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## A. C. I. D. Patterns of Attention Deficit Hyperactivity Disorder and Learning Disabilities

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A. C. I. D. Patterns of Attention Deficit  
Hyperactivity Disorder and  
Learning Disabilities

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Date of Approval

April 22, 1993

Running head: A. C. I. D. PATTERNS

## Abstract

The purpose of this study was to determine if there is a substantial overlap in attention deficits between Attention Deficit Disorder with and without hyperactivity and Learning Disabilities. Data was collected for fifty-seven subjects; thirty subjects with ADHD and 27 subjects with at least one academic skills disorder. The subjects' information was gathered from a learning resource center in a middle class suburb. The subjects had been administered the WISC-R. Scaled scores for the A. C. I. D. cluster were gathered and the data were analyzed by means of a mixed analysis of variance. The analysis found no significant difference ( $p < .05$ ) between subjects with ADHD and those with LD with an F-ratio of 0.21. The findings suggest that attention deficits are overlapping between Attention Deficit Disorder with and without hyperactivity and learning disabilities.

Acknowledgments

Thanks to the resource center for their cooperation in providing the data for this study. Thank you to my thesis committee for the support and advice during this research.

Thank you to my loving family and my very understanding husband who have financially and emotionally supported me through my nontraditional college adventure. Thanks for helping make my dreams come true.

Thanks to all my wonderful friends here at Longwood for the great memories and all the encouragement. Best wishes out in "the real world".

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A. C. I. D. Patterns of Attention Deficit  
Hyperactivity Disorder and  
Learning Disabilities

Research in the last decade focused on defining learning disabilities (LD); however, no definitive answer evolved. In the current decade, questions now focus on defining attention deficits. Among these questions are such ones as: exactly what is Attention Deficit Disorder (ADD); is there a distinct difference between Attention Deficit Hyperactivity Disorder (ADHD) and Attention Deficit Disorder; is ADD a learning disability; does it cause learning disabilities; which treatment works best or does it require a multiple treatment approach? A growing body of research is addressing these issues. (Note to reader: abbreviations for LD and ADHD will encompass all learning disabilities and Attention Deficit Disorder with or without hyperactivity respectively unless otherwise noted.)

The answers appear to be clouded by the definitional and identification issues concerning these diagnostic labels (Biederman, Newcorn, & Sprich,

1991). The Diagnostic and Statistical Manual of Mental Disorders, 3rd ed. Revised (DSM-III-R) places Attention Deficit Hyperactivity Disorder, under the subclass Disruptive Behavior Disorders. In addition to social difficulty, a child with ADHD appears to have definite academic difficulties similar to those of children with learning disabilities. This makes it difficult to distinguish between them. These diagnostic labels are all assessed in various ways: medically, behaviorally, academically, and/or cognitively. The A. C. I. D. cluster (i. e., performance on the subtests Arithmetic, Coding, Information and Digit Span) of the Wechsler Intelligence Scale for Children-Revised (WISC-R) is a common measure used in the multimethod assessment of children with Attention Deficit Hyperactivity Disorder. These subtests of the WISC-R assess a child's distractibility and attention span.

The debate in the past has been concerned with definitional issues surrounding learning disabilities. Siegel (1988) asked "What is the learning disability a disability of?" (p. 265). She feels the all-encompassing concept of learning disabilities should

be dropped and a domain specific approach adopted. The consensus among researchers regarding the cause of learning disabilities seems to be some sort of cognitive disorder reflected in the difficulty of using language (e. g., listening, thinking, speaking, reading, writing, and spelling) or calculations (Biederman, Newcorn, & Sprich, 1991; Silver, 1990). The most widely used definition comes from Public Law 94-142 which states that a learning disability is a disorder in one or more of the basic psychological processes involving the understanding or the uses of language resulting in difficulty in skills such as listening, speaking, thinking, writing, reading, spelling or calculations (Federal Register, 1977 in Cantwell & Baker, 1991).

The DSM-III-R classifies learning disabilities as Specific Developmental Disorders which is divided into three disorders, Academic, Speech and Language, and Motor (American Psychiatric Association, 1987). The definition used to meet the DSM-III-R criteria is the underdevelopment of a specific skill (i. e., academic, speech, language, or motor), not

due to educational experience or physical or neurological disorders, significantly affecting academic accomplishments or daily living. The specific academic developmental disorders will be the concern of this study.

The focus of this study is Attention Deficit Hyperactivity Disorder of the Disruptive Behavior Disorders, which, as a group, are defined as those disorders, in which socially disruptive behavior is distressing more to others than the person with the disorder (American Psychiatric Association, 1987). Attention Deficit Hyperactivity Disorder is currently defined by DSM-III-R as extreme inattention, hyperactivity and impulsivity. It is a behavioral term adopted by DSM-III-R (Cantwell & Baker, 1991). For a diagnosis of ADHD at least eight of the fourteen diagnostic criteria need to be present in addition to the duration of behavior and age of onset criteria. Literature, thus far, appears to support the DSM definition of this new label (Biederman, Newcorn, & Sprich, 1991; Tarnowski, Prinz, & Nay, 1986). During assessment, children with ADHD have difficulty

processing incoming information and resisting interference of other distractions (Lufi, Cohen, & Parish-Plass, 1990; Tarnowski, Prinz, & Nay, 1986).

This suggests that a cognitive disorder affecting distractibility, impulsivity, and hyperactivity may exist (Silver, 1990).

Despite the definitional problems surrounding ADHD and learning disabilities, research has continued to tighten the link between the two. An overlap from 15% to 92% exists between LD and hyperactivity attentional problems or ADHD (Biederman, Newcorn, Sprich, 1991; Cantwell & Baker, 1991; Halperin, Gittelman, Klein, & Rudel, 1984; Rosenthal & Allen, 1978; Tarnowski, Prinz, & Nay, 1986; Tarver & Hallahan, 1974). The reverse shows 76% to 80% of children with ADHD are below expected levels in at least two academic areas (Biederman, Newcorn, & Sprich, 1991; Cantwell & Baker, 1991). Both diagnoses have derived from the former label minimal brain dysfunction (Silver, 1990). The association between ADHD and LD can take four pathways: a) one in the same, ADHD=LD; b) ADHD leads to LD; c) LD leads to ADHD; or d) a

third variable causes the manifestation of both LD and ADHD as separate concepts. Cantwell and Baker (1991) state that although the theory that ADHD leads to LD seems logical, the evidence is scant.

Attention, however, appears to be the linking variable between ADHD and LD (Cantwell & Baker, 1991), but the relationship needs to be explored. Studies show that children with learning disabilities seem to exhibit problematic attentions, hyperactive behaviors, and impulsivity; and those with ADHD may exhibit significant levels of learning difficulties. Tarnowski, Prinz, & Nay (1986), and Richards, Samuels, Turner, & Ysseldyke (1990) approached the differentiation between ADHD and LD by measuring several types of attention and observing the existence of patterns among the groups. Tarnowski, Prinz, and Nay (1986), compared ADD with hyperactivity, LD, ADD with Hyperactivity-LD, and normal children using measures of sustained attention, selective attention and span of apprehension. Richards, Samuels, Turner, & Ysseldyke (1990) went a step further and examined whether or not children with ADD and hyperactivity

and students with learning disabilities had different rates of processing information. Respectively their results were: (1) children with ADD and hyperactivity had deficits in sustained attention and appear to be susceptible to distractors, (2) students with LD have an impairment in selective attention, exhibit recall difficulties and process information more slowly, and (3) for those with both ADD with hyperactivity and LD confounded attention deficits occur.

The previous studies compared ADHD with learning disabilities, but a question arises: what about a specific learning disability, for example a reading disability? Reading disability is the most common of the Specific Learning Disabilities. Halperin, Gittelman, Klein, & Rudel (1984) intended to determine whether ADD with hyperactivity and ADD with hyperactivity-reading disability were distinct groups using diagnostic measures. They found no clear differences between the two groups. Their most interesting finding was the relationship between those with reading disabilities and their age. The

reasons suggested by Halperin, Gittelman, Klein, & Rudel (1984) for this relationship are: (1) reading disorders as early and stable characteristics of children with hyperactivity; (2) "snowball effect" in the development of reading disabilities; or (3) a higher referral rate of those with hyperactivity and academic problems. Currently, even though learning disabilities are a common problem for children with ADHD, most do not meet the federal criteria for LD classification (Teeter, 1991). Biederman, Newcorn, & Sprich (1991) caution that not all children with ADHD have LD nor do all children with LD have ADHD. Silver (1990) strongly states that ADHD is not a learning disability because it does not affect the brain's ability to learn, but rather its availability to learn.

The controversies surrounding the diagnostic labels within DSM-III-R question the usefulness of the diagnostic criteria. Luiselli (1991) discussed the advantages and disadvantages of utilizing the DSM system. The problems surrounding the use of DSM-III-R include its being designed after a medical



model. A second problem involves the disorders and their criteria not being based on empirical data, as well as the effects of labeling. For the Disruptive Behavior Disorders, trouble areas include overly restrictive criteria and issues of comorbidity among them. Luiselli (1991) felt that the minimal behavioral criteria and the multi-axial system were assets to the system. He stated that the multi-axial system is beneficial because it forces the examination of the whole child.

The WISC-R is commonly used in assessment. The WISC-R has stood its ground as a standard and reliable instrument in assessment of behavior disorders and learning disabilities. The WISC-R's stability or reliability across diagnostic and age groups varies. In its use with students with learning disabilities, researchers found that IQ scores achieved on the WISC-R were relatively stable over the three year re-evaluation period (Oakman & Wilson, 1988). Hale and Landino (1981) found that normal children and children with behavioral disturbances cannot be differentiated by subtest differences on the WISC-R.

Though it may not have discriminatory value, warned the researchers, it still bears clinical utility for assessing deficits in the cognitive processes. Hale and Landino (1981) also found that using the WISC-R for placement decisions yielded correct decisions only 66% of the time. When looking at the various factor structures of the WISC-R, discrepancies arise. Groff and Hubble (1982) found that younger youths (ages 9 to 11) with borderline to mild mental retardation reflect higher distractibility than the older youths. A similar situation was found in a population of normal youngsters in Kaufman's 1975 study.

The WISC-R has been useful in differentiating children with attention deficits from others (Lufi & Cohen, 1985). Researchers found that those with attention deficits scored significantly lower on the Arithmetic, Digit Span and Coding subtest, which together form the Freedom from Distractibility factor (Kaufman, 1975; Lufi & Cohen, 1985). When the Information subtest is added, the four are called collectively the A. C. I. D. cluster. This cluster

is also used to identify attention deficits. In 1990, Lufi, Cohen, and Parish-Plass, found the Arithmetic and Coding subtest to differentiate between ADHD and groups with emotional disturbances as well as ADHD and a control group. According to Bowers, et al., (1992), low Information and Digit Span scores indicate high achievement lags. Despite the research, Nichols, Inglis, & Mackay (1988) believe there is no evidence for the A. C. I. D. cluster.

The A. C. I. D. cluster subtests measure the child's distractibility and attention span. Actually, the Information subtest, which measures general knowledge by way of passive attention, yields little in assessing attention deficits. This subtest is included because it is the first to be administered; therefore, those who require extra time to "gather themselves" or focus their attention will perform poorly (Kaufman, 1975). Digit Span is a supplemental subtest consisting of 7 pairs of numbers. The task involves such memory processes as alertness, focused attention and sustaining concentration. Digit Span is strongly correlated to the Arithmetic subtest which

measures attention span, concentration, and mental alertness. The final subtest of the cluster is Coding. This subtest places demands on psychomotor speed and coordination by measuring such processes as attention, concentration, and sustained effort. On this subtest "[m]any learning disabled children do particularly poorly. . . because they have to work so hard to maintain accurate control over the symbol renderings and to sequential performance (e.g., in visual scanning)" (Swiercinsky, 1988, p.7-12). In light of Swiercinsky's (1988) work the WISC-R A. C. I. D. cluster appears to measure attention deficits.

The purpose of this study was to determine, by examining the patterns of the WISC-R A. C. I. D. cluster, if substantial overlap in attention deficits between Attention Deficit Disorder with and without hyperactivity and learning disabilities exist. The following study was designed to test the hypothesis that distractibility and attention deficits will not be significantly different between the Attention Deficit Disorder with and without hyperactivity and learning disabilities.

## METHOD

Subjects

Data were collected for ninety-six subjects ages 6-12 years, with a mean age of 8.6, from a private learning resource center located in a middle class suburb. See Table 1 for further analysis of the demographic information collected. The subjects had come to the center's clinic for assessment of attention deficits. A list of subjects in each diagnostic category [Attention Deficit Hyperactivity Disorder, Learning Disabled and Undifferentiated Attention Deficit Disorder (treated as ADHD without hyperactivity)] were obtained. Twenty-seven subjects with Learning Disabilities and 30 subjects with Attention Deficit Hyperactivity Disorder or Undifferentiated Attention Deficit Disorder were included. Those subjects with insufficient information, dual diagnoses, or a Full Scale score on the WISC-R of less than 80 were discarded. Also discarded from the study were those who did not meet the age requirement. A total of 39 files were discarded: 5 for insufficient data, 1 for a low IQ,

Table 1

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Demographic Information by Group

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<u>Characteristic</u>	<u>ADHD</u>	<u>LD</u>
Gender		
Male	25	21
Female	5	6
Total	30	27
Age (mean years)	8	9
Grade (mean years)	3	4
Education		
Private	14	13
Public	16	14
Mean Full Scale IQ	108.9	108.1

---

18 for dual diagnosis (ADHD+LD or Undifferentiated Attention Deficit Disorder+LD) and 15 who did not meet the age requirement.

### Procedure

All subjects had been administered the twelve subtests of the WISC-R in the last four years (1989-1992) by a trained professional. A diagnosis of ADHD, LD, or Undifferentiated ADD was given as a consensus of a committee of three professionals (i. e., Psychologist, Medical Doctor, and Education Specialist) based on the DSM-III-R criteria.

The LD group consisted of the three academic skill disorders identified in the DSM-III-R. A scaled score from the Arithmetic, Coding, Information, and Digit Span subtests of the WISC-R as well as demographic information (e. g., gender, age, grade, parent's occupation and educational level) and Full Scale score was gathered from subjects' files.

For the protection of the subjects' privacy, each file was assigned a number for the duration of the research. The decoding sheet is filed with the center's director.

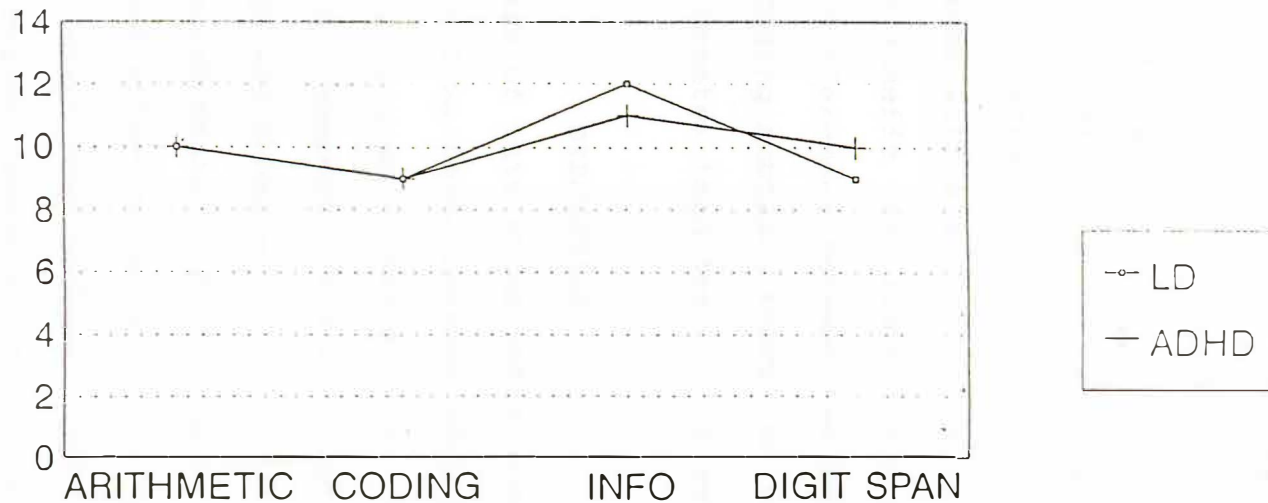
## RESULTS

The data were analyzed by means of a mixed analysis of variance to determine if any significant differences existed between the diagnostic groups on the A. C. I. D. cluster of the WISC-R. A post hoc one way analysis of variance was performed on the subtest scaled scores to determine if a significance between the subtests exists.

The data were examined by comparing the patterns of the WISC-R subtest scaled scores between the two diagnostic labels, ADHD and LD. The mean scaled scores for the subjects with ADHD were Arithmetic 10, Coding 9, Information 12, and Digit Span 9. The mean scaled scores for the subjects with LD were Arithmetic 10, Coding 9, Information 11 and Digit Span 10 (See Figure 1). The mixed analysis of variance yielded an F-ratio of 0.21 on the diagnostic labels ADHD and LD, which was not significant at the  $p .05$  level. Also, no significance ( $p .05$ ) was found in the interaction of the labels and the A. C. I. D. subtests with an F-ratio of 1.04. When the data were collapsed over



# AVERAGE SCALED SCORES ON THE ACID CLUSTER OF THE WISC-R



LD	10	9	12	9
ADHD	10	9	11	10

LD=ACADEMIC SKILLS DISORDERS  
ADHD=ADHD AND UNDIFFERENTIATED ADD  
FIGURE 1

the labels, the mean scaled scores for the subtests were Arithmetic 10, Coding 9, Information 11 and Digit Span 9. These yielded an F-ratio of 10.70 which was significant at a  $p$  .001 level. A post hoc analysis of variance was conducted on the subtests. An F-ratio of 8.95 was obtained with a significance at the  $p$  .001 level. A Scheffe test found the significance to be due to the differences between the Information subtest and the Coding subtest, where the Information subtest mean was greater than the Coding subtest mean.

#### DISCUSSION

The hypothesis of this study was a significant difference would not be found between ADHD and LD on the A. C. I. D. cluster of the WISC-R. The statistical analysis supports this hypothesis. Subjects with ADHD and those with LD scored similarly on the subtests which measure the subjects' distractibility and attention span. This substantiates previous research which make similar claims (Cantwell & Baker, 1991; Richards, Samuels, Turner, & Ysseldyke, 1990; and Tarnowski, Prinz, & Nay, 1986). The

statistical significance found between the Information subtest and the Coding subtest yields little information to the purpose of this study. However, further studies should be conducted to see whether or not this is a common pattern for individuals with attention deficits.

This study had several limitations. The first limitation was that the data not only support the hypothesis that ADHD and LD have attentional deficits, but also substantiate the claims that the A. C. I. D. cluster does not produce a significant measure of attention and distractibility. In order for this to have been refuted, a control group would be needed. Second, the grouping of Attention Deficit Hyperactivity Disorder with Undifferentiated Attention Deficit Disorder may cause bias, since research reveals that comorbidity may exist between certain learning disabilities and certain attention deficits (i.e. selective attention or sustained attention). Similarly, comorbidity of ADHD and LD with the other disruptive behavior disorders (i. e., Conduct Disorder and Oppositional Defiant Disorder), which have uncertain diagnostic characteristics related

to attention and distractibility, may cause a bias factor. The results of this study can be generalized only to white middle class males. A few females (Total of 11) were included in the study. Barkley, DuPaul, & McMurray (1990) found no significant differences between males and females in their evaluation of Attention Deficit Disorder with and without Hyperactivity. However, the research is lacking and these results should be interpreted with caution, especially when relating the data to females and minorities.

This study has raised some questions for further research. These questions include: are the separate diagnoses of ADHD and LD necessary; is the A. C. I. D. cluster a useful measure of attention and distractibility; and is a pattern in the WISC-R A. C. I. D. cluster useful for identifying ADHD and/or LD? It should be noted that scores from the WISC-III should be considered for future research. In summary, the results of this study indicate that ADHD and LD exhibit similar patterns on the WISC-R A. C. I. D. cluster which measures attention and

distractibility. More research needs to be conducted in the area of attention and its measurement before these results can be accurately confirmed.

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I understand that the  
information I am providing  
is confidential and that it  
will be used only for the  
purpose for which it is  
being provided.

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information I am providing  
is confidential and that it  
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purpose for which it is  
being provided.

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Appendix A

Consent Form

I understand that the  
information I am providing  
is confidential and that it  
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purpose for which it is  
being provided.

I understand that the  
information I am providing  
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being provided.

I understand that the  
information I am providing  
is confidential and that it  
will be used only for the  
purpose for which it is  
being provided.

Consent Form

Consent for Participation in  
Social and Behavioral Research

I consent to the Center's participation in the research entitled A. C. I. D. Patterns Among Disruptive Behavior Disorders and Learning Disabilities.

Amanda G. Kelly and/or her authorized representative has explained the purpose of the study, the procedure to be followed, and the expected duration of the center's participation.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Further, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me or the Center.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date \_\_\_\_\_

Signed \_\_\_\_\_  
center's director

Signed \_\_\_\_\_  
principal investigator

Biography of Author

Amanda Gillilan Kelly was raised by her parents in a rural county set in the Blue Ridge Mountains. After graduating from high school with honors, Kelly attended Dabney S. Lancaster Community College where she received an Associates of Arts and Sciences Degree in Education. Following her marriage, she attended Longwood College for three years and completed a Bachelors Degree in Psychology. Currently, Kelly is working toward completion of a Masters Degree in Special Education, also from Longwood College. She is expected to complete the requirements in May of 1993.