

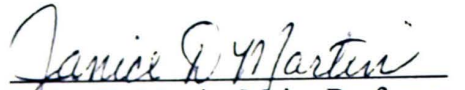
4

THE RELATIONSHIP BETWEEN
ERRORS ON THE BENDER VISUAL MOTOR GESTALT TEST
AND MEASURES OF ATTENTION AND IMPULSIVITY

JODI LYNN HENDERSON

To the Graduate Council:

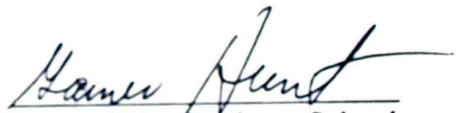
I am submitting herewith a thesis written by Jodi Lynn Henderson entitled "The Relationship Between Error on the Bender Visual Motor Gestalt Test and Measures of Attention and Impulsivity." I have examined the final copy of this thesis from form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of arts with a major in Psychology with a concentration in School Psychology.


Janice D. Martin, Major Professor

We have read this thesis
and recommend its acceptance:



Accepted for the Council:


Dean of The Graduate School

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements of a Master's degree at Austin Peay State University, I agree that the Library shall make it available to borrowers under rules of the Library. Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgment of the source is made.

Permission for extensive quotation from or reproduction of this thesis may be granted by my major professor, or in her absence, by the Head of Interlibrary Services when, in the opinion of either, the proposed use of the material is for scholarly purposes. Any copying or use of the material in this thesis for financial gain shall not be allowed without my written permission.

Signature Jill L. Henderson

Date 5-30-97

The Relationship Between
Errors on the Bender Visual Motor Gestalt Test
and Measures of Attention and Impulsivity

A Thesis

Presented to
the Graduate and Research Council of
Austin Peay State University

In Partial Fulfillment
of the requirement for the Degree
Master of Arts

by

Jodi Lynn Henderson

May 30, 1997

ACKNOWLEDGEMENTS

I would like to thank my major professor, Dr. Janice Martin for her guidance and patience. For the past two years Dr. Martin has continued to encourage and support me even when I was ready to give up. I would also like to thank the other committee members, Dr. Stuart Bonnington and Dr. Charles Woods, for their comments and assistance.

ABSTRACT

The purpose of the current study was to determine if a relationship exists between errors on the Bender Visual Motor Gestalt Test (BENDER) and independent measures of attention and impulsivity. Data was collected from protocols of children who were evaluated at a Regional Medical center between the ages of 4 and 21 ($N = 138$). Data used for the current study was collected from the Bender, the Conners' Parent Rating Scale-48, and the READD a continuous performance test. Step-wise multiple regressions were applied to the variables to determine the relationship between Bender error categories and the individual measures of attention and impulsivity. The results revealed a significant ($p < .05$) relationship between the READD omission score measuring inattention and the Bender error categories of integration, erasures, and completion time; and a significant ($P < .05$) relationship between the READD commission score a measure of impulsivity, and the Bender error score of erasures.

TABLE OF CONTENTS

CHAPTER

I.	INTRODUCTION.....	1
II.	LITERATURE REVIEW.....	6
	DSM IV Assessment of Attention and Impulsivity.....	7
	Behavior Rating Scales.....	8
	Clinical Instruments/Continuous Performance Test.....	10
	Raggio Evaluation of ADD(READD).....	13
	Bender Visual Motor Gestalt Test.....	16
	Purpose of study.....	21
	Limitations.....	21
III.	METHODS.....	23
	Participants.....	23
	Measures.....	24
	Raggio Evaluation of Attention Deficit Disorder.....	24
	Conners' Parent Rating Scale.....	25
	Bender Visual Motor Gestalt Test.....	27
	Statistical Analyses.....	29
IV.	RESULTS.....	31
	Multiple Regression.....	31
	Inter-rater Reliability.....	32
V.	DISCUSSION.....	33
	Attention and Impulsivity.....	34
	Inter-rater Reliability.....	35
	Plans for Future Research.....	36
	LIST OF REFERENCES.....	39

CHAPTER I

INTRODUCTION

Attention has been defined as "a control process that allows us to select from a complex stimulus array those factors that are important to behavior, thereby influencing the process of decision making and the cognitive strategies that are necessary for day-to-day living" (Timmermans & Christensen, 1991, pg. 26). Children exhibit attention difficulties in many ways including difficulty completing tasks, difficulty persisting in play activity, difficulty concentrating on tasks requiring sustained attention, distractibility, and difficulty attending to instructions (Ammerman, Last, & Hersen, 1993). Impulsivity, a construct often associated with attention, has been simply defined as difficulty controlling one's impulses (Ammerman et al, 1993). Impulsivity may be exhibited as disruptive acts, interrupting conversations, difficulty taking turns, and problems self-regulating behavior without external controls. Children with impulsivity problems may also appear fidgety and have difficulty staying in their seats during class.

These behaviors can create many problems, both socially and academically for the child. Attention Deficit Hyperactivity Disorder (ADHD) is a childhood disorder related to attention and impulsivity.

With the recent publication of the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV; APA, 1994), the separate categories of Attention Deficit Disorder and Attention Deficit Hyperactivity Disorder have been merged to create one category, Attention Deficit / Hyperactivity Disorder (ADHD). Rather than using separate categories, the DSM-IV provides three subtypes of ADHD that indicate the predominant symptoms; Combined Type, Predominantly Inattentive Type, and Predominantly Hyperactive-Impulsive Type. Much of the research on attention and impulsivity has been conducted with children with ADHD. Since the name of attention disorders has changed so much over time, with relatively little change in the core symptoms, for the purposes of the current study and to reduce confusion, both Attention Deficit Disorder and Attention Deficit/ Hyperactivity Disorder will be referred to as ADHD throughout the rest of the paper.

Although there are several subtypes, ADHD is defined by

the common primary symptoms of impulsivity, inattention, and hyperactivity. The DSM-IV indicates that the essential feature of ADHD is a persistent pattern of inattention and/or hyperactivity-impulsivity that is both more frequent and severe than is typical of individuals at similar levels of development and age (APA, 1994).

Disorders related to attention are the most commonly diagnosed disorders in childhood. More boys than girls are diagnosed with ADHD. The direct cause of attentional difficulties is not known, although the general consensus is that the cause is biological in nature. One of the leading hypotheses is that the parts of the brain that control attention and impulsivity are not functioning appropriately (Ammerman, et al., 1993). Hypotheses as to the behavioral causes of the biological basis of attentional difficulties are diet (Barkley, 1990; Feingold, 1974), neurochemical mechanisms (ie. heredity; Johnson, 1988), prenatal events such as maternal alcohol consumption (Barkley, 1990), and environmental and psychosocial factors (Barkley, 1990). However, at this point in time no single cause of ADHD has been identified at either the behavioral or biochemical level.

With the increased number of diagnoses of ADHD, the assessment of attention and impulsivity in children is becoming increasingly important and complex. When assessing a child for attentional difficulties, a multi-method approach has been shown to be the most appropriate and beneficial (DuPaul, 1992; DuPaul, Anastopoulos, Shelton, Guevremont, & Metevia, 1992). The multi-method approach advocated by DuPaul and others incorporates a screening and a multi-method assessment. The multi-method assessment includes data gathered by parent and teacher interviews, review of school records, rating scales, observations, and academic data. The interpretation of the results culminates in the development of a treatment plan. The current study will be concerned primarily with instruments used during the screening stage of the assessment process.

The current study will be an investigation of attention and impulsivity as measured by the Raggio Evaluation of Attention Deficit Disorder (READD; Raggio, 1991), the Conner's Parent Rating Scale-48 (CPRS-48; Conners'; 1989), and the Bender Visual Motor Gestalt Test (Bender; Koppitz, 1963). Instruments such as the READD and the CPRS-48 are frequently used to measure attention and impulsivity in

children (Barkley, 1990; DuPaul, 1992; Shelton, 1994). The Bender has not been used as frequently in the assessment of attention and impulsivity. The Bender is usually used as a developmental measure of visual motor integration in children (Groth-Marnat, 1991 & Koppitz, 1963). However, a few studies have investigated the relationship of different components of the Bender with attention and impulsivity (Blaha, Fawaz, & Wallbrown, 1979; Donnelly & Murphy, 1974; Milich & Fitzgerald, 1985, and Oas, 1984). Although the previous studies on the Bender have been intriguing, they have by no means been exhaustive.

CHAPTER II

LITERATURE REVIEW

As more and more children are being referred for evaluations of attention and impulse problems an objective evaluation becomes crucial. A study by Desgranges, Desgranges, and Karsky (1995) underscores this point. A review of 375 clinical cases indicated that, accurate or not, a preconceived diagnosis of ADHD by the referral source appeared to have an impact on the success of subsequent treatment. The researchers noticed that potentially effective treatment was often terminated prematurely by clients referred for ADHD who did not receive a diagnosis. Based on this finding and other information, the authors concluded that ADHD may be an overused "excuse" that teachers, parents, and children use for a variety of problems. Keeping personal bias and subjective opinions out of any evaluation is important and helps to facilitate diagnosis and appropriate intervention. There are several basic criteria and tools used in the assessment of attention

and impulsivity problems in children.

DSM-IV Assessment of Attention and Impulsivity

One of the most commonly used methods to determine the level of impairment of attention and impulsivity is a behavioral approach using DSM-IV criteria. To accommodate different symptom patterns, the DSM-IV provides three subtypes: Combined Type, Predominantly Inattentive Type, and Predominantly Hyperactive-Impulsive Type. The DSM-IV (APA, 1994) uses a set of behaviorally based criteria to evaluate and diagnose attention and impulsivity based disorders. Six symptoms in either the category of inattention or impulsivity must be present in order to diagnosis ADHD. Additionally, both impulsivity and inattention must have been present before the age of 7 years. The symptoms must also be present in more than one setting and there must be clear evidence of clinically significant impairment in social, academic, or occupational functioning. Other mental disorders as causes of the symptoms must also be ruled out. When these criteria are met, a diagnosis of ADHD can be made. It is important to note that when using the DSM-IV to make a diagnosis of ADHD, objective assessment instruments are not required nor usually used. Although the DSM-IV uses

a combination of symptoms of attention, impulsivity, and hyperactivity to make a diagnosis, the present study will not be examining the aspect of hyperactivity. The present research is not investigating ADHD, it is simply an investigation of two of the primary components of the disorder.

Behavior Rating Scales

Standardized behavior rating scales and checklists have been an important part of the assessment of attention. Much of the literature on the assessment of attention in children advocates using behavior rating scales as an integral part of the process (Barkley, 1991; DuPaul, 1992; Shelton, 1994). Behavior rating scales and checklists help to identify strengths and weaknesses, provide a fairly quick measure of progress and interventions, enable comparisons across different situations, and enable comparison of different informants using standardized criteria (Sattler, 1992). Two of the most commonly used rating scales are the Conner's Parent Behavior Rating Scale (CPRS) and Conner's Teacher Behavior Rating Scales (CTRS) (Barkley, 1991). After a parent or teacher completes the rating scale for a particular child, the results are compared with a normative

sample of same age children to see how much the child's scores deviate from the scores of average children (Barkley, 1991)

The current study used the CPRS-48 as a rating scale measure of attention and impulsivity. The Conner's Rating Scales were originally developed to help create a valid description of a child's behavior and to monitor the effects of medication on children with ADHD. Such behavioral rating scales are typically used as screening instruments (Conners, 1989). The scales consist of a list of behaviorally based sentences and words (ie. Excitable, Impulsive) that the parent or teacher must rate according to four options: (0) Not at all, (1) A little, (2) Pretty much, and (3) Very much. The results are then transferred to a graph-like profile form which allows visual display and comparison to the appropriate normative group. Norms are available for children ages 3-17.

Milich and Fitzgerald (1985) compared the scores from the CTRS of 48 referred boys from an outpatient psychiatric clinic to classroom observations in three different settings (large group, small group, and seat work). The researchers compared the Inattention/Overactivity (I/O) and Aggression

(A) subscales of the CTRS with observed variables. The observational variables were found to be significantly correlated with the rating subscale scores. Results indicated that clusters of observation variables were significantly correlated with behaviors that are typically related to the particular scales investigated. For example, behaviors such as failing to attend and failing to comply were associated with the I/O scale and talking back and physical aggression were associated with the A scale. The Milich and Fitzgerald (1985) study provides supportive evidence for the CTRS's (teacher reports) ability to adequately reflect what is actually occurring in the classroom. Another study, conducted by Schachar, Sandberg, and Rutter (1986), found that the CTRS scores of 33 boys were significantly related to observed behavior. Both of these studies, as well as others, provide supportive evidence for the validity of rating scales in the assessment of attention and impulsivity in children.

Clinical Instruments/Continuous Performance Test

Research has shown clinically based assessment instruments to be valid indicators of attention difficulties in children. Clinically-based tests are typically

standardized instruments that measure sustained attention and impulse control (DuPaul et al., 1992). Tests such as these enable researchers and clinicians to compare individual results with other children of the same age, grade, or developmental level.

Although there are many tests designed to assess attention and impulsivity in children, the current research was designed to use a computerized version of a continuous performance test (CPT). There are many different versions of the CPT; however, they all involve the presentation of stimuli, requiring the subjects to respond to a designated target. The stimuli can be presented visually or auditorially, and may involve letters, numbers, or shapes. CPTs are generally used as indicators of sustained attention and vigilance. Two types of errors can be made on CPTs, omission and commission errors. Omission errors are the number of target stimuli not responded to and commission errors are the number of times the subject responded to stimuli that were not designated as target stimuli. The total number of omission errors is used as a measure of sustained attention. Commission errors are generally used as indicators of vigilance and impulse control, ie.

impulsivity (DuPaul et al., 1992). Children with ADHD usually have higher omission and commission scores when compared to control groups (Lassiter, D'Amato, Raggio, Whitten, & Bardos, 1994; Seidel and Joschko, 1991; Timmermans & Christensen, 1991). Most CPTs last anywhere from several minutes to half an hour. O'Brien, Morganstein, Newcorn, Sharma, Wold, and Halperin (as cited in Halperin, 1991), using a computerized version of the CPT, found that an ADHD group performed significantly different when compared to a group of children with conduct disorder. Lassiter and others (1994) found commission errors on the READD, a computerized version of the CPT, to be significantly correlated to parent report measures of oppositional behavior and hyperactivity. CPT measures have also been shown to be related to DSM-III-R criteria for ADHD (Healey, Newcorn, Halperin, & Wolf, 1993).

The use of CPTs in educational settings has been further validated by studies indicating that results are significantly correlated to academic achievement (Campbell, D'Amato, Raggio, & Stephens, 1991; Halperin, Sharma, Greenblatt, & Schwartz, 1991). Campbell and others report the READD version of the CPT to be significantly correlated

to academic achievement ($r = .83$). Halperin reports the CPT's measure of false alarms ($r = -.23$), Hit Reaction Time Standard Deviation ($r = -.31$), inattention score ($r = -.23$), and dyscontrol score ($r = -.25$) to be significantly correlated with the reading/decoding ability as measured by the WRAT-R at a $p < .0055$ level. Halperin and others (1991) also report adequate reliability and stability of a CPT over time. After initially testing 138 boys with the CPT, 38 were randomly selected for retesting and the overall results indicated significant test-retest ($r = .65 - .74$) and split-half reliabilities ($r = .71 - .92$). Finally Seidel & Joschko (1991) found a version of the CPT to adequately distinguish between performance of a control group and a previously identified ADHD group. This research provides supportive evidence that CPTs are generally accepted as valid measures of attention and impulsivity in children.

Raggio Evaluation of Attention Deficit Disorder

The version of the CPT that will be used in the current study will be the Raggio Evaluation of Attention Deficit Disorder (READD; Raggio, 1991). The READD is a computerized version of the CPT that was designed to be presented on Apple, IBM, or IBM Compatible computers. The READD is an 8

minute version of the CPT. The child must press a space bar each time the letter A is followed on the screen by the letter X. The READD was chosen for the current study because teaching of the task was built into the standardization of the instrument. In other words, the child masters the task before formal testing begins. The developers suggest that the learning component may yield a more direct measure of attention because children who are unfamiliar with such tasks are able to take the time to learn the task before measurement of attention and impulsivity begins. If the child has not learned the task before the testing is begun scores may yield results that are confounded by a lack of understanding of the task. The READD uses standard scores with a mean of 100 and a standard deviation of 15, which makes the results easily comparable to many other clinical measures. The READD manual indicates that the constructs the READD measures are an individual's ability to attend (attention) and the ability to inhibit impulses (impulsivity). The READD manual provides age normed data for omission and commission errors for children 6-16 years old. The READD also provides standard scores from a population of children with a diagnosis of ADHD.

Two studies of the READD have resulted in contradictory and inconclusive findings. Lassiter and others (1994) performed a study investigating the relationship of the READD to scholastic achievement and parent and teacher behavior rating scales on 104 children referred for learning problems between the ages of 6-16 years. Their findings indicated that the READD was not significantly correlated with any measures of academic achievement. Also, commission errors on the READD were found to be significantly negatively correlated to the hyperactivity index of the Conner's Parent Rating Scale. This finding contradicts research (Halperin et al., 1991) where a version of the CPT was found to be significantly correlated to academic achievement. These conflicting results may be a result of the samples used by the researchers.

Another study conducted by Campbell and others (1991), also using the READD, found the results from the READD to be correlated to academic achievement. Using a sample of 54 referred children between the ages of 6-15, results from the READD were compared to frequently used intellectual (WISC-R), academic (WRAT-R and PIAT), and behavioral measures (Conner's Parent Behavior Rating Scale). Results indicated

that the READD was more closely associated to academic achievement than to verbal intelligence, perceptual-spatial organization, or behavior. The researchers also interpreted the results to mean that the CPT may not measure attention in a learning disabled population. Although Campbell's results are more similar to Halperin and others (1991), the results still do not provide convincing evidence of the READD's ability to measure attention and impulsivity.

Bender Visual Motor Gestalt Test

Another commonly used clinical test measuring a variety of characteristics in children is the Bender Visual Motor Gestalt Test (Bender). The Bender is an individually administered pencil and paper test in which the subject is required to copy nine figures presented one at a time on 4x6 inch cards. The Bender has commonly been used as a screening instrument to screen for brain damage, visual motor difficulties, emotional disturbance and has even been used as a rough estimate of intelligence (Groth-Marnat, 1990). More specifically, the Bender has been used to assess reading (McKay & Neale, 1985), anxiety and acting out (McCormick & Brannigan, 1984), and impulsivity in children (Oas, 1984).

McKay and Neale (1985) found a relationship between performance on the Bender and school achievement using Koppitz error (distortion, rotation, perseveration, integration, lines for dots, circles for dots, and angulation) categories rather than the total Bender errors in a random sample of 221 kindergarten children. Data was gathered on the children from kindergarten until fourth grade. When attempting to predict reading accuracy in first grade, the Bender error category of circles for dots was the best predictor after WISC-R total IQ score. Circles for dots accounted for 3% of the variance independently of the WISC-R total IQ score.

Although the Bender is a commonly used assessment device, it's validity in the measurement of attention and impulsivity in children has not been extensively researched. Successful completion of the Bender is contingent upon four stages of information processing (Blaha et al., 1979). The individual must look at a visual representation of the figure (Stage I, Preprocessing), the figure is then compared to memory which may involve recognition or recall (Stage II, Central Processing). After the individual recognizes or recalls the figure the next step is the selection of an

appropriate response (Stage III, response Selection) and the final step is the execution of the response which involves the visual motor integration (Stage IV, Response Execution). Blaha and others (1979) observed that the Bender did indeed tap all four information processing stages in a group of middle class black children. They compared the results of Bender protocols with tests known to measure particular stages. Blaha and colleague's (1970) findings also supported the notion that impulsivity can be measured in situations with high response uncertainty, such as the Bender.

Another variable that can be used as a measure of impulsivity is the time the child takes to complete the task (Koppitz, 1963). Koppitz indicates that the average completion time for 6-9 and $\frac{1}{2}$ year olds is approximately 6 minutes and 30 seconds. Children who finished the task in an unusually short time were considered more impulsive and were found to be more impulsive on another measure of impulsivity. Koppitz (1963) further indicated that impulsive children were more prone to use multiple sheets of paper for the Bender. A study conducted by Donnelly & Murphy (1974) compared the placement (regular or irregular)

of the Bender figures with the hypomania and psychasthenia scales of the MMPI. In a group of clinical patients diagnosed with either unipolar or bipolar depression, the researchers found that irregular placement, indicating a lack of control, was significantly correlated with higher scores on the hypomania scale. An overly methodical placement, suggesting high impulse control, was characteristic of lower hypomania scores.

One of the strongest studies investigating the relationship of the Bender with attention and impulsivity in children is a study conducted by Oas (1984). Oas found that Bender performance was related to impulsivity in hospitalized and non-hospitalized adolescents. The subjects consisted of 214 adolescents, 100 of which were obtained from a psychiatric hospital and the remaining 114 were drawn from local junior and senior high schools. The subjects were administered a variety of tests: Matching Familiar Figures Test, Draw-a-Person, Bender Gestalt, the age appropriate Wechsler IQ test, and behavior rating scales. To score the Benders, the researchers devised a list of 12 impulsive variables (1. Completion time, 2. Aggression, 3. Overall quality, 4. Discontinuity, 5. Omissions, 6.

Collisions, 7. Transformations, 8. Size increase, 9. Angle changes, 10. Planning, 11. Perseveration, 12. Scribbling) and 12 nonimpulsive variables (1. Completion time, 2. Overall quality, 3. Erasures, 4. Slope, 5. Numbering, 6. Size decrease 7. Spacing, 8. Angulation, 9. Ordering, 10. Sketching, 11. Counting, 12. Flattened curvature). The authors indicated their list of criteria was based on published empirical and nonempirical data, but no operational definitions were given. A correlational analysis comparing the results from the various measures was performed. The results indicated a statistically significant correlation supporting the researcher's hypothesis that drawing performance was related to independent measures of impulsivity. The Bender impulsivity variables that emerged as the most significant were completion time, overall quality, discontinuity, omissions, transformations, and perseverations. The most significant nonimpulsive variables were completion time, overall quality, and counting.

The scoring method used for the Bender in the current study will be a modification of the Koppitz Developmental Scoring System, which is one of the most commonly used

scoring systems (Groth-Marnat, 1990). Research conducted by Shapiro & Simpson (1995), intending to investigate the sensitivity of the Koppitz in measuring visual motor skills in adolescents, inadvertently found that error scores on the Bender may be influenced by concentration as well.

Purpose of the study

The purpose of the current study was to determine the strength of the relationship between errors on the Bender and other measures of attention and impulsivity. Specifically, how well do time of completion, erasures and errors on the Bender in areas of distortion, rotation, perseveration, integration, and disproportion correlate with the READD commission and omission scores and the Impulsive-Hyperactive, the Hyperactivity Index, and the Psychosomatic scales on the CPRS-48, a parent report measure. If performance on the Bender is indicative of attention or impulsivity, then perhaps with additional supportive research, the Bender could be used as a screening device for children suspected of having an attention disorder.

Limitations

The constructs of attention and impulsivity are difficult to measure and the current study is not without

limitations. Perhaps the most obvious limitation may be the composition of the sample. The sample consists of children from one geographical region in the South and any generalizations must be made with caution. The study is also ex post facto, and any follow up or continuation with this particular sample would be difficult at best. However, despite the limitations, it is hoped that the current study will serve as a pilot study to generate and guide further research. The primary goal of the current research was to investigate the relationships between performance on the Bender Visual Motor Gestalt Test and individual measures of attention and impulsivity. More specifically, the current research investigated whether specific types of errors on the Bender were significantly correlated with independent measures of attention and impulsivity.

CHAPTER III

METHOD

Participants

The protocols used for the current study were randomly selected from a data base of approximately 3,000 protocols of children between the ages of 4 and 21. The participants in the current study ($n = 138$) were between 4 years 11 months and 15 years 7 months old, with a median age of 7 yrs 9 mo. One hundred-six boys and thirty-two girls participated. One hundred-twenty participants were Caucasian and 18 were from minority cultures. Mean IQ (as measured by the WISC-R) was 100.8. Mean achievement scores (math, reading, and spelling as measured by the WRAT-R) were commensurate with the IQ scores.

The original protocol base came from a tri-state region around the University of Mississippi Medical Center, and consisted of children referred to the Child Development Clinic for various reasons. The major reason for referral for the sample group was to assess ADHD ($n = 106$), assess learning disabilities ($n = 2$), and to assess educational

impact of medical disorders ($n = 23$). Of the children in the sample 17 were diagnosed with significant ADHD and placed on medication, 27 were diagnosed with mild ADHD and not placed on medication, and 22 were considered to have symptoms of ADHD. The data base is considered archival and total anonymity was assured as no names are associated with individual protocols.

Measures

The measures of attention and impulsivity used in the current study were the READD version of the CPT, the Conner's Parent Behavior Rating Scale (CPRS-48), and the Bender Visual Motor Gestalt Test. During the referral and assessment process, the children were individually administered the READD and the Bender, among other tests that will not be considered in the current study, and the parents were administered the Conner's Parent Behavior Rating Scale. These three measures are described below.

READD

The standardization sample of the READD consisted of 361 non-ADHD children (6-13 years old) and 271 children diagnosed with ADHD (5-9 years old) children referred for learning problems and Attention Deficit Disorder. The READD

can be administered by various computers. For the current study the READD was administered on an Apple II-E computer with a standard monochrome monitor. The READD was administered according to standardized instructions in the manual and took approximately 8 minutes to administer. Raw scores were computed for omission and commission errors and then converted to standard scores using the tables provided in the manual. The standard score has a mean of 100 with a standard deviation of 15.

Test-retest reliability has not been established for the READD; however, test-retest reliability has been established as relatively stable for CPTs in general. Halperin et al. (1991) found split-half and test-retest reliabilities for a version of the CPT that is similar to the READD to be in acceptable ranges. Interrater reliability is not an issue as the test is administered and scored by computer under standardized conditions.

Results of studies of construct validity for the READD have lead to inconclusive results and therefore, the current study will also serve as a validity study.

Conner's Parent Rating Scale

The CPRS is used to characterize the behaviors of a

child and compare them to an age appropriate normative group. The parent was shown a set of items and asked to rate the degree to which the behavior is present in their child using four response options: (0)Not at all, (1)Just a little, (2)Pretty much, (3)Very much. There are four versions of the Conner's: the CPRS-48, a parent rating scale with 48 questions; the CPRS-93, a parent rating scale with 93 questions; the CTRS-39, a teacher rating scale with 39 questions; and the CTRS-28, a teacher rating scale with 28 questions.

The CPRS-48 was used for the current research. The CPRS-48 includes 6 scales: a)Conduct Problem; b)Learning Problem; c)Psychosomatic; d)Impulsive Hyperactive; e)Anxiety; and f)Hyperactivity Index. The Conner's Scales, including the CPRS-48 include a Hyperactivity Index which is not the same as the Hyperactive scale. The Hyperactivity Index is composed of the 10 items that have been shown to be most sensitive to drug effects. Furthermore, the Hyperactivity Index was developed to provide an assessment of the extent to which the child engages in behaviors that are typically indicative of an underlying diagnosis of hyperkinesis. The scoring for the CPRS-48 is simple. The

examiner transfers the respondent's answers to a key and adds the scores in each column. The raw scores are then transferred to a profile form which provides normalized T-scores with a mean of 50 and a standard deviation of 10. T-scores greater than 65 are considered clinically significant.

The Conner's Manual provides test-retest reliability coefficients over one year for the CPRS-48 which range from .40 for the Psychosomatic factor to .70 for the Immature-Inattentive and Hyperactive-Impulsive factors. The manual further indicates that mother/father correlations averaged .85. Predictive, discriminant, concurrent, and construct validity have also been adequately established.

Bender Visual Motor Gestalt Test

The Bender is an individually administered pencil and paper test in which the subject is required to copy nine figures presented one at a time on 4x6 inch cards. For purposes of the current study (to investigate the relationship of Bender errors with independent measures of attention and impulsivity), the Bender was administered in the standard procedure. The scoring method that was used for the current study was a modified version of the Koppitz

Developmental Scoring System. The traditional Koppitz Scoring System was developed for children ages 5-10 (Koppitz, 1963). The Koppitz scoring System was standardized with 1104 children from kindergarten through fourth grade (Groth-Marnat, 1991). Groth-Marnat indicates interrater reliabilities between .88 and .96 and test-retest reliability of .58 to .66.

The modifications of the Koppitz scoring system used in the current study are minimal. The Koppitz scoring criteria include the following: distortion of shape, disproportion, rotation, integration, circles for dots, angles in curves, and incorrect angles. The criteria are used in different combinations for each figure. Under the traditional Koppitz Scoring System the child receives one error point for each criteria no matter how many times it occurs. For example, if the child makes an integration error three times on a particular figure, it is scored only once. However, using the current modified version, an error would be scored each time it occurred, enabling a comparison of particular error categories or clusters of error categories to individual measures of attention and impulsivity.

The children's Bender protocols were rescored according

to the modified guidelines by graduate students trained in the modified scoring method. Each graduate student scored all Bender protocols independently and blind to the results of the independent measures of attention and impulsivity. The results of the new Bender scoring criteria were checked for inter-rater reliability.

The specific variables of interest for the current research with the Bender were completion time for the task, erasures, integration errors, rotation errors, distortion errors, perseveration errors, and disproportion errors. The Bender variables were compared with omission and commission standard scores on the READD and the Impulsive-Hyperactive, Hyperactivity Index, and Psychosomatic scaled scores from the CPRS-48.

Statistical Analyses

The current study investigated the relationship between the CPRS-48 Hyperactivity Index, the CPRS-48 Impulsive-Hyperactive Scale, the CPRS-48 Psychosomatic Scale; Bender errors of integration, perseveration, distortion, rotation, and disproportion; time it took to complete the Bender figures and erasures; and omission and commission scores from the READD (See Table 1). Step-wise multiple

regressions were applied to the variables to determine if a significant relationship existed between the Bender error scores and any of the parent report or computer variables. That is, are different levels of attention and impulsivity, as measured by the CPRS-48 and the READD related to any combination of types of errors on the Bender.

TABLE 1

MEASUREMENT VARIABLES

CPRS-48 Scales	Bender Error Categories
1. Hyperactivity Index	1. Integration
2. Impulsive-Hyperactive Scale	2. Perseveration
3. Psychosomatic Scale	3. Distortion
READD Scores	4. Rotation
1. Omission Score	5. Disproportion
2. Commission Score	6. Completion Time
	7. Erasures

Multiple regression allows correlation coefficients to be generated for multiple dependent variables while considering all other variables. Since the current study has multiple variables, a multivariate procedure was necessary. Alpha was set at .05.

CHAPTER IV

RESULTS

Multiple Regression

Multiple regression was used to determine the strength of the relationship between errors on the Bender and any of the parent report or computer variables used in the study. Specifically, READD omission and commission errors and CPRS-48 Hyperactivity, Impulsivity, and Psychosomatic scales were regressed against Bender error scores derived from a modified Koppitz scoring system.

Stepwise Multiple Regression ($p_{in} = .05$, $p_{out} = .10$) showed that Bender scores using the modified Koppitz scoring system were significantly predictive of READD omission scores ($R = .42$, $F(3,87) = 6.42$, $p < .05$). Variables of Completion time ($T = 2.38$, $p < .05$), erasures ($T = 2.00$, $p < .05$), and integration errors ($T = -2.96$, $p < .05$) were the only variables that were entered into the final equation. These variables accounted for approximately 18% of the variance in omission scores on the READD. Variables of

distortion errors, integration errors, disproportion errors, and rotation errors were not significant.

The Bender error variable of erasures was singularly predictive of READD commission scores ($R = .22$, $F(1,89) = 4.46$, $p < .05$). Erasures accounted for approximately 13% of the variance in commission scores on the READD. None of the other variables in the study added appreciably to the predictive ability of the regression equation (p in = .05, p out = .10).

Bender scores were not significantly predictive of any of the CPRS-48 scales used in the current study: Hyperactivity Index, Impulsive-Hyperactive Scale, or the Psychosomatic Scale.

Inter-rater Reliability

Inter-rater reliability was assessed using Pearson r correlations. Inter-rater reliability across all 6 variables (rotations, perseveration, integration, erasures, disproportion, and distortion) and total errors was significant ($r = .25$ to $.94$, $p < .05$).

CHAPTER V

DISCUSSION

The primary purpose of the current study was to determine the strength of the relationship between errors on the Bender and more commonly used measures of attention and impulsivity in children. In this group of children referred for learning problems, three categories of Bender errors, completion time, erasures, and integration errors, appeared to be significantly correlated with READD commission errors (a computerized measure of inattention). Only one Bender category, erasures, was shown to be significantly correlated with READD commission errors (a computerized measure of impulsivity). Bender error categories were not found to be significantly predictive of the CPRS-48 parent report measures of inattention (Hyperactivity Index), impulsivity (Impulsive-Hyperactive Scale), or psychosomatic complaints (Psychosomatic Scale). Inter-rater reliability of the modified version of the Koppitz scoring system of the Bender was found to be adequate.

Attention and Impulsivity

For the group of children used in the current study the Bender variables that appeared to be most correlated with the computerized measure of sustained attention and impulsivity were completion time, erasures, and integration errors. That is, the more inattentive and impulsive the child, as measured by the READD, the more likely the child was to make more than one erasure per Bender figure. Also, the more inattentive the child the longer it took to complete the task. Interestingly, the more inattentive and impulsive the child as measured by the READD, the fewer integration errors were made.

The results of the current study are supportive of the study by Oas (1984) which indicated completion time of the Bender was significantly correlated with measures of attention and impulsivity. The current study suggests that difficulty sustaining attention results in longer task completion time. The traditional Koppitz scoring system does not use the category of completion time in the calculation of a standard score. Although not definitive, the current study suggests that the variable of task completion time may be helpful in screening for attention

and impulsivity problems in children.

Another category that the traditional Koppitz scoring method does not use, but that the current study found to be correlated with both attention and impulsivity was erasures. The Oas (1984) study also used the variable of erasures in its investigation of impulsivity in children. Unlike the current study, Oas did not find erasures to be significantly correlated with impulsivity; however, p was set at a more stringent .001 and specific probabilities were not reported.

The CPRS-48 scales (Hyperactivity Index, Impulsive-Hyperactive Scale, and Psychosomatic Scale) were not found to be correlated with any of the Bender variables. Campbell et al. (1991) suggested that computerized performance tests (CPT) do not measure the construct of attention similarly to parent report measures in a population of students with learning disabilities. The CPT used in the Campbell study yielded different results than the Conners' Scale and suggested that the CPT scores were more correlated with academic achievement than to overt behavior at home or school as measured by parent and teacher report measures.

Inter-rater Reliability.

Inter-rater reliability was adequate across all six

variables: rotation, perseveration, integration, erasures, disproportion, and distortion. The inter-rater reliabilities established in the current study were not quite as strong as the reliabilities reported in Groth-Marnat (1991) for the original Koppitz scoring system. The reliabilities cited in Groth-Marnat for the traditional Koppitz scoring were across several evaluators. The current study used a modified version of the Koppitz system, and only two evaluators, which could account for some of the difference. The scoring criteria for the new variables were not as well refined as the Koppitz variables. Since few new categories of errors were created, only examples of every category devised for each stimulus picture, the newly created variables may have actually been deleted from the Koppitz system to create stability. The only two new categories, erasures and completion time, were found to have adequate inter-rater reliability as well.

Plans for Future Research

Although the current study indicates some significant and interesting results, they should be interpreted cautiously. A potential confounding variable in the current study is that all of the subjects were children who were

referred to a child development clinic, which implies that they were exhibiting some type of learning problem or unusual behavior. Therefore the data cannot be interpreted as being representative of the general population of children. A follow up study using a random sampling of children from the general population would yield more representative results.

In the search for more objective methods of identifying attention problems in children, teacher and/or parent reports may not get the credit they deserve. One factor that makes a rating scale more appealing than a measure such as the Bender is that the results may indicate a more global picture of the child's behavior across several settings. The task demands of the Bender are quite different than the behavioral demands of a classroom. Rating scales such as the CPRS-48 measure overt off task behavior in a reliable and valid manner.

The modified Koppitz scoring method designed for the current study was also difficult to use. If used again it is recommended that much more specific and detailed guidelines be set. Furthermore, it is difficult to determine if the modified guidelines currently used made a

significant difference, with the exception of erasures. The results indicated that the only error category that was significantly correlated with the computer measures of attention and impulsivity was integration and that is a category currently used in the traditional Koppitz scoring system. Future research may be more useful if the traditional Koppitz method is compared to the modified method with the addition of completion time and erasures.

Despite the results of the current study, the question still remains how to accurately identify academic attention and impulsivity problems in children. The CPT and the Bender are more similar to academic tasks than the behaviors rated by parents and teachers, but may not be any more predictive of academic achievement. Test-retest reliabilities of the CPT are somewhat higher than the Bender, possibly indicating a more consistent, reliable measure than the Bender.

LIST OF REFERENCES

REFERENCES

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.).

Washington, DC: Author.

Ammerman, Last, & Hersen (1993). Handbook of Prescriptive Treatments for Children and Adolescents.

Boston: Allyn and Bacon.

Barkley, R. A. (1991). Diagnosis and assessment of attention deficit-hyperactivity disorder. Comprehensive Mental Health Care, 1(1), 27-43.

Barkley, R. A. (1990). Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. New York: The Guilford Press.

Blaha, J., Fawaz, N., & Wallbrown, F. H. (1979). Information processing components of Koppitz errors on the Bender Visual Motor Gestalt Test. Journal of Clinical Psychology, 35(4), 784-790.

Campbell, J. W., D'Amato, R. C., Raggio, D. J., & Stephens, K. D. (1991). Construct validity of the computerized continuous performance test with measures of intelligence, achievement, and behavior. Journal of School Psychology, 29(2), 143-150.

Conners, C. K. (1989). Conners' Rating Scales Manual. New York: MultiHealth Systems.

Desgranges, K., Desgranges, L., & Karsky, K. (1995). Attention deficit disorder: Problems with preconceived diagnosis. Child and Adolescent Social Work Journal, 12(1), 3-17.

Donnelly, E. F. & Murphy, D. L. (1974). Primary affective disorder: Bender-Gestalt sequence as an indicator of impulse control. Perceptual and Motor Skills, 38(3), 1079-1082.

DuPaul, G. J. (1992). How to assess attention-deficit hyperactivity disorder within school settings. School Psychology Quarterly, 7(1), 60-74.

DuPaul, G. J., Anastopoulos, A. D., Shelton, T. L., Guevremont, D. C., & Metevia, L. (1992). Multimethod assessment of attention-deficit hyperactivity disorder: The diagnostic utility of clinic-based tests. Journal of Clinical Child Psychology, 21(4), 394-402.

Feingold, B. F. (1974). Why Your Child is Hyperactive. New York: Random House.

Groth-Marnat, G. (1990). Handbook of Psychological Assessment. New York: John Wiley & Sons.

Halperin, J. M. (1991). The clinical assessment of attention. International Journal of Neuroscience, 58, 171-182.

Halperin, J. M., Sharma, V., Greenblatt, E., & Schwartz, S. T. (1991). Assessment of the continuous performance test: Reliability and validity in a nonreferred sample. Psychological Assessment, 3(4), 603-608.

Healey, J. M., Newcorn, J. H., Halperin, J. M., Wolf, L. E. (1993). The factor structure of ADHD items in DSM-III R: Internal consistency and external validation. Journal of Abnormal Child Psychology, 21(4), 441-453.

Johnson, H. C. (1988). Drugs, dialogue, or diet: Diagnosing and treating the hyperactive child. Social Work, 33(4), 349-355.

Koppitz, E. M. (1963). The Bender Gestalt Test for Young Children. New York: Green & Stratton, Inc..

Lassiter, K. S., D'Amato, R. C., Raggio, D. J., Whitten, J. C., & Bardos, A. N. (1994). The construct specificity of the Continuous Performance Test: Does inattention relate to behavior and achievement. Developmental Neuropsychology, 10(2), 179-188.

McCormick, T. T. & Brannigan, G. G. (1984). Bender Gestalt signs as indications of anxiety, withdrawal, and acting out behavior in adolescents. Journal of Psychology, 118(1), 71-74.

McKay, M. F. & Neale, M. D. (1985). Predicting early school achievement in reading and handwriting using major 'error' categories from the Bender-Gestalt Test for young children. Perceptual and Motor Skills, 60, 647-654.

Milich, R. & Fitzgerald, G. (1985). Validation of inattention/overactivity and aggression ratings with classroom observation. Journal of Consulting and Clinical Psychology, 53(1), 139-140.

Oas, P. (1984). Validity of Draw-A-Person and Bender Gestalt tests as measures of impulsivity with adolescents. Journal of Consulting and Clinical Psychology, 52(6), 1011-1019.

Raggio, D. J. (1991). Raggio Evaluation of Attention Deficit Disorder [Computerized Test]. Jackson: University of Mississippi Medical Center, Child Development Clinic.

Sattler, J. M. (1992). Assessment of Children (Rev. 3rd ed.). San Diego: Jerome M. Sattler, Publisher.

Schachar, R. J., Sandberg, S., & Rutter, M. (1986). Agreement between teachers' ratings and observations of hyperactivity, inattentiveness, and defiance. Journal of Abnormal Child Psychology, 14(2), 331-345.

Seidel, W. T. & Joschko, M. (1991). Assessment of attention in children. The Clinical Neuropsychologist, 5(1), 53-66.

Shapiro, S. K. & Simpson, R. G. (1995). Koppitz scoring system as a measure of Bender-Gestalt performance in behaviorally and emotionally disturbed adolescents. Journal of Clinical Psychology, 51(1), 108-112.

Shelton, T. L. (1994). Critical issues in the assessment of attention deficit disorders in children. Topics in Language Disorders, 14(4), 26-41.

Timmermans, S. R. & Christensen, B. (1991). The measurement of attention deficits in TBI children and adolescents. Cognitive Rehabilitation(4), 26-31.