory model.
Conclusions

The results of this study provided information regarding the natural history of children with reading problems only, with ADHD only, and with reading problems and ADHD. The intent of this study was to determine which correlates are attributable to a diagnosis of ADHD and which are attributable to the presence of reading problems.

In regards to antecedent variables, the results showed that children with reading disabilities tended to exhibit phonological processing problems which were mainly receptive in nature. These difficulties should be considered an antecedent for the development of later reading problems in that they pre-date school entry. In addition, children with reading problems are likely to come from families who during the early childhood years have less resources to cope with problem situations. These children are also more likely to exhibit difficult temperamental characteristics which may result in placing more demands on their parents. This combination of risk factors is likely to lead to further complications since their parents tend to have less resources to deal with increased demands. The fact that differences in temperamental characteristics become less significant for the RD only group at age 5 and that there was a decrease in family adversity at age 7, suggests that the RD only group would be less at risk for later difficulties in comparison to the RD/ADHD group.
In regards to school-age variables the results of this study showed that children with reading difficulties tended to have a more negative academic self-concepts than children with ADHD only or children from the comparison group. The results also indicated that for a particular group of children reading problems may lead to the manifestation or exacerbation of ADHD related behaviors. However, behaviors at home should be considered in that are likely to distinguish between those children who would meet the criteria for a "pervasive" ADHD diagnosis and those who would meet the criteria for a "situational" ADHD diagnosis. In regards to delinquency it seems that the school environment is likely to lead to the manifestation or exacerbation of delinquency for the situational group. For the pervasive group, since neither ADHD or reading problems solely contributed to delinquency other variables such as temperament or family adversity may influence the development of their delinquent behaviors.

As children with reading disabilities reach late adolescence they are likely to exhibit similar levels of delinquency as their non-disabled peers. These findings may suggest that difficulties exhibited by these children desist as they mature. However, for those children with a long consistent history of behavioral problems (children in the RD/ADHD group) that explanation seems inadequate. Rather,
their apparent normalized behavior is likely the result of an expected increase in delinquency during adolescence.

In conclusion, the results of this study provided information regarding the natural history of children with reading problems only, with ADHD only, and with reading problems and ADHD. Clearly, these results support the notion that development is a multidimensional dynamical process which can be affected by a host antecedant variables. Variables which may consequently affect both school performance and the child's attitudes about their scholastic ability. Since the majority of a school-age child's identity revolves around school-tasks, a negative self image may result in the child acting out in a disruptive manner. Behaviors which are likely to place them in conflict with their parents and teachers. Of course, not all children may progress to this point as a result of personal or family strengths which may compensate for individual deficiencies.
Table 1
Means, Standard Deviations, and Univariate Results for the Reynell Developmental Language Scales

<table>
<thead>
<tr>
<th>Reynell Scales</th>
<th>Age</th>
<th>Grp 1</th>
<th>Grp 2</th>
<th>Grp 3</th>
<th>Grp 4</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive</td>
<td>3</td>
<td>-.26(0.82)</td>
<td>-.64(1.13)</td>
<td>.19(0.94)</td>
<td>.15(0.96)</td>
<td>6.67**</td>
<td>1&amp;2&lt;4 &amp; 3</td>
</tr>
<tr>
<td>Expressive</td>
<td>3</td>
<td>-.56(1.04)</td>
<td>-.55(0.84)</td>
<td>-.19(0.98)</td>
<td>.11(0.93)</td>
<td>9.86**</td>
<td>1&amp;2&lt;4</td>
</tr>
<tr>
<td>Receptive</td>
<td>5</td>
<td>-.24(0.80)</td>
<td>-.51(0.89)</td>
<td>.23(0.78)</td>
<td>.14(0.75)</td>
<td>7.95**</td>
<td>1&amp;2&lt;4 &amp; 3</td>
</tr>
<tr>
<td>Expressive</td>
<td>5</td>
<td>-.29(0.92)</td>
<td>-.42(0.90)</td>
<td>-.11(0.86)</td>
<td>.03(0.90)</td>
<td>3.06*</td>
<td></td>
</tr>
</tbody>
</table>

RD Only

RD/ADHD

ADHD Only

Comparison Group

* p < .05 (Non-Significant Scheffe' Group Contrasts)

** p < .001
Table 2

Means, Standard Deviations, and Univariate Results for Family Adversity

<table>
<thead>
<tr>
<th>Family Adversity</th>
<th>Age</th>
<th>Grp 1&lt;sup&gt;a&lt;/sup&gt; M SD</th>
<th>Grp 2&lt;sup&gt;b&lt;/sup&gt; M SD</th>
<th>Grp 3&lt;sup&gt;c&lt;/sup&gt; M SD</th>
<th>Grp 4&lt;sup&gt;d&lt;/sup&gt; M SD</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Adversity</td>
<td>3</td>
<td>.35(1.06)</td>
<td>.44(0.99)</td>
<td>.04(0.92)</td>
<td>-.15(0.95)</td>
<td>5.80***</td>
<td>4 &lt; 1 &amp; 2</td>
</tr>
<tr>
<td>Family Adversity</td>
<td>5</td>
<td>.35(1.05)</td>
<td>.42(1.02)</td>
<td>.20(0.93)</td>
<td>-.17(0.93)</td>
<td>6.56***</td>
<td>4 &lt; 1 &amp; 2</td>
</tr>
<tr>
<td>Family Adversity</td>
<td>7</td>
<td>-.02(0.92)</td>
<td>.49(0.95)</td>
<td>-.33(0.79)</td>
<td>-.18(0.93)</td>
<td>3.69**</td>
<td>2 &gt; 3 &amp; 4</td>
</tr>
<tr>
<td>Family Adversity</td>
<td>9</td>
<td>.19(0.99)</td>
<td>.34(1.22)</td>
<td>.30(1.16)</td>
<td>-.08(0.96)</td>
<td>2.68*</td>
<td></td>
</tr>
<tr>
<td>Family Adversity</td>
<td>11</td>
<td>.15(0.92)</td>
<td>.45(1.14)</td>
<td>.18(1.28)</td>
<td>-.14(0.92)</td>
<td>3.56*</td>
<td></td>
</tr>
<tr>
<td>Family Adversity</td>
<td>13</td>
<td>.04(0.94)</td>
<td>.54(1.12)</td>
<td>.11(1.29)</td>
<td>-.08(0.91)</td>
<td>2.70*</td>
<td></td>
</tr>
<tr>
<td>Family Adversity</td>
<td>15</td>
<td>.00(1.09)</td>
<td>.22(1.10)</td>
<td>.08(0.89)</td>
<td>-.14(0.89)</td>
<td>1.32</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>RD Only; <sup>b</sup>RD/ADHD; <sup>c</sup>ADHD Only; <sup>d</sup>Comparison Group; <sup>*</sup>p < .05 (Non-Significant Scheffe’ Group Contrasts); <sup>**</sup>p < .01; <sup>***</sup>p < .001.
Table 3
Means, Standard Deviations, and Univariate Results for Temperament

<table>
<thead>
<tr>
<th></th>
<th>Grp 1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grp 2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Grp 3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Grp 4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>M  SD</td>
<td>M  SD</td>
<td>M  SD</td>
<td>M  SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of Control</td>
<td>3  .16(0.98)</td>
<td>1.01(1.74)</td>
<td>-.02(0.99)</td>
<td>-.23(0.77)</td>
<td>13.22*</td>
<td>4 &lt; 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 &gt; 1 &amp; 3</td>
</tr>
<tr>
<td>Lack of Control</td>
<td>5  .05(0.96)</td>
<td>1.16(1.93)</td>
<td>.09(1.07)</td>
<td>-.19(0.68)</td>
<td>14.84*</td>
<td>2 &gt; 1, 3, &amp; 4</td>
</tr>
</tbody>
</table>

<sup>a</sup>RD Only

<sup>b</sup>RD/ADHD

<sup>c</sup>ADHD Only

<sup>d</sup>Comparison Group

<sup>*</sup>p < .001
Table 4

Means, Standard Deviations, and Univariate Results for the Student's Perception of Ability Scale (SPAS)

<table>
<thead>
<tr>
<th></th>
<th>Grp 1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grp 2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Grp 3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Grp 4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>SPAS</td>
<td>9</td>
<td>-0.45(0.93)</td>
<td>-0.40(0.80)</td>
<td>-0.13(1.07)</td>
<td>0.10(0.94)</td>
<td>6.31*</td>
</tr>
<tr>
<td>SPAS</td>
<td>11</td>
<td>-0.52(1.06)</td>
<td>-0.87(0.85)</td>
<td>-0.32(0.95)</td>
<td>0.17(0.84)</td>
<td>12.72*</td>
</tr>
</tbody>
</table>

<sup>a</sup>RD Only

<sup>b</sup>RD/ADHD

<sup>c</sup>ADHD Only

<sup>d</sup>Comparison Group

<sup>*</sup>p < .001
Table 5

Means, Standard Deviations, and Univariate Results for Parent Reports of ADHD Symptomology and Delinquent Behaviors

<table>
<thead>
<tr>
<th></th>
<th>Grp 1a</th>
<th>Grp 2b</th>
<th>Grp 3c</th>
<th>Grp 4d</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
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<td>.08</td>
<td>.78</td>
<td>.95</td>
<td>.88</td>
<td>1.25</td>
</tr>
<tr>
<td>ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>.01</td>
<td>.89</td>
<td>1.06</td>
<td>.99</td>
<td>.25</td>
<td>1.01</td>
</tr>
<tr>
<td>ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>-.03</td>
<td>.85</td>
<td>1.01</td>
<td>1.14</td>
<td>.98</td>
<td>1.43</td>
</tr>
<tr>
<td>ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>.03</td>
<td>.92</td>
<td>1.00</td>
<td>1.37</td>
<td>.96</td>
<td>1.27</td>
</tr>
<tr>
<td>ADHD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>.28</td>
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<td>1.21</td>
<td>1.65</td>
<td>.74</td>
<td>1.08</td>
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<tr>
<td>ADHD</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
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<td>1.25</td>
<td>1.19</td>
<td>.94</td>
<td>1.27</td>
</tr>
<tr>
<td>Delinquency</td>
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<td></td>
</tr>
<tr>
<td>5</td>
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<td>.88</td>
<td>.90</td>
<td>.91</td>
<td>.22</td>
<td>.87</td>
</tr>
<tr>
<td>Delinquency</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
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<td>1.02</td>
<td>1.14</td>
<td>.14</td>
<td>.83</td>
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<td>Delinquency</td>
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<td>9</td>
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<td>1.16</td>
<td>.44</td>
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<td>Delinquency</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>-.10</td>
<td>.87</td>
<td>.01</td>
<td>.85</td>
<td>.35</td>
<td>1.32</td>
</tr>
</tbody>
</table>

aRD Only; bRD/ADHD; cADHD Only; dComparison Group; *p < .05 (Non-Significant Scheffe' Group Contrasts); **p < .01; ***p < .001.
### Table 6

**Means, Standard Deviations, and Univariate Results for Teacher Reports of ADHD**

**Symptomology and Delinquent Behaviors:**

<table>
<thead>
<tr>
<th></th>
<th>Grp 1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grp 2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Grp 3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Grp 4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>ADHD</td>
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<td>.15</td>
<td>1.10</td>
<td>1.58</td>
<td>1.33</td>
<td>.48</td>
</tr>
<tr>
<td>ADHD</td>
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<td>1.12</td>
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<td>1.63</td>
<td>.92</td>
</tr>
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<td>.77</td>
<td>1.15</td>
<td>1.46</td>
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<td>1.35</td>
</tr>
<tr>
<td>ADHD</td>
<td>11</td>
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<td>0.84</td>
<td>2.01</td>
<td>1.20</td>
<td>2.00</td>
</tr>
<tr>
<td>ADHD</td>
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<td>1.08</td>
<td>1.26</td>
<td>1.58</td>
<td>.53</td>
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<td>Delinquency</td>
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<td>1.42</td>
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<td>Delinquency</td>
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<td>.22</td>
<td>1.28</td>
<td>1.02</td>
<td>1.69</td>
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</tr>
<tr>
<td>Delinquency</td>
<td>9</td>
<td>.25</td>
<td>1.26</td>
<td>1.45</td>
<td>1.98</td>
<td>.91</td>
</tr>
<tr>
<td>Delinquency</td>
<td>11</td>
<td>-.11</td>
<td>0.83</td>
<td>1.35</td>
<td>1.79</td>
<td>1.63</td>
</tr>
<tr>
<td>Delinquency</td>
<td>13</td>
<td>.36</td>
<td>1.46</td>
<td>0.92</td>
<td>2.11</td>
<td>.59</td>
</tr>
</tbody>
</table>

<sup>a</sup>RD Only; <sup>b</sup>RD/ADHD; <sup>c</sup>ADHD Only; <sup>d</sup>Comparison Group; *p < .001.
Table 7

Means, Standard Deviations, and Univariate Results for Self-Reports of Delinquency

<table>
<thead>
<tr>
<th></th>
<th>Grp 1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grp 2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Grp 3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Grp 4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>F</th>
<th>Group Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age M SD</td>
<td>Age M SD</td>
<td>Age M SD</td>
<td>Age M SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile Arrests</td>
<td>18 -.02(0.64)</td>
<td>.68(2.40)</td>
<td>.29(0.81)</td>
<td>.03(0.95)</td>
<td>2.79*</td>
<td></td>
</tr>
<tr>
<td>Total Convictions</td>
<td>18 .07(0.72)</td>
<td>.62(1.92)</td>
<td>.00(0.41)</td>
<td>.03(1.08)</td>
<td>1.73</td>
<td></td>
</tr>
<tr>
<td>Past Year Theft</td>
<td>18 .15(1.28)</td>
<td>.20(0.67)</td>
<td>.06(0.37)</td>
<td>-.05(0.19)</td>
<td>2.79*</td>
<td></td>
</tr>
<tr>
<td>Past Year Aggression</td>
<td>18 .15(0.92)</td>
<td>-.15(0.35)</td>
<td>-.17(0.13)</td>
<td>.13(1.16)</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>Past Year Fraud</td>
<td>18 .17(1.69)</td>
<td>-.06(0.56)</td>
<td>.44(1.58)</td>
<td>.13(1.11)</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>Past Year Drug Use</td>
<td>18 .05(0.91)</td>
<td>.08(1.18)</td>
<td>.50(1.98)</td>
<td>-.01(0.89)</td>
<td>1.20</td>
<td></td>
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</tbody>
</table>

<sup>a</sup>RD Only;  <sup>b</sup>RD/ADHD;  <sup>c</sup>ADHD Only;  <sup>d</sup>Comparison Group;  "p < .05 (Non-Significant Scheffe' Group Contrasts);  ""p < .01;  """"p < .001.
APPENDIX B

FIGURES
Figure 1. Teacher ADHD ratings from the ages of 5 to 13.

Figure 2. Teacher antisocial behavior ratings from the ages of 5 to 13.
REFERENCES


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in students with and without learning disabilities. 


review and report in a clinically referred sample. 


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