DEVELOPMENT OF DRAWING SKILLS IN YOUNG CHILDREN: CONTRIBUTIONS OF NONVERBAL AND VERBAL ABILITIES

A Thesis

by

KIMBERLY MORETZ BRENDLE

Submitted to the Graduate School

Appalachian State University

in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

June 1996

Major Department: Psychology

DEVELOPMENT OF DRAWING SKILLS IN YOUNG CHILDREN: CONTRIBUTIONS OF NONVERBAL AND VERBAL ABILITIES

A Thesis

by

Kimberly Moretz Brendle

June 1996

APPROVED BY:

Verne R. Bacharach
Chairperson, Thesis Committee

Robert Hill
Member, Thesis Committee

Douglas Waring
Member, Thesis Committee

James Long
Chairperson, Department of Psychology

Joyce Lawrence
Dean of Graduate Studies and Research

ABSTRACT

DEVELOPMENT OF DRAWING SKILLS IN YOUNG CHILDREN:
CONTRIBUTIONS OF NONVERBAL AND VERBAL ABILITIES

Kimberly Moretz Brendle, B.A., University of North Carolina

M.A., Appalachian State University

Thesis Chairperson: Verne R. Bacharach

This study examined the extent to which the development of nonverbal abilities and the development of verbal abilities in young children are related to the quality of spontaneous drawings produced by children. Although various theories have linked children's drawing skills to their intellectual development, few authors have distinguished between verbal and nonverbal components of intellectual development when discussing this link (Strommen, 1988). The distinction has important implications for clinicians who use children's drawings to assess children's intellectual development. In order to properly evaluate the meaning of drawing assessment scores, clinicians need to know the extent to which children's drawing skills are a function of the development of their nonverbal and verbal abilities. The relationship between drawing skill development and the development of verbal and nonverbal abilities has never been

empirically established. The present study used regression analysis to sort out the independent and combined influences of these two sources of intellectual development on children's drawing skills as assessed by the Goodenough-Harris Draw a Person test. The analysis indicated that verbal abilities are correlated with Draw A Person test scores.

ACKNOWLEDGMENTS

First, I would like to thank my chairperson, Dr. Verne Bacharach, whose continuous patience, guidance, and knowledge made this thesis a manageable project for me. I would also like to thank Dr. Robert Hill and Dr. Douglas Waring for sharing their support as members of my committee. To Catherine Bradey, I wish to extend my deepest gratitude for sharing her experience, wisdom, and support throughout this endeavor; I would not have my sanity today without her friendship over the years. To my parents, I extend my heartfelt appreciation for all their love and support. To my children, I thank them for their patience and understanding during the times I had to be away from home. The support of my professors, family, and friends has given me the strength to push forward and expand the realm of my goals.

DEDICATION

I would like to dedicate this work to my husband, Joseph Brendle. His unconditional love and constant support have given me more strength and hope than he knows. His sense of humor has lightened my load, brightened my frustration, and dried many tears. His belief in my abilities as a Psychologist, mother, and wife are apparent in many ways. I do not know how this thesis would have come to fruition without his creative vocabulary and editorial expertise. Together we have faced this project and more, sharing the sorrows and joys along the way. I cannot imagine creating anything without him by my side. I am blessed to have found love with such a wonderful man.

TABLE OF CONTENTS

List of Tables

Introduction

As early as 1885, the spontaneous drawings of young children were being used to describe physical and psychological stages of child development (Goodenough, 1926). Since then, psychologists have focused on the use of children's drawings to assess their intellectual development. Early efforts to examine this relationship failed to distinguish clearly between nonverbal and verbal components of intellectual development (Strommen, 1988). If children's drawings are to be used to evaluate intellectual development, it is important to know the extent to which drawing skills are a function of these two intellectual abilities. The present study was designed to identify the effects of nonverbal and verbal abilities on the quality of young children's drawings as measured by the Goodenough-Harris Draw a Person test.

History of the Goodenough-Harris Draw a Person Test

The use of human figure drawings as an intellectual assessment tool emerged from work done at the turn of the century by Luquet (1912)(as cited in Golomb, 1974). Luquet, and most subsequent authors (e.g., Arnheim, 1954; Piaget & Inhelder, 1956; Werner, 1948), emphasized the notion that

children's drawing skills are directly linked to their conceptual and intellectual development. Luquet's belief was that drawings were based on a mental model, and the act of drawing was an attempt by children to reproduce realistically this mental image. He emphasized the development of cognitive factors such as the ability to interpret meaning, vocabulary, and the ability to see and process relationships among objects and parts of objects as influencing the translation of the mental image onto paper. The importance of these cognitive factors led Luquet to his five stages of development in children's drawings (Thomas & Silk, 1990).

According to Luquet (as cited in Thomas & Silk, 1990), children's first stage of drawing development begins around the age of 18 months and entails non-representational scribbling. Luquet viewed this stage as composed of play and exercise because children do not attempt to interpret their drawings in any manner. By age 2.5 years, children progress to the second stage of drawing skill development. Children begin interpreting their scribbles as pictures, often labeling the drawing before it is finished and changing their original intention if the final product looks like something else. Luquet termed this period "fortuitous realism." Between the ages of 3.5 to 5 years, children begin to make representational drawings, but sometimes fail to

coordinate parts of the drawings due to an absence of a relationship between the elements. This third stage is called "failed realism." The fourth stage occurs from years 5 to 7 and is termed "intellectual realism." Children have developed constructs of relationships between elements and include items they know exist but are not usually seen in the real world. For example, children will produce what have been called "transparency" or "x-ray" drawings, e.g., body parts being seen through clothing. "Visual realism," the final stage which emerges from the eighth year into adolescence, appears when children begin to produce perspective drawings and coordinate the proportions and relationships of their drawings accordingly.

Luquet's stages of drawing development, as well as information about children's drawing obtained by other researchers (Claparede, 1907, Ivanoff, 1909, Kerchensteiner, 1905, Schuyten, 1904 as cited in Goodenough, 1926), laid the theoretical foundation for the idea that the development of children's drawing skills are the result of the children's intellectual development. Subsequent authors, particularly Piaget, used evidence obtained from children's drawings to support their account of intellectual development (Freeman, 1980; Piaget & Inhelder, 1956).

Goodenough (1926) recognized the possibility that children's drawings might be used as an index of their intellectual development. Because earlier studies (e.g., Kerchensteiner, 1905 and Schuyten, 1904 as cited in Goodenough, 1926) suggested children's drawing skills may be related to the maturation of mental processes, Goodenough conducted research to determine the extent to which the acquisition of drawing skill was related to children's intellectual development. This research led to the development of the Goodenough Intelligence Scale which was the first assessment instrument to use children's drawing to assess intellectual development (Goodenough, 1926).

The Goodenough Intelligence Scale was administered by asking children to draw a picture of a man. The drawings were then evaluated for certain features, such as the inclusion of hands, which were presumably related to intellectual development. The test was quick to administer and to score using Goodenough's 52-point scoring method. The test was useful mainly for mental ages ranging from 4 to 10 years, and the test-retest reliability for a single age group in that range was .80 to .90. A correlation of .76 existed with the Stanford-Binet for separate age groups in that range (Goodenough, 1926).

Advantages of the scale included the simplicity of the drawing task, the familiarity of the subject drawn, and the

low amount of variability in the basic characteristics of human figure drawings produced by young children. There were disadvantages of using the scale as well. Problems existed with the scale's nonverbal nature and scoring system (Harris, 1963). Nonverbal intelligence scales usually have low reliability and validity (Goodenough, 1926). In the case of the Goodenough Intelligence Scale, reliability was good when one drawing of one child was scored, but reliability was low when several drawings of a single child were assessed (Thomas & Silk, 1990).

The validity of the Goodenough Intelligence Scale was questioned when researchers gained more information about the development of children's drawing skills. As this information accumulated, it became apparent that the system used to score children's drawings did not accurately reflect the development of these skills (Freeman, 1980). Data revealed, for example, that the Goodenough scoring system penalized more advanced drawing skills such as string drawing or threading. At this stage, children attempt to draw using continuous contours producing a two-dimensional figure with a single outline (Thomas & Silk, 1990). Children avoid including detailed features, such as fingers and hands, in their drawings because the threaded drawings are

more difficult to produce than earlier pictures that included such features (Harris, 1963). See Appendix A for examples of threaded drawings.

Because the Goodenough scale was no longer viewed as a valid measure of intelligence, it was revised by Harris (1963). Harris lengthened the scale to include a 73-point scoring system. The new items extended the test into the adolescent years, increased the reliability and validity of the scale, and provided a basis for possible projective uses of the test. The scale is now known as the Goodenough-Harris Draw a Person test (Harris, 1963).

The problems with reliability and validity were addressed by sampling different aspects of cognitive ability in each age group from kindergarten to ninth grade (Harris, 1963). To increase the age limit of the test, several items found only in the drawings of adolescents were included (Scott, 1981). Harris also replaced the ratio IQ with a deviation IQ in order to obtain a standardized scale score (Harris, 1963; Kramer & Conoley, 1992). In an attempt to improve the reliability and validity of the scale, the drawings of a woman and of the self were also added.Harris (1963) noted that children go through distinct stages in the drawing of a female figure. He suggested that the separate

drawings of a man and a woman may each indicate similar concept formation and thus, when scored, show a high correlation with each other.

The Goodenough-Harris test has been widely used since the 1963 revision. It has been used as a projective measure of personality as well as a screening device for emotional disturbance (McElhaney, 1969). The test has also been used to assess intellectual development in special populations such as the very young, the mentally delayed, those with hearing deficits, language problems, and attention span difficulties (Scott, 1981). Harris suggested, in his revision, that the test not be used as an IQ test in and of itself, but as a tool in selecting the children in need of more detailed attention as well as for those with severe intellectual and conceptual retardation (Harris, 1963).

Problem

Most research on children's drawing skill development has emphasized the role of general cognitive maturation on the improvement of these skills. However, Strommen (1988) has pointed out that the development of drawing skills may be related to nonverbal abilities, which he refers to as perceptual-motor skills, as well as to general intellectual development. Strommen labeled this perceptual-motor position the mental picture theory. This theory suggests that disorganization of children's early drawings are a result of

immature development of visual and motor centers of the brain, rather than cognitive development (Strommen, 1988). Many theorists have suggested that spontaneous drawings are not solely an act of interpreting mental images but may be related to the processes involved in creating a copy of a physical object. The processes are theorized to be visual perception and motor coordination. These processes are needed, first, to perceive the object and, second, to create the object's resemblance on paper (Thomas & Silk, 1990).

Previous researchers who have studied children's drawings have failed to distinguish between the general notion of intellectual development and the idea that intellectual development has specific components. Although this distinction is well understood and has been incorporated in all standard, individual tests of intelligence (e.g. WAIS-R, WISC-III), researchers have lumped nonverbal and verbal abilities together when assessing the relationship between drawing ability and intellectual development. As a result, there is no empirical evidence that relates directly to Strommen's hypothesis that drawing ability in children may be more closely related to the development of nonverbal than verbal skills. In an attempt to identify the relationship between nonverbal abilities and the development of drawing skills in young children, children in the present study completed a standard

test of intelligence that included two components: subtests that assess verbal abilities and subtests that assess nonverbal abilities. The children also took the Goodenough-Harris Draw a Person test, and their test scores were regressed on the nonverbal and verbal intelligence test scores in an attempt to sort out the relative contribution of these sources of intellectual development on the development of drawing skills.

The results of this study were expected to indicate a correlation between nonverbal abilities and drawing skill. As previously mentioned, most of the early research on the development of children's drawing skills has focused on the final product and has not assessed the process involved in making a drawing. Some authors (Freeman & Janikoun, 1972; Strommen, 1988) theorize that children's drawing skills may result more from drawing strategies (i.e. planning, organizational skills, and graphic descriptions) than from some mental picture which is conceptually translated onto paper. Factors such as planning and organization are related to nonverbal abilities assessed by standard intelligence tests with tasks such as copying and picture completion (Sattler, 1992). Graphic descriptions are also related more to nonverbal abilities in that these descriptions develop from trial and error in the execution of drawing rather than from perception and imagination (Phillips et al., 1985).

These performance factors should be key elements involved in the process of producing drawings according to recent research (Freeman, 1980; Phillips et al., 1985).

Method

Participants

The 42 participants were a sample of children from 2 years 11 months to 6 years of age who were referred to the Developmental Evaluation Center in Boone, North Carolina. Children are referred to the Center because of various concerns about their behavior or other developmental delay indicators. Children who are referred attend a screening clinic in order to assess their intellectual and perceptual-motor functioning and to identify needs for special services. Of the 42 participants, 28 were male, and 14 were female. The mean age was 4.20 (SD=.63). The mental ages ranged from 2 to 6 years, with an average mental age of 3.79 (SD=.78).

Parents of the children referred to the screening clinic signed an informed consent form at the screening clinic. Parents were invited to obtain further feedback on the findings of the study.

Materials

Norms for the Goodenough-Harris Draw A Person test were established on a sample of 2,975 [U.S.] children between the ages of 5 and 15 years. Normative values were

also calculated for children ages 3 to 4 years from less representational samples as the previous age range. Those norms are presented as guidelines for use with the preschool population (Harris, 1963). Scorer reliabilities for the Goodenough-Harris test are usually over .90 (Anastasi, 1972).

The following information about reliability and validity scores are for the original 1926 version of the test. Split-half reliabilities for the original version of the test are in the .70s and .80s. Retest reliabilities, over at least a three month period, fall in the .60s and .70s (Anastasi, 1972). Correlations of the original 1926 version range from .36 to .65 with the Stanford-Binet (Dunn, 1972), and range from .38 to .77 with the Wechsler Intelligence Scale for Children (Harris, 1963). To establish the reliability and validity for the 1963 revision, Harris (1963) reported correlations with the original version ranging from .91 to .97.

The Differential Ability Scales (DAS) was used to obtain mental age scores, verbal ability scores, and nonverbal ability scores. The DAS was designed to measure the cognitive abilities and achievement of children ages 2.6 to 17.11 years of age. A sample of 3,475 U.S. children was used to standardize the test. A General Conceptual Ability score is obtained for each child. Verbal ability for

children in the sample age range is measured by subtests such as Verbal Comprehension and Naming Vocabulary. Nonverbal ability is measured by subtests such as Picture Similarities, Pattern Construction, and Copying. Outside of the core subtests, five additional diagnostic subtests measure short term memory, perceptual skills, and speed of information processing. Mean internal consistency reliabilities ranged from .90 to .95 for the General Conceptual Ability score. Concurrent validity scores range from .72 to .89 with the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) and from .69 to .77 for the Stanford-Binet Intelligence Scale, Fourth Revision (SB-IV) (Aylward, 1992).

For the Goodenough-Harris Draw a Person test each child was given an 8" x 10" white sheet of paper and a black felt tip pen. The experimenter used an information sheet to record required data for each child (see procedures).

Procedures

In order to obtain scores for nonverbal and verbal functioning, Developmental Evaluation Center examiners administered the DAS. The standardized Verbal ability and Nonverbal ability scores were recorded on the information sheet. To obtain chronological age for the children, the test date and date of birth for each child were also

recorded. Other data recorded on the information sheet was sex of the child and mother's education level.

After completing the intelligence test, participants were asked to make a drawing of a person. The protocols were assigned identification numbers. All references to the names of particular children were removed from the information given to the researcher. The researcher and one other psychology graduate student independently scored each drawing using the Goodenough-Harris 73-point scoring method.

Results

Multiple regression was used to identify the relationships between children's drawing scores and the predictor variables. Inter-scorer reliability for the drawings was also calculated. In addition, various descriptive statistics are reported.

Two people independently scored the drawings. The correlation between the two scorers was .92. All subsequent analysis were based on averaged DAP scores. The mean DAP score was 4.63 (SD=3.28). DAP scores ranged from zero to 12. See Table 1 for a summary of the statistical values for other variables in this study. Table 2 shows the zero-order correlation coefficients among these variables.

A regression analysis was completed, regressing DAP scores on children's nonverbal and verbal abilities scores. The multiple R was statistically significant, R=.47,

$F(2,39)=5.43$, $p<.01$. Examination of the semipartial correlation coefficients showed that DAP scores were correlated with verbal abilities scores, $r_{sp}=.41$, $t=2.89$, $p<.01$. DAP scores were not correlated with nonverbal abilities scores, $r_{sp}=.08$, $t=.57$, $p=.57$. See Table 3 for additional information regarding the regression analysis.

Table 1

Summary Statistics for DAP Scores as a Function of Verbal and Nonverbal Abilities

Variable	Mean	Std Dev	Minimum	Maximum
Age	4.20	0.63	3	6
Mental Age	3.78	0.81	2	6
Verbal Ability	87.55	15.94	55	122
Nonverbal Ability	87.52	14.40	65	123
Full IQ	87.17	13.75	62	114
DAP	4.63	3.28	0	12

N=42

Table 2

Correlation Coefficients

	DAP	VIQ	NVIQ	IQ	AGE	MA	SEX
DAP	1.00	.46**	.23	.34*	.57**	.67**	.16
VIQ	.46**	1.00	.32	.62**	.24	.68**	-.06
NVIQ	.23	.32*	1.00	.89**	-.37*	.47**	-.15
IQ	.34*	.62**	.89**	1.00	-.23	.61**	-.15
AGE	.57**	.24	-.37*	-.23	1.00	.46**	.02
MA	.67**	.68**	.47**	.61**	.46**	1.00	-.20
SEX	.16	-.06	-.15	-.15	.02	-.20	1.00

*-Signif. $\leq$ .05 **-Signif. $\leq$ .01

Table 3

Results of Analysis Regressing DAP Scores On Verbal and Nonverbal Ability Scores

	b	SE b	Beta	Part	Partial	t	p
Verbal Ability	.09	.03	.43	.41	.42	2.89	.01
Nonverbal Ability	.02	.03	.09	.08	.09	0.57	.57

Discussion

A correlation between DAP scores and nonverbal ability scores was expected. However, the results showed that DAP scores were instead correlated with verbal ability scores. The original expectation was based on the assumption that spontaneous drawings produced by young children are related to the act of visually perceiving an object and the act of physically representing it on paper. Current literature (Freeman, 1980; Phillips et al., 1985; Strommen, 1988) which suggests that children's drawing skills may develop as a result of nonverbal elements of intelligence, such as perceptual accuracy and visual-motor coordination, supports this expectation. Based on the theoretical foundation for a correlation between children's drawing skills and intelligence (Goodenough, 1926; Piaget & Inhelder, 1956; Harris, 1963), and the recent research mentioned above which emphasized the possible key role of nonverbal intelligence in the quality of children's drawings, the assumption was that nonverbal intelligence would be more highly correlated, than verbal intelligence, with the development of drawing skills.

The discrepancy between what was expected and what was found can be explained. First, the DAP may be more of a cognitive representational task involving the use of symbols rather than a perceptual-motor task. A perceptual-motor

task, such as copying, measures nonverbal reasoning; children must visually perceive the picture, then physically organize the parts of their productions to match the original (Sattler, 1992). The DAP does not require children to copy a picture or even to produce an *accurate* drawing but rather a representational drawing of a person. Thus, the DAP drawing task may be more of a symbolic task in that children may be trying to depict their mental descriptions of an object, which may include such symbols as shapes and sizes, rather than a realistic replication of an object's physical form. Therefore, the planning and organization involved in producing a picture or a representational symbol may be more of an abstract, conceptual process than a perceptual-motor act. The use of symbols and symbolic reasoning is more closely related to verbal intelligence than nonverbal intelligence (Piaget & Inhelder, 1956; Flavell, 1963). Therefore, if children are using drawings as symbols to represent their knowledge of a person, then the DAP would correlate more highly with verbal rather than nonverbal abilities.

The idea that the DAP correlates with verbal abilities can be explained by what Piaget called "symbolic images" (Flavell, p. 120). The use of symbolic images refers to the ability of children to represent words and events with

symbols. This ability begins to develop around age 18 months, during what Piaget termed the sensory-motor stage, and continues developing through age 7 at which time children should be in the stage Piaget termed preoperational (Flavell, 1963). This simply means that as children grow older, their use of symbols matures from mostly overt acts, such as imitation, into cognitive symbolic representations of reality. For example, two-year old children may hold up a cup in order to ask for something to drink, an overt act. As children age, their actions should become more complex and include limited use of words: one and two word phrases. Eventually children should develop a vocabulary to replace the use of overt actions and begin to use their vocabulary in a much more complicated manner: sentences.

If Piaget's theory of cognitive development is accurate, it could explain the correlation between DAP scores and verbal intelligence found in this study. Research on the DAP indicates that children between the ages of 3 to 5 years do not include such items as elbow and knee joints or clothing in their drawings (Harris, 1963). These children may have mental descriptions of such items and be able to point out or name a knee or coat if asked, but they may not yet have the symbolic representations needed to depict such items in a drawing. Children in the sampled age range would fall into the age range of 3 to 5 years, which coincides

with the lower end of Piaget's preoperational stage, at which time children would have limited use of symbolic function (Flavell, 1963).

The results of this study need to be interpreted with caution for several reasons. First, the small sample size of 42 participants may have influenced the results. Ideally, a study should consist of 30 to 40 participants per predictor variable (Cohen & Cohen, 1983). The present study involved two predictor variables, nonverbal and verbal intelligence, which would indicate the need for 60 to 80 participants.

Second, the restricted age range may have distorted the results. The chronological and mental age ranges were relatively narrow compromising the validity of the correlation found in this study. Additional research including a wider age range of children is needed.

A third reason to use caution when interpreting the results is the nature of the sample selection. The participants were children who had been referred for an evaluation due to suspected risks for developmental delays. Research (Harris, 1963; McElhaney, 1969; Thomas & Silk, 1990) has indicated the use of the DAP as a screening device for such a population; however, the research base (Goodenough, 1926; Piaget & Inhelder, 1956; Harris, 1963; Phillips et al., 1985) for the relationship between children's drawing skills and intelligence has thus far

included participants selected from public schools. Some of these participants may also have been at risk for developmental delays, but that specific population has yet to be the focus of research involving the development of drawing skills in young children. Therefore, the results of this study can only be generalized to children in the age range of 3 to 6 years and who may be at risk for developmental delay.

Overall, the results of this study do support much of the earlier research on the development of drawing skills in young children. Perhaps in the translating of a mental image onto paper some aspects of perception and organization play a role. The role of these elements may be more of a symbolic function such as conceptual recognition of the relationships of parts of objects and use of symbols representing such recognitions rather than in a visual-motor manner. Luquet's theory of conceptual development more accurately reflects the development of drawing skills in young children than the more recent research proposing that nonverbal abilities may be more important. Surprisingly, a good vocabulary appears to have more influence on the outcome of a child's drawing than perceptual accuracy or visual-motor coordination. Therefore, the DAP could be useful as a screening device assesing deficiencies or risks for delay in the area of verbal abilities.

REFERENCES

References

Anastasi, A. (1972). The seventh mental measurements yearbook. Nebraska: Buros Institute of Mental Measurements.

Arnheim, R. (1954). Art and visual perception. Berkley: University of California.

Aylward, G. P. (1992). The eleventh mental measurements yearbook. Nebraska: Buros Institute of Mental Measurements.

Cohen & Cohen (1983). Applied multiple regression/ correlation analysis for the behavioral sciences. New Jersey: Lawrence Erlbaum Associates.

Dunn, J. A. (1972). The seventh mental measurements yearbook. Nebraska: Buros Institute of Mental Measurements.

Flavell, John H. (1963). The developmental psychology of jean piaget. New York: D. Van Nostrand Company.

Freeman, N. H. (1980). Strategies of representation in young children: analysis of spatial skills and drawing processes. New York: Academic Press.

Freeman, N. H. & Janikoun, R (1972). Intellectual realism in children's drawings of a familiar object with distinct features. Child Development, 43, 116-21.

Golomb, C. (1974). Young children's sculpture and drawing. Massachusetts: Harvard University Press.

Goodenough, F. L. (1926). The measurement of intelligence by drawings. New York: Harcourt, Brace and World, Inc.

Harris, D. B. (1963). Children's drawings as a measure of intellectual maturity. New York: Harcourt, Brace and World, Inc.

Kramer, J. & Conoley, J. (1992). The eleventh mental measurements yearbook. Nebraska: Buros Institute of Mental Measurements.

McElhaney, M. (1969). Clinical psychological assessment of the human figure drawing. Illinois: Bannerstone House.

Phillips, W. A., Inall, M. & Lauder, E. (1985). Visual Order. Cambridge: Cambridge University Press.

Piaget, J. & Inhelder, B. (1956). The child's conception of space. London: Routledge and Paul.

Sattler, J. M. (1992). Assessment of children, 3rd ed. California: Jerome M. Sattler.

Scott, L. (1981). Measuring intelligence with the goodenough-harris drawing test. Psychological Bulletin, 89, 483-505.

Strommen, E. (1988). A century of children drawing: the evolution of theory and research concerning the drawings of children. Visual-Arts Research, 14, 13-24.

Thomas, G. & Silk, A. (1990). An introduction to the psychology of children's drawings. New York: New York University Press.

Werner, H. (1948). Comparative psychology of mental development. Chicago: Follett.

APPENDIX A
Threaded Drawings

a. M 6.2

a. F 6.7

a. F 4.11

b. M 5.6

b. M 4.9

b. F 6.4

c. F 6.2

c. M 7.11

c. F 6.1

Adapted from Thomas & Silk, 1990. Examples of threaded drawings include all figures b-c.

VITA

Kimberly Moretz Brendle was born in Raleigh, North Carolina, on April 12, 1969. She grew up in Kings Mountain, North Carolina, where she attended elementary schools and graduated from Kings Mountain Senior High School in June 1987. The following August, she entered the University of North Carolina at Chapel Hill, and in May 1991, she received a Bachelor of Arts degree in Psychology. In the fall of 1992, she began study toward a Master of Arts degree in Clinical Psychology at Appalachian State University. This degree was awarded in May 1996. She is currently employed by Surry Community College.

Mrs. Brendle is a member of the American Psychological Association. Her mailing address is 551 Tobaccoville Road, Rural Hall, North Carolina. Her parents are Mr. and Mrs. Alvin B. Moretz of Kings Mountain, North Carolina. She is married to Joseph O. Brendle and has two sons, Logan and Aubrey Brendle.