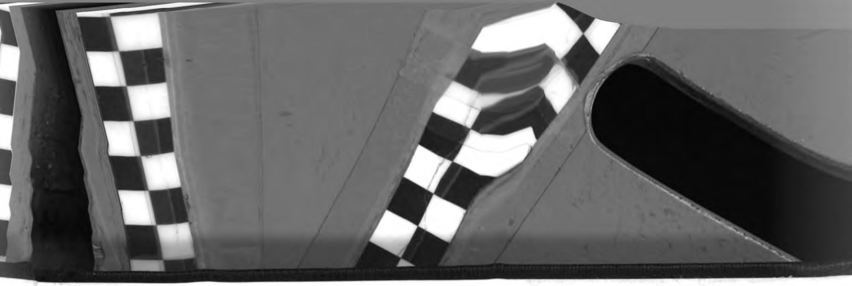

ABSTRACT

AN ASSESSMENT OF THE USEFULNESS OF THE WARTEGG DRAWING COMPLETION TEST AS A MEASUREMENT OF INTELLIGENCE AMONG CHILDREN

by Kenneth B. Matheny

The Problem

This study was concerned with an assessment of the usefulness of the Wartegg Drawing Completion Test as a test of intelligence and a predictor of academic achievement among young, school-aged children. The drawings of children sampled in the study were scored using two scoring systems in order to determine the validity of each.

Comparisons were made between the performance of the children on this test and their intelligence test scores obtained on the Primary Mental Abilities test, their grade point averages, and their Stanford Achievement Test scores in arithmetic and reading. The relationship of sex, age, and socio-economic status to one's performance upon the test was also investigated.

It was hypothesized that:

Hypothesis 1: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and the S.R.A. Primary Mental Abilities Test.

Hypothesis 2: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and the arithmetic scores obtained on the Stanford Achievement Test.

Hypothesis 3: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and the reading scores obtained on the Stanford Achievement Test.

Hypothesis 4: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and grade point averages in academic subjects.

Hypothesis 5: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and the age of the subjects.

Hypothesis 6: A significant correlation would be found between the Wartegg Drawing Completion Test scored for intelligence and socio-economic status.

Hypothesis 7: Sex differences among the Wartegg scores would prove to be significant in each validation group.

Hypothesis 8: There would be a relationship between the intelligence and achievement of children and their scores obtained on each of the scoring variables. (Subsumed under this hypotheses were seven sub-hypotheses dealing with the relationship of each of the seven variables on the Wartegg scoring system to six validating criteria.)

The Sample

The sample consisted of 176 fourth grade, public school children in the Waverly School District, Lansing, Michigan. Members of the sample were separated according to sex and divided into validation and cross validation groups for each sex.

Procedures and Methodology

The drawings of the children sampled were scored using both scoring systems. These scores were then correlated with I.Q. and each of the nine factors on the S.R.A. Primary Mental Abilities Test, age, grade point average, reading and arithmetic achievement scores on the Stanford Achievement Test, and socio-economic status.

Furthermore, each of the seven Wartegg scoring variables was correlated with the above mentioned validating criteria. Sex differences between the total Wartegg scores and among the seven Wartegg variables were examined by tests for the significance of the differences. Intercorrelational matrices were constructed to study the relatedness of the scoring variables.

Results

Each of the hypotheses was tested in all four of the validation groups (male validation, male cross validation, female validation, and female cross validation groups). The results were not always unanimous; nevertheless, the following results appear justified by the study:

1. Scores on the Wartegg Drawing Completion Test were significantly related to the Intelligent Quotients on the S.R.A. Primary Mental Abilities test, the Arithmetic and

Reading scores on the Stanford Achievement Tests, and Grade Point Averages.

2. Age and Socio-Economic Status were found to be non-significantly related to the Wartegg scores.

3. Sex differences were significant only in two cases out of eighteen comparisons.

4. Scoring variables on the Wartegg Test which correlated with many of the validating criteria were Dimensionality, Proportionality, and Detail.

5. The two scoring systems used with the Wartegg correlated so highly as to suggest that in the main we have only one scoring system.

AN ASSESSMENT OF THE USEFULNESS OF THE WARTEGG DRAWING COMPLETION TEST AS A MEASUREMENT OF INTELLIGENCE AMONG CHILDREN

By

Kenneth B. Matheny

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CHAPTER I

INTRODUCTION

For well over a half century psychologists have shown interest in forms of expressive behavior as a means of measuring personality.(46:43) However, many barbs have been directed toward those who have held such interests by those who think of themselves as more truly scientific. It is true that "the subject has been a favored target of charlatans, 'character analysts,' and dilettantes whose real interest has been the exploitation of a gullible public." (5:345-346) Nevertheless, this approach to the study of personality has so grown in importance that Gordon Allport calls it the "wave of the future." (5:345-346)

The form of expressive behavior most frequently investigated in a serious manner has been drawings. European psychologists, most frequently of the Gestalt school, have furnished the major stimulus for this investigation. It is contended that an individual's basic personality structure can be inferred from his drawings. The Machover Draw A Person (44) and the House-Tree-Person (7) tests are prominent examples of test construction with such a purpose. Other tests sharing this

assumption and enjoying less following are currently upon the market. The number of efforts to construct such tests has lead one reviewer to comment that interest in the possibilities that graphic expression offers for the understanding of the personality is now at its peak.(44:19)

Some studies have been conducted in an effort to use drawings as the basis for the measurement of intelligence. The most successful has undoubtedly been the study by Florence Goodenough which resulted in the Draw A Man Test. (17) This test has been demonstrated to have usefulness as a non-verbal test of intelligence. Lauretta Bender has attempted to use drawings as an index of one's visual motor coordination development.(4) Koppitz devised a scoring system for this test.(37) The system allows for the establishment of a developmental age. Within the ages from five to ten years this score correlates reasonably well with scores obtained on the Wechsler Intelligence Scale for Children.(36:413-416)

In 1952 Dr. Marion Kinget introduced into the United States the Wartegg Drawing Completion Test as an addition to the repertory of projective devices available to clinicians. A prototype of this test was constructed by F. Sander, an exponent of _Ganzheit Psychologie_ developed at the University of Leipzig. Sander's efforts resulted in a technique which he called a Phantasie Test.(34:3) Sander's work gave rise to the effort of Ehrig Wartegg, a colleague

at the University of Leipzig.(34:4) Dr. Wartegg constructed the present form of the Wartegg Drawing Completion Test. (52, 53, 54) Dr. Kinget submitted the work of Wartegg to research involving 383 "normal" adult subjects and reported the results as a doctoral dissertation at the University of Louvain in Belgium.

Out of Dr. Kinget's study grew a rather elaborate scoring system to aid in interpreting the drawings. The scoring of this test allows for analysis of the personality into four components: emotion, imagination, intellect, and activity.(34:9-10)

The Instrument

The Wartegg Drawing Completion Test consists of eight frames encased in a heavy black border arranged adjacent to each other on the upper half of the form. The scoring blank appears on page 108 of the Appendix. Within each frame there is a different stimulus of very small dimension. These stimuli are described by Kinget(34:35-37) as having the following properties:

> Stimulus 1, the dot, has the characteristics of smallness, lightness, roundness, centrality. In itself this stimulus is unimposing and could easily be overlooked by the less perceptive or less sensitive subject.

However, its exact central position lends it an importance which retains the attention and calls for acknowledgment. Thus a tension arises between imagination and thinking, for the material insignificance of this stimulus must be combined with its functional importance in order to result in adequate completion.

Stimulus 2, the wavy line, suggests something lively, mobile, loose, fluttering, growing, or flowing. The qualities of this stimulus decidedly resist matter of fact treatment or technical use and require integration into something organic or dynamic.

Stimulus 3, the three vertical regularly increasing lines, express the qualities of rigidity, austerity, regularity, order and progression. These qualities may blend and produce complex impressions of dynamic organization, gradual development, methodical construction and similar concepts.

Stimulus 4, the black square, appears heavy, solid, massive, angular, and static and evokes concrete materiality. While stimulus 3, in spite of its mechanical character, still shows something growing and dynamic, stimulus 4 is completely inorganic and inert.

It also has a somber appearance, conducive to associations of a somewhat depressive or, in rare cases, threatening character.

Stimulus 5, the two opposed slanting lines, expresses predominantly the idea of conflict and dynamism. The position of the longer line evokes something directed decidedly upwards, to which the shorter lines shows frank opposition. The rigidity of the lines and their perpendicular relation also suggests construction or technical use.

Stimulus 6, the horizontal and vertical lines, has a strictly matter-of-fact sober, rigid, dull and uninspiring aspect. At first sight it seems fit only for completion into simple geometric patterns or elementary objects. Experience shows, however, that this stimulus may be worked into a variety of interesting combinations. However, the off-center position of each of the lines makes their completion into a balanced whole a tough task requiring considerable planning activity.

Stimulus 7, the dotted half-circle, suggests something very fine, delicate, round and supple that is at the same time appealing and a little puzzling because of its complex, beadlike structure.

This structured aspect of the stimulus, together with its somewhat awkward location within the square, forces the selective activity of the mind and resists casual or crude treatment.

Stimulus 8, the broadly curved line, has the organic qualities of roundness and flexibility of stimulus 7, but whereas 7 has something irritating in its complexity and smallness, stimulus 8 appears restful, large, fluent, and easy to deal with. Its smooth curve readily suggests completion into organic subject matter, animate or inanimate, while its downward bending movement and location connote the idea of cover, shelter, and protection. Its relatively large dimension also evokes expansion and vastness as proved by the frequent completion of this stimulus unto natural phenomena such as rainbows or sunsets.

Dr. Kinget suggested that certain identifiable characteristics within the drawings of subjects held value for discriminating levels of intelligence.(34:103)

Statement of the Problem

It is the purpose of this study to determine the usefulness of the Wartegg Drawing Completion Test as a screening instrument for intelligence and a predictor of achievement among young children. As in a similtaneous

study conducted by John Keith (31) among children in the Central African Federation, the Republic of South Africa, and the British Protectorate of Swaziland, we will also attempt to ascertain the value of this instrument for indicating differential characteristics in the drawing formations of high and low achieving children of the United States.

Dr. Kinget has indicated that the test does have potential usefulness for estimating levels of intelligence. However, evidence of its empirical validity was not convincingly demonstrated. Furthermore, Dr. Kinget was concerned only with the drawings of adults and primarily in an attempt to assess their projective implications. The present study is designed to measure the usefulness of this instrument in discriminating levels of intelligence among children. No effort will be made to develop a system of personality interpretation for use with children. Such a project is outside the concern of this study. Neither will we attempt to establish age norms for scoring. The children in this study will be of uniform grade level.

The drawings by the children sampled in this study will be scored upon variables largely derived from Kinget's work. Comparisons will be made between the performance of our subjects and their intelligence test scores, their grade point averages, and their achievement test scores in crucial academic subjects. The relationship of sex, age,

and socio-economic status to one's performance upon this test will also be investigated. The data will be analyzed in order to examine the discriminating value of several variables believed to be relevant to the assessment of intelligence.

Justification for the Study

Aside from the extensive work by Goodenough in standardizing the Draw A Man Test, little has been done to demonstrate the possibility of objectively scoring drawings for a measure of intelligence. The present study is in this sense closely related to the work of Florence Goodenough.

The most important aspect in which the Wartegg Drawing Completion Test differs from the Draw-a-Man is in its less structured quality. Whereas the subject is compelled to draw a man upon Goodenough's test, the directions for administering the Wartegg Drawing Completion Test allow for a great number of variations in response. This aspect of the test is similtaneously an asset and a liability. The advantage it enjoys over the Draw-a-Man is in its increased promise as a projective instrument due to its increased ambiguity. Its disadvantage resides in the increased difficulty inherent in scoring. The test then appears particularly well adapted to the expression of both adjustment and intelligence, but it yet remains to be seen if it can be objectively scored for intelligence. It is to investigate its possibilities in this respect that this study is dedicated.

The study by Mr. Keith being conducted similtaneously with this study is predicated upon the assumption that a non-verbal test of intelligence would be of particular value in a multi-language area such as Africa. The present writer is not unaware of the disrepute into which researchers attempting to construct a "culture-free" test have fallen. In fact, so dismal has been the failure within this area that Cronbach concluded: "It is now generally agreed that no universal test for measuring mental ability can be developed."(12:204) Nevertheless, it would seem most likely that a non-verbal test of intelligence in a multi-lauguage area such as Africa could be constructed. Now if this same test appeared equally as discriminating with a non-primitive society such as the United States, then these results would at least prove to be of genuine interest.

The test lends itself well to use with school children. The task has a great deal of appeal for children, and the instructions are brief and easily understood. The average time required for group administration of the test is approximately one-half hour. Experienced scorers can score the blank as a test of intelligence in from three to five minutes. The job of scoring can easily be mastered by those not necessarily skilled in psychometrics, and the blank itself is quite inexpensive.

The primary purpose of this test is for use as a projective instrument. It has generated much research as a

projective test upon the continent of Europe and is gaining increasing attention in this country. This fact leads to a further justification for this study. The clinical value of this instrument would be enhanced significantly if it could be used simultaneously as a projective test and as a rough screening of intelligence. The Rorschach has set a precedent in this respect.(35:352-376)

Limitations of the Study

The extent to which generalizations may legitimately be drawn from this study are limited to school children of a uniform grade level. While this procedure introduces a means of controlling for the age factor, it makes it necessary to be very cautious about generalizing the results to children of other ages. No effort is being made to furnish age norms. While such is highly desirable, it also appears overly ambitious for a study of this nature. The expense in both time and money makes such a project prohibitive.

Two improvements in the instructions for administering the test have subsequently occurred to the writer. It now appears desirable to request the children to draw pictures. The present instructions suggest only that "you may draw whatever you like." It is believed that children will most likely draw something of a representational nature if asked to draw pictures. Such would aid in the scoring

of the drawings. It also appears likely that the scoring might be rendered more accurate if the children were allowed to explain what they had drawn. Therefore, in future studies it might prove desirable to request the children to offer an explanation of their drawings.

A survey of the rather elaborate data collected in this study tends to suggest that the population sampled may be slightly favored socio-economically, and consequently the representativeness of the sample in any absolute sense may be called in question.

The Thesis in Perspective

Chapter I of this thesis concerns itself with an introduction to the usefulness of drawings as a source for the measurement of intelligence. The instrument presently under investigation is introduced. The problem being examined, the justification for such a study, and its limitations are stated.

Chapter II offers a resume of existing research concerning the use of drawings for the purpose of intellectual evaluation and of the Wartegg Drawing Completion more specifically.

Chapter III outlines the methodology of the study. The instrument to be used, the scoring system adopted, the sample, the criteria against which the scoring is to be validated, and the statistical analysis to be employed are all discussed.

Chapter IV provides an analysis of the data with appropriate tables to aid in the analysis.

Chapter V presents a summary of the results, conclusions to be drawn, and recommendations for further study.

CHAPTER II

A REVIEW OF THE LITERATURE

In an historical survey of the use of drawings for the measurement of intellectual functioning, Goodenough(17:2) traces the study back to the work of Ebenezer Cooke who published an article on children's drawings in 1885. Other early writers contributing to the study were Perez, Sully, Barnes, Baldwin, Shinn, Brown, Clark, Herrick, Lukens, Maitland, O'Shea, and Goetze.(17:3) The work of these early researchers was, unfortunately, almost altogether descriptive. Age norms and other statistical treatment of the data are for the most part conspicuously absent from their works.

Scientific interest in the drawings of children reached a pinnacle between the years 1900 and 1915. It was around this time that some ambitious studies of international flavor were begun. Lamprecht(39:2) requested that drawings from cultures from all parts of the world be sent to the University of Leipzig for examination and comparison. A great deal of work was done in the early stages of the study, but it was never completed. Levinstein(41:2) published a summary of certain parts of this material, but no adequate study of the entire collection has appeared.

Ivanoff(27:3) conducted a study of the drawings of school children in four Swiss cantons. He offered a scoring system which included the following: a sense of proportion, imaginative conception, and technical and artistic value. His scores correlated positively with teachers' ratings for general ability, and certain moral and social traits.

Katzaroff(29:4) and Maitland(45:4) conducted separate studies in an investigation of populars, i.e., those drawings which occur most commonly in the drawings of children. Maitland found that the human figure occurred most regularly until the age of ten. Katzaroff found that among his subjects whose ages ranged from six to fourteen that the most common were first "miscellaneous objects," with houses second, and the human figure third.

Burbury,(9:487-506) in her study with children in clinics and schools, concludes that the drawing of a house is spontaneous only between the ages of five to eight. After eight it suggests immaturity.

Schuyten and Lobsien(17:4) found that with increasing age the proportions of the different parts of the body approach more nearly to the proper standards.

Kerschensteiner(32:5) spent about two years collecting and studying approximately 100,000 drawings made under standardized conditions by children in Munich and in the surrounding towns and villages. He found that his collection could be broken down into three different categories:

1. Purely schematic drawings.
2. Drawing according to visual appearance.
3. A still later stage in which the child attempts to give an impression of three-dimensional space.

He analyzed the differences between the drawings of feeble-minded youngsters and normal children. He suggested that the drawings of the feeble-minded are more primitive than those made by normal children and that their drawings lack coherence. Furthermore, he found definite sex differences in children's drawings in favor of the males.

Contrary to the findings of Kerschensteiner, Goodenough(17:57) found no significant quantitative differences between the sexes when using her scoring system. She did find, however, a great deal of qualitative differences between the drawings of the sexes.

Rouma notes the following differences between subnormal children and younger normal children in respect to their drawings:

> The spontaneous drawings of subnormal children show: 1) a marked tendency to automatism, 2) slowness in the evolution from stage to stage, and 3) frequent retrogression to an inferior stage. 4) There are numerous manifestations of the flight of ideas. The drawings which cover a sheet of paper are not finished, and they have to do with a number of very disparate subjects. 5) Certain drawings by subnormal children, taken singly, are very complete; but when we examine them more closely we find that the child has confined himself to a series of sketches which have evolved slowly, and by slight modifications have gradually reached a certain degree of perfection. . . .

> It occasionally happens that a subnormal child possesses an unusual power of visual memory and is thus capable of producing very remarkable drawings. These cases are analogous to those of other inferiors who display a great superiority of one of their faculties. . . . 6) Many subnormal children show a great anxiety to represent an idea in its totality, or to reproduce all the details in a given sketch. . . . 7) Subnormal children prefer those drawings in which the same movement frequently recurs, and 8) they do meticulous work.(48:7)

Kik(33:9) pointed up the marked difference between real creative ability and mere ability to copy. He suggested that pupils showing real creative ability also obtained good grades, but that copyists, on the whole, did rather inferior school work.

Rouma(48:7) found that children not having had previous experience at drawing perform less well than experienced children <u>at first</u>, but that this factor is easily equalized by a comparatively small amount of practice.

Goodenough concludes from her historical survey of the work with children's drawings the following:

1. In young children a close relationship is apparent between concept development as shown in drawing, and general intelligence.
2. Drawing, to the child, is primarily a language, a form of expression, rather than a means of creating beauty.
3. In the beginning the child draws what he knows, rather than what he sees. . . . Later on he reaches a stage in which he attempts to draw objects as he sees them. The transition from

the first stage to the second one is a gradual and continuous process.

4. . . . the child exaggerates the size of items which seem interesting or important; other parts are minimized or omitted.
5. The order of development in drawing is remarkably constant, even among children of very different social antecedents.
6. The earliest drawings made by children consist almost entirely of what may be described as a graphic enumeration of items. Ideas of number, of the relative proportion of parts, and of spatial relationships are much later in developing.
7. In drawing objects placed before them, young children pay little or no attention to the model. Their drawings from the object are not likely to differ in any important respect from their memory drawings.
8. Drawings made by subnormal children resemble those of younger normal children in their lack of detail and in their defective sense of proportion. They often show qualitative differences, however, especially as regards the relationship of the separate parts to each other. Not infrequently the same drawing will be found to combine very primitive with rather mature characteristics.

9. Children of inferior mental ability sometimes copy well, but they rarely do good original work in drawing. Conversely, the child who shows real creative ability in art is likely to rank high in general mental ability.
10. There is much disagreement among investigators regarding the relationship between children's drawings and those made by primitive or prehistoric races. Until more careful study has been made of the many factors involved in such comparison, the legitimacy of drawing conclusions appears to be very doubtful.
11. Marked sex differences, usually in favor of the boys, are reported by several investigators, especially Kerschensteiner and Ivanoff.
12. Up to about the age of ten years children draw the human figure in preference to any other subject.(17:12-13)

Goodenough's studies led her to believe that a drawing test could be constructed which would faithfully discriminate among levels of intelligence. Her work resulted in the Draw A Man Test which was first published in 1926. It was necessary to discard four previous scoring systems before adopting the present method. Her system divided drawings into two broad classifications: class A, which consists of unrecognizable scribbling not discernible as a human figure; and class B, those drawings representing

a man in a scorable form. Coherence, proportionality, detail, motor coordination, and full faced or profile views of the man are taken into consideration in the scoring. In its standardization the test was administered to 3,593 subjects. Goodenough suggests the following facts concerning the test:

1. The probable error of estimate of an I.Q. is approximately 5.4 points at all ages from five to ten years.
2. Partial correlation treatment shows that the test makes a significant contribution to a prognosis of school success.
3. The average correlation with Stanford-Binet mental age is .763 for ages four to twelve taken separately.
4. The test results can be influenced by special coaching in drawing the human figure, but they appear to be relativly unaffected by the type of art instruction ordinarily given in the primary grades.
5. Artistic ability is practically a negligible factor at these ages.(17:81-82)

The Draw A. Man Test has incited a host of studies applying its technique to various other cultures. Hunkin (26:52-63) adapted the test to African school children from ages six to thirteen. His work involved administering the test to 2,300 children.

Hsiao(25) changed the task to "draw a man with a short gown" for his work with Chinese children. His study involved 4,000 children in eleven schools in Nanking. His test was developed as an entrance examination for the elementary schools.

Fay(17:22) devised a test in Paris with norms for ages seven to twelve years of age. This test was revised by Winstock in 1935. The subjects were asked to make a drawing which would illustrate the statement, "A lady takes a walk and it rains." The scoring is based upon the amount and accuracy of detail. The results indicate that improvement accompanies each year up to age twelve.

The House-Tree-Person Test was constructed by John Buck(8) for purposes of personality evaluation. The initial work was based upon an analysis of 150 sets of drawings produced by white adults of the University of Virginia Hospital at the Lynchburg State Colony. These patients had been diagnosed as either maladjusted, psychopathic, psychoneurotic or psychotic. The subjects were merely instructed to draw a house, a tree, and a person. The subject's intellectual level is supposedly revealed by the amount of detail, perspective, and proportion in his drawings.

A great number of other authors have attempted to construct drawing tests for purposes of personality interpretation. Koch(12:208) has developed a test similar a

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to the House-Tree-Person test for use in Switzerland. Holzberg (23:243-261) has devised a check list consisting of 174 items by which he claims to be able to point up significant differences in the drawings of normals and schizophrenics in general and between normals and paranoid, hebephrenic, and catatonic sub-groups. Karon Machover,(44) devised the Draw A Person Test in 1949. In interpreting the drawings stress is laid primarily upon interrelated patterns of drawing traits. Single traits evinced in a drawing are not usually given serious consideration. It is the complex of traits that is supposed to be revealing. Among others, bizarreness, excessive incongruity, over-symbolic treatment, and silliness are specifically thought to be indicative of mental pathology. (44:23)

A study by Luquet(48:8) indicated that a child's drawings undergo much fluctuation from day to day. It usually takes an appreciable amount of time for a new feature to become fixed in a drawing. For this reason he felt that a child's drawings should not be treated statistically.

Fred Brown(7:173-184) reviewed the House-Tree-Person test along with other human figure drawing tests and concluded that the constancy of performance in this type of drawing is to be held suspect. He was equally suspicious of the attempts to quantify the results of such drawings and suggested that the "quality of the quantity" be more fully considered.

A later study by Stanley Grahm,(19:385-386) however, offers differing results. In this study twenty-three "naive" graduate students drew the human figure. Then these students were subjected to a two hour lecture on the interpretation of human figure drawings. Drawings were represented in the lecture as being infinitely revealing of the worst in one's personality. They were subsequently requested to draw another human figure. A correlation of .71 between the paired sets was obtained. This suggests then that human figure drawings offer a consistent picture of self-image in spite of attempts to disguise.

Anastasi and Foley(2:71) surveyed the literature concerning efforts to discriminate among psychiatric groupings on the basis of drawings. They concluded that the drawings were discriminating only in the cases of extreme mental disorders and only with individuals who offered very startling or bizarre productions.

Although highly significant correlations are usually found to exist between intelligence test scores and scores in art ability from kindergarten through the third grade, Burkhart(10:230-241) states that intelligence tests are not good predictors of art ability beyond the third grade level. Goodenough(17:82) found that the Draw A Man Test correlated .44 with teachers' judgments of ability within the first three grades, but that the correlation in grades above the third was too low to be significant.

The Bender Visual Motor Gestalt Test(4) has proven a useful device for the measurement of one's visual-motor coordination. The test consists of a set of cards with standardized designs. The subjects are then asked to faithfully reproduce them. Bender has age norms included within the manual. Koppitz (36:413-416) has developed an alternative system of scoring which appears much more objective than that offered by Bender. Koppitz conducted a correlational study with ninety elementary school children to whom she administered both the Bender-Gestalt and the Weschsler Intelligence Scale for Children. She found significant relationships between the two tests. More specifically she found that the Arithmetic and performance subtests were significantly related to the Bender but not the Information, Comprehension, and Similarities subtests.

The Illinois Art Ability Test(12:316) developed by Gilbert and Ewing has been found to correlate .27 with freshmen grade average. This test requires not only artistic skill but creative effort. The Horn Art Aptitude Test(24:350-359) offers the subject a very small starting sign in a square, and the subject is asked to complete the picture according to his own imagination. Scores on this test, in one study, correlated .66 with grades in a special art course for high school seniors.

Hirota(21:363-375) compared the paintings of four year olds with those produced by six year olds and concluded that the drawings by younger children were more colorful and less "concrete." Hofmann(22:801) in a study of 428 drawings of eighteen children in kindergarten concluded that the nature of a child's drawings does show a child's readiness-level for the first grade.

The Rorschach is commonly used as a measure of intelligence as well as for purposes of personality interpretation. Klopfer, (35:352-376) however, states that the Rorschach ". . . is not considered a substitute for a test of general intelligence--although for some purposes such an estimate might be all that is required, thus making an intelligence test unnecessary."

The intellectual estimate derived from the Rorschach performance is primarily based upon the perceptual process. Elements in the perceptual process especially significant for purposes of intellectual determination are the following:

1. <u>The form level</u> (an F response): This is the most important indication of level of intelligence furnished by one's performance on the Rorschach. A vague, global perception reflects a relatively low level of capacity, while the more refined and differentiated perception reflects a higher level of intelligence.(1:47)

2. <u>Human Movement</u> (an M response): This response is one which revolves around the human figure or derivation of the human figure, or its parts, <u>and</u> is seen in motion.(35:352)

Such a response especially with high form level is said to be a sign of high intelligence.

3. Whole Responses (W responses): A high level of intellectual functioning is indicated by a fair number of W responses of high enough form level to indicate good differentitation and organization of perception. A large number of W responses, with low form level, however, is indicative of low mentality.(35:353)

4. Original Responses (O responses): A large number of original responses of good form level and without strain and bizarre elements are indicative of a high level of intellectual efficiency.(35:358)

5. Variety of Content: All things being equal, variety of content is felt to be an indication of high intelligence. Subjects of mediocre or defective intelligence frequently give a preponderance of animal responses, since animal forms are very easy to see in the ink blots.(35:362)

6. Succession: An orderly succession of perceptions is considered to be a healthy sign of intelligence. A confused succession often indicates a weakening of intellectual control.(35:368)

Research with the Wartegg

The reviews of Dr. Kinget's work have been almost exclusively related to its projective claims. This, of course, is quite natural since the primary purpose of the test is for use in the evaluation of personality. The test was covered

by Life magazine(42:65) in 1952 shortly after its introduction into this country. Foley(15:669-670) pointed up the lack of objective norms and the use of "vague and subjective statements." Walter Kass(28) noted the ingenuity of the blank's small graphic stimulus elements, the brevity of its format, and the richness of the productions it elicits, and predicted a popularity for the test as a research instrument applicable to clinical populations. Gleser(16:251-253) spoke favorably of the fact that the investigation was conducted using "normal" subjects. However, she noted that Kinget, out of expediency, had used the same data both for validation of the test and for subsequent changes and elaboration of the scoring system. The lack of statistical data and the inadequacy of the manual were pointed up. Brown(6:367-368) concludes that the test has heuristic and research potentialities, but that its immediate acceptance into the clinician's test battery is contraindicated.

Baur(3:52-55) conducted a study in which he administered the Wartegg to seventy-three children between the ages of six and sixteen. The children were all diagnosed as being enuretic, psychopathic, epileptic, mentally deficient, or suspected schizopherenic. He found distinctive drawing characteristics in each group.

Studies by Erna Duhm(13:5867) and Hemme Muller-Suur (50:446-450) analyzed the drawing of over 2,000 subjects in Europe. A sizable number of these subjects were mentally retarded. In these studies the mentally retarded tended to:

1. fail to integrate the starting design elements given on the test blank into their drawing,
2. show a marked repetition of simple graphic themes in their drawings, and
3. disregard the borders of the squares.

A study entitled, "A Comparison of Intelligence Test Scores on the Wechsler Intelligence Scale for Children and the Wartegg Drawing Completion Test with School Achievement of Elementary School Children," was conducted at the University of Detroit in 1954 by Rosemary Stark.(49:28) This study suggested that the Wartegg Drawing Completion Test could be objectively scored as an intelligence test. A Pearson-Product-Moment Coefficient of correlation (.790) between the Wartegg scores and the WISC scores lent support to this contention. However, certain weaknesses were noted in this study:

1. The sample was small (fifty third grade children) and non-representative--according to the author, they were drawn from the upper-middle class;
2. The sample did not include a proportionate number of mentally retarded children (which fact should have lowered the validity coefficient); and
3. Most serious of all, it appears that the coefficient was obtained by using a scoring system which underwent several changes upon the basis of an investigation of the data <u>without cross validation</u>. (49:28)

Stark's scoring system was largely derived from variables suggested by Kinget but with a few additions gained from Goodenough's work. The scoring was based upon the following factors: (1) orientation, (2) detail, (3) organization, (4) proportion, (5) dimension, (6) symmetry, (7) symbolism and/or abstraction, (8) movement, (9) originality, (10) variety, and (11) time.(49:59)

Takela and Hakkarainen(51:4654) conducted a study in Finland using 1,025 subjects representing seventeen occupations. They concluded that performance on the Wartegg could be used for differentiating occupational groups and could possibly serve as a predictor of vocational success.

CHAPTER III

METHODOLOGY

The Sample

The entire fourth grade population of Waverly school district was chosen as our sample. The fourth grade pupils are distributed in ten classrooms throughout the district. Wartegg drawings were obtained from 259 of the 264 fourth grade pupils registered in the district. There were two prime consideration in the selection of the Waverly school district:

1. Representativeness. The Waverly school district includes a wide range of socio-economic levels. At least one of the schools is largely comprised of children from a favored socio-economic class while two of the schools serve many children of the lower class. The guidance coordinator of the system describes the district as covering a full range of classes with the median status being skewed slightly toward the higher strata.(18)

2. Accessibility. (a) The Waverly school district is geographically located just west of Lansing, Michigan. It is, therefore, conveniently located for purposes of this study. (b) The school system showed enthusiasm for the study and proved to be very cooperative. This fact rendered the job of data collecting much easier. (c) The Science

Research Associates Primary Mental Abilities test and the arithmetic and reading forms of the Stanford Achievement Test were administered to the fourth grade just prior to the onset of this study. This greatly expedited the task of collecting criteria with which to correlate the Wartegg scores.

Pupils in the fourth grade classrooms, along with other classrooms in the district, have been screened in order to judge their eligibility for the special classrooms for the educable mentally handicapped. Therefore, all of the children in the sample (with two known exceptions) are judged to be above the border-line mentally handicapped range of intelligence, i.e., they are believed to have intelligence quotients of eighty and above. The range of intelligence scores is thereby somewhat restricted. This fact would tend to lower the correlation since the coefficient depends in part upon the magnitude of the range encompassed.

Data Collecting

The entire sample was administered the Wartegg Drawing Completion Test between the eighth and sixteenth of May. The principals and teachers were most cooperative and liberal time was apportioned for the testing.

The Science Research Associates Primary Mental Abilities test was chosen as a criterion with which to correlate the Wartegg test. This test was given to all fourth grade classrooms during the month of December, 1961, by John Grabow, the

director of guidance for the school district. A number of make-ups stretching into the following two weeks were needful in order to obtain a high percentage of the fourth grade pupils.(18)

Stanford Achievement tests were administered to all fourth grade classrooms during the month of February, 1962. These tests covered skills involved in arithmetic and reading and were administered under the auspices of the guidance department. Reading scores were obtained for 222 pupils and arithmetic scores for 215 pupils.

A questionnaire was distributed to all the parents of the fourth grade children in the district to obtain a basis for socio-economic ranking. The questionnaire was sent out with the children on May 22nd and 23rd, and ninety-three per cent of them were returned. The history and nature of the questionnaire and the weights to be used in this study will be discussed later in the chapter.

The ages of the children and their grade point averages were taken from their cumulative record folders on the last day of school.

Research Hypotheses to be Tested

Hypothesis 1: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and the S. R. A. Primary Mental Abilities Test.

Hypothesis 2: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and the arithmetic scores obtained on the Stanford Achievement Test.

Hypothesis 3: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and the reading scores obtained on the Stanford Achievement Test.

Hypothesis 4: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and grade point averages in academic subjects (arithmetic, language, reading, spelling, writing, social science and general science). Grade point averages will represent the mean of all grades in academic subjects over the past two years. The point system allowing four points for an A, three for a B, two points for a C, one point for a D, and zero points for an E will be used.

Hypothesis 5: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and the age of the subjects.

Hypothesis 6: A significant correlation will be found between the Wartegg Drawing Completion Test scored for intelligence and socio-economic status.

Hypothesis 7: Sex differences in the Wartegg scores will prove to be significant in each validation group.

Hypothesis 8: There will be a relationship between the intelligence of children and certain characteristics found in their drawings. More specifically,

(a) There will be a significant relationship between integration of stimuli and (1) S.R.A. Primary Mental Abilities test scores, (2) arithmetic scores on the Stanford Achievement Test, (3) reading scores on the Stanford Achievement Test, (4) grade point averages, (5) ages, and (6) socio-economic status.

(b) There will be a significant relationship between the repeating of simple graphic themes in the drawings and the six variables mentioned in (a).

(c) There will be a significant relationship between a disregard for the borders of the squares, "bursting the frame," and the six variables mentioned in (a). An attempt will be made to identify those pupils "bursting the frames" for creative reasons and those doing so for lack of intellectual acumen.

(d) There will be a significant relationship between dimensionality in drawings and the six variables mentioned in (a).

(e) There will be a significant relationship between the degree of proportionality in drawings and the six variables mentioned in (a).

(f) There will be a significant relationship between the amount of detail in drawings and the six variables mentioned in (a).

(g) There will be a significant relationship between the number of meaningful drawings included in one's performance upon the Wartegg and the six variables mentioned in (a).

The Scoring System

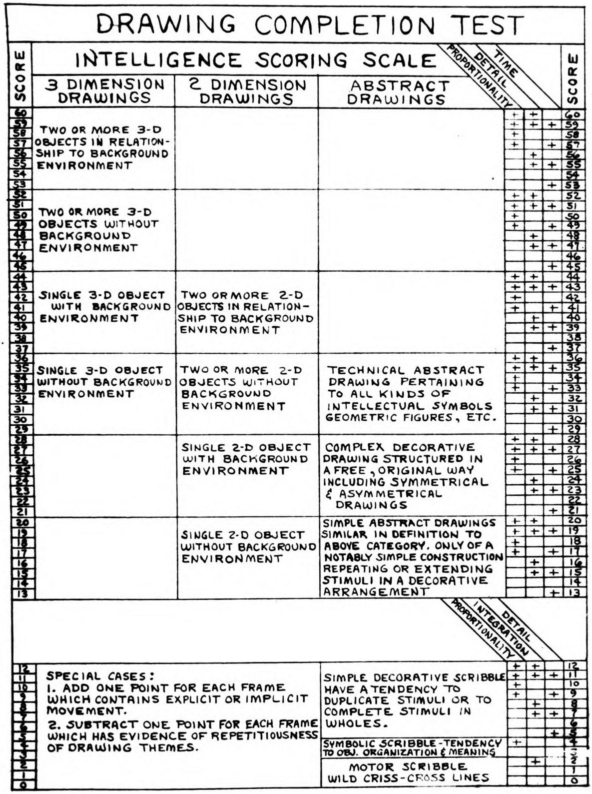
In her book, The Drawing Completion Test,(34) Marian Kinget suggested the following variables as having relevance to the measurement of intelligence by means of the Wartegg test: (1) organization, (2) dimension, (3) symbolism and abstraction, (4) movement, (5) originality, (6) variety, (7) form level, and (8) time.

Stark(49) leaned heavily upon the original work of Kinget in divising a scoring system made up of the following variables: (1) orientation, (2) detail, (3) organization, (4) proportion, (5) dimension, (6) symetry, (7) abstraction, (8) movement, (9) originality, (10) variety, and (11) time.

John Keith(31) attempted to build further upon the work of Kinget while incorporating the suggestions made by Stark. Basically Keith's scoring scale involves the following variables: (1) dimensionality, (2) abstraction, (3) proportionality, (4) detail, (5) time, and (6) repetitiousness. While the variables used by Keith were not original, the omnibus-like character of the scale is somewhat novel, however. A copy of the scoring scale is found on the following page.

The present writer conducted a study using the drawings of children in two third grade classrooms of the Wardcliff School in Okemos, Michigan, to determine test-retest reliability of the test using the scoring scale suggested by Keith. The time lapse for the two administrations was approximately four months. A Pearson Product-Moment coefficient of correlation of .23 was obtained between the group's first and second productions. A coefficient of this magnitude, of course, is far from satisfactory for such an instrument. It suggested that the likelihood of successfully predicting intelligence by means of this scale is not at all promising.

It was felt that in part the low coefficient obtained in the above study was due to lack of scorer reliability as a result of non-operational scoring variables. Certain changes were made in the scoring scale in order to reduce ambiguity. A copy of the revised scoring scale is found on page thirty-seven. The drawings were then scored upon the basis of the revised scale and a Pearson Product-Moment coefficient of correlation of .73 was obtained between the group's first and second productions. Although this change in scoring procedure sharply increases the test-retest reliability of the score, it is no guarantee of the validity of the instrument.



DRAWING COMPLETION TEST

INTELLIGENCE SCORING SCALE

SCORE	3 DIMENSION DRAWINGS	2 DIMENSION DRAWINGS	ABSTRACT DRAWINGS	PROPORTIONALITY	DETAIL	TIME	SCORE
60	TWO OR MORE 3-D OBJECTS IN RELATIONSHIP TO BACKGROUND ENVIRONMENT			+	+		60
59				+	+	+	59
58				+			58
57				+		+	57
56					+		56
55					+	+	55
54							54
53						+	53
52	TWO OR MORE 3-D OBJECTS WITHOUT BACKGROUND ENVIRONMENT			+	+		52
51				+	+	+	51
50				+			50
49				+		+	49
48					+		48
47					+	+	47
46							46
45						+	45
44	SINGLE 3-D OBJECT WITH BACKGROUND ENVIRONMENT	TWO OR MORE 2-D OBJECTS IN RELATIONSHIP TO BACKGROUND ENVIRONMENT		+	+		44
43				+	+	+	43
42				+			42
41				+		+	41
40					+		40
39					+	+	39
38							38
37						+	37
36	SINGLE 3-D OBJECT WITHOUT BACKGROUND ENVIRONMENT	TWO OR MORE 2-D OBJECTS WITHOUT BACKGROUND ENVIRONMENT	TECHNICAL ABSTRACT DRAWING PERTAINING TO ALL KINDS OF INTELLECTUAL SYMBOLS GEOMETRIC FIGURES, ETC.	+	+		36
35				+	+	+	35
34				+			34
33				+		+	33
32					+		32
31					+	+	31
30							30
29						+	29
28		SINGLE 2-D OBJECT WITH BACKGROUND ENVIRONMENT	COMPLEX DECORATIVE DRAWING STRUCTURED IN A FREE, ORIGINAL WAY INCLUDING SYMMETRICAL & ASYMMETRICAL DRAWINGS	+	+		28
27				+	+	+	27
26				+			26
25				+		+	25
24					+		24
23					+	+	23
22							22
21						+	21
20		SINGLE 2-D OBJECT WITHOUT BACKGROUND ENVIRONMENT	SIMPLE ABSTRACT DRAWINGS SIMILAR IN DEFINITION TO ABOVE CATEGORY. ONLY OF A NOTABLY SIMPLE CONSTRUCTION REPEATING OR EXTENDING STIMULI IN A DECORATIVE ARRANGEMENT	+	+		20
19				+	+	+	19
18				+			18
17				+		+	17
16					+		16
15					+	+	15
14							14
13						+	13

SCORE			PROPORTIONALITY	INTEGRATION	DETAIL	SCORE
12	SPECIAL CASES: 1. ADD ONE POINT FOR EACH FRAME WHICH CONTAINS EXPLICIT OR IMPLICIT MOVEMENT. 2. SUBTRACT ONE POINT FOR EACH FRAME WHICH HAS EVIDENCE OF REPETITIOUSNESS OF DRAWING THEMES.	SIMPLE DECORATIVE SCRIBBLE HAVE A TENDENCY TO DUPLICATE STIMULI OR TO COMPLETE STIMULI IN WHOLES.	+	+		12
11			+	+	+	11
10			+			10
9			+		+	9
8				+		8
7				+	+	7
6						6
5					+	5
4		SYMBOLIC SCRIBBLE-TENDENCY TO OBJ. ORGANIZATION & MEANING	+			4
3						3
2		MOTOR SCRIBBLE WILD CRISS-CROSS LINES		+		2
1						1
0						0

Figure 1. Drawing Completion Test

Wartegg
Drawing Completion Test I
Scored for Intelligence

	Meaningfulness	Porportionality	Integration	Detail	Time		SCORE
3 Dimensional minus 1 pt. for every repetitious drawing	+	+	+	+	—		29
	+	+	+	+	+		28
	+	+	+	—			27
	+	+	—	+			26
	+	+	—	—			25
	+	—	+	+			24
	+	—	+	—			23
	+	—	—	+			22
	+	—	—	—			21
2 Dimensional minus 1 pt. for every repetitious drawing	+	+	+	+	—		20
	+	+	+	+	+		19
	+	+	+	—			18
	+	+	—	+			17
	+	+	—	—			16
	+	—	+	+			15
	+	—	+	—			14
	+	—	—	+			13
	+	—	—	—			12
	—	+	+	+	—		11
	—	+	+	+	+		10
	—	+	+	—			9
	—	+	—	+			8
	—	+	—	—			7
	—	—	+	+			6
	—	—	+	—			5
	—	—	—	+			4
	—	—	—	—			3
1 Dimensional (or scribbling)	—	—	+	—	—		2
	—	—	—	—	—		1

Figure 2. Wartegg Drawing Completion Test I

In a study of inter-scorer reliability Paul Kreider(38) examined the relationship of the scores of Keith, Kreider, and Matheny using Keith's scoring scale. This study made use of the Okemos sample. A rank order coefficient of correlation of .49 was found to exist between these scorings. Subsequently Mr. Kreider rescored the drawings using the scale revised by the present author. A rank order coefficient of correlation of .80 was found to exist between his scoring and the author's scoring upon the basis of the revised scale. The coefficient might well have been considerably higher if the more appropriate correlation coefficient, the Pearson Product-Moment, had been used.

The revisions made in the scoring scale then appear to have significantly improved both test-retest reliability and inter-scorer reliability. Upon the basis of the study of the drawings of the Okemos school children, the following changes in Keith's scoring scale were suggested:

1. The scoring procedure offered no distinction between two and three dimensional drawings which integrated the stimulus and those which did not. In the Okemos sample many of the two dimensional drawings fail to integrate the stimuli. The present writer assumes there to be a qualitative difference between those two dimensional drawings which integrate the stimuli and those which do not. The research by Erna Duhn (13) and Hemme Muller-Suur(50) give support for this assumption.

Therefore, it was recommended that integration be added as an additional variable for two and three dimensional drawings.

2. Keith's scale made no distinction between the dimensional drawings which were meaningful and those which were not meaningful.

While it quite unlikely that one might have a three dimensional drawing which was non-meaningful, it is quite possible that one might draw a two dimensional drawing without meaning. Therefore, it was recommended that meaningfulness be added as a scoring variable.

3. From score twelve down an obvious error was made in Keith's scale. The presence of detail in one's drawing was penalized while its absence was rewarded. The revision reversed this procedure.

4. Among the drawings obtained from the Okemos school children, there were none which could clearly be scored as abstract drawings. Consequently, it is felt that with children all three levels of abstract drawings could be omitted from the scoring procedure without the test suffering any loss in its ability to discriminate among levels of intelligence. Such an omission would greatly add clarity and reduce subjectivity in the scoring procedure. Therefore, the abstract categories were omitted from the scoring scale.

5. Proportionality and detail seemed to be meaningless variables when applied to scribbles. Therefore, detail and proportionality were omitted as scoring variables at the one dimensional or scribbling level.

6. The attempt to discriminate among simple decorative, symbolic, and motor scribbles appeared highly subjective. Therefore, these three levels were also subsummed under the title of scribbles.

7. Dr. Kinget had recommended that time be considered only in the case of those drawings where other factors were not obviously neglected. In Keith's scale credit was given for rapid performance whether or not one's drawings were judged to be proportional and to have detail. It was noticed in scoring the drawings belonging to the Okemos sample that many of the drawings which scored the lowest were drawn the more quickly. Therefore, speed was considered a plus factor only upon those drawings which were judged to be both proportional and to contain sufficient detail.

Kinget is presently suggesting a new procedure for scoring drawings as measurements of intelligence. The new procedure consists basically of six levels which concern the subject's attempt at integration of the stimuli into his drawing. The assumption is made that the higher the level of integration the brighter the subject. The appropriateness of the drawing for the particular stimulus is also considered along with proportionality and originality. To date the scoring procedure is not firmed up well enough to serve as a basis for this study.

Scoring Scale for Hypotheses One Through Six

It will be noted in reviewing the hypotheses that a different system is necessary in scoring the drawings for purposes of hypotheses one through six than will be used for hypothesis eight. Two different scoring systems will be employed for purposes of the first six hypotheses.

The first scoring system.--The first system employed in the testing of the first six hypotheses makes use of the following variables: dimensionality, meaningfulness, proportionality, integration, detail, repetition, and time. Originality, used as a variable by Kinget, Stark, and the Rorschach test, appears inappropriate for this study inasmuch as a list of popular responses has not yet been amassed. Abstraction as a variable does not appear appropriate for children upon the basis of the study involving the Okemos school children. The above mentioned variables are defined in the following manner:

1. Dimensionality: Drawings may be classified as one, two, or three dimensional in nature. The properties of dimensionality are sufficiently well defined as to make further definition unnecessary.

2. Meaningfulness: This variable refers to the ability of the drawing to convey something of a representational nature to the examiner. Since the child is not asked to verbally identify the drawing, meaningfulness must be inherent in the projected qualities of the drawing.

3. Proportionality: This variable refers to the relationship of the various parts of the picture to the whole. It depends exclusively upon the meaningfulness of the picture. Consequently, if a drawing is not perceived as having meaningfulness, there is no way of rating the degree of proportionality offered by the drawing.

4. Integration: This variable is judged to be present when there is clear evidence that the subject has taken cognizance of the stimulus in his drawing. Degree of integration is not considered at this point. The sole criterion is whether or not there is clear evidence that the subject has attempted to incorporate the stimulus into his drawing.

5. Detail: Drawings which add ornamentation beyond that necessary for clear recognition of the item represented are given credit for detail.

6. Repetition: Drawings which appear to be replicating a previous theme suffer a penalty of one point. In a sense, this is a reverse procedure for scoring variety of content. It appears to lend itself to objective scoring more fully than does variety as a scoring variable.

This first scoring system is of the type used by Keith. It is an omnibus sort of scale with certain variables weighted more heavily than others. The reader is referred to a copy of the scale found on page thirty seven. There are no empirical data to support the relative weightings assigned in the various factors in the scale. Where variables have been assigned inappropriate weightings, this fact works against the validity of an instrument. Consequently, the present investigator does not entertain as much hope for the validity of this first scoring system as for the second system to be mentioned.

The second scoring system.--The second system weighs each scoring variable equally. Scores will be obtained for each of seven variables: integration, repetition, "bursting the frame," dimensionality, proportionality, detail, and meaningfulness. The variables will be scored in the following manner:

1. Each of the eight frames will receive a score based upon its success or failure in integrating the stimulus within the frame. A score of "three" will be given drawings which are evaluated by the scorer as incorporating the stimulus within the drawing. A score of "one" will be assigned to a drawing which appears to have ignored the stimulus. In the case of a drawing which is difficult to score with either a "three" or a "one," i.e., a drawing where there is evidence that the stimulus was recognized but not incorporated within

the drawing, a score of "two" will be assigned.

2. Repetition will be scored as follows: a drawing which clearly repeats a previous theme receives a score of "one." A score of "two" is given where the evidence is unclear, and a score of "three" is assigned each drawing showing no tendency to repeat a theme.

3. "Bursting the frame" will refer to those drawings which disregard the borders of the frame. Such a performance could be obtained from a cerebral palsied child, a mentally deficient child or from a non-conforming creative child. There are no known cerebral palsied children in the sample. An effort will be made to identify those children who have disregarded the borders, "bursted the frames," for creative purposes. It is believed that such a performance will appear creative and not merely defiant or non-elightened. A drawing "bursting the frame" is given a score of "one," while a drawing not guilty of this infraction is given a score of "three."

4. A three dimensional drawing is scored "three." A two dimensional drawing is scored "two," and a one dimensional drawing is scored "one."

5. Drawings manifesting exacting proportional qualities are scored "three." Drawings showing measurable proportionality (but described as being less than exacting) are assigned a score of "two," while grossly disproportionate drawings are scored "one."

6. Where there is clear evidence of ornamentation on a drawing beyond that inherent within the qualities of the figure, a score of "three" is given. Where there is doubt, a score of "two" is given, and a "one" where there appears to be no detail.

7. Drawings which are clearly representational in nature are assigned scores of "three." Drawings which appear unintelligible to the scorer are assigned scores of "one," and questionable drawings are assigned scores of "two."

Scores obtained for each of these seven variables will be added to gain a total score for each subject. It is the total score which will be used in the correlations involved in the first six hypotheses. A copy of this scoring system is found on the following page.

Scoring for Hypothesis Eight

Each of the subhypotheses subsumed under hypothesis eight involves one of the seven variables just discussed above. Scoring of the variable in each case will be exactly the same as the scoring of that variable discussed above (e.g., a drawing which clearly integrates the stimulus is scored "three"; a drawing which has ignored the stimulus a score of "one"; and a drawing which is not clear in this respect a score of "two").

Wartegg Drawing Competion Test
Scoring Scale II

Name ______________ Frames School ______________

Scoring Variable	1	2	3	4	5	6	7	8	Total
Meaningfulness									
Dimensionality									
Proportionality									
Integration									
Detail									
Bursting Frame									
Repetition									
Grand Total									

Figure 3. Wartegg Drawing Completion Test II

Administration of Test

The Wartegg test was administered to the subjects by units of classrooms. The following procedures were observed in each case:

1. The pupils were seated a suitable distance apart to render opportunities for cheating less likely.
2. The drawing blank was attached to the back of a manilla folder to insure a uniform drawing surface.
3. The subjects were furnished number two drawing pencils, again to insure uniformity.
4. Thereupon the subjects were given the following instructions in accordance with the suggestions offered in Kinget's manual:

> On this form you see eight squares. Each of these squares contains little signs. These signs have no special meaning; they are to be part of the drawings which I want you to make in each of the squares. You may draw whatever you like and you may start with the sign you like best. You may work as long as you wish, and you may use the eraser. Do not, however, turn the sheet. This must be the top. [Examiner illustrates].(34:28-29)

The instructions were repeated for purposes of clarity. Most of the children appeared to understand quite well and promptly proceeded to busy themselves with the task. However, a few pupils appeared immobilized, and it was necessary for the examiner to paraphrase the instructions slightly in order to get them started. Time required for administering the test to an entire class ranged from thirty to forty-five minutes.

Statistical Procedures

Members of the sample will be randomly assigned to two groups. The study will be conducted using one group, and a cross-validation study will make use of the second group. In an attempt to assess possible sex differences, each validation group will be separated according to sex.

Hypotheses one through six.--In order to test hypotheses one through six a Pearson Product-Moment coefficient of correlation will be employed to examine the relationship between the Wartegg scores and (1) Primary Mental Abilities scores, (2) each factor on the Primary Mental Abilities test, (3) the arithmetic scores on the Stanford Achievement Test, (4) the reading scores on the Stanford Achievement Test, and (5) grade point averages. Each correlation will be tested to determine if it is significantly different from zero. The significance level will arbitrarily be set at .05. Separate correlations will be obtained using both scoring scales to which we have previously referred.

Hypothesis seven.--This hypothesis will be tested by obtaining a mean score for each sex using both scoring systems. An F test will be computed to determine the homeogeniety of the variances of the sex groups, and the appropriate t test will be applied to evaluate the significance of the difference between means. Again a significance level of .05 will be used.

Hypothesis eight.--Each of the subhypotheses in this major hypothesis will be tested by using a Pearson Product-Moment coefficient of correlation to gain an index of the relationship between scores on the variable involved and each of the validating criteria mentioned in the hypothesis. A score for the variable of interest in the subhypothesis will be gained for each subject by totaling his scores for that variable for each frame. It is this total score which will be correlated with the validating criteria mentioned in the subhypothesis. Again, an .05 level of confidence will be used to determine the significance of the correlation.

Validating Criteria

1. Science Research Associates Primary Mental Abilities Test: The elementary form of this test is the appropriate form for our age group. This test was developed by the Thurstones as a relatively "pure test" of the "primary mental abilities" discovered by the authors in a factor analysis of 56 tests administered to students at the University of Chicago. The test is broken down into

five factors: verbal, spatial, reasoning, perceptual, and numerical. These factors were five of the eight factors discovered in the factor analysis mentioned above.(12:256-258)

The *verbal factor* is broken down into a score for words and a score for pictures so as not to unduly penalize reading disability cases. The verbal factor purports to measure verbal comprehension and reasoning. The *number factor* attempts to measure the same thing as measured by simple arithmetic tests. The *spatial factor* represents an attempt to measure one's ability to conceptualize relationships among objects in space. The *reasoning factor* is broken down into a score for words and a score for figures and purports to measure the ability to induce a rule from several instances. The *perceptual factor* is supposed to measure clerical speed and accuracy.

The I.Q. is derived by the formula 2V + R, where V refers to the verbal factor and R to the reasoning factor. It is evident that V and R are considered to be much better predictors of school achievement than the other three factors. Unfortunately, these additional scores to date have not been too useful in predicting educational or vocational success.

Anastasi(28) points up the inadequacy of the treatment of reliability coefficients. Inter-correlations among factors are much too high with several groups to claim to be pure factors.(28) Unfortunately, test construction efforts in this case have been somewhat crippled by abbreviating its form in an attempt to improve its commercial features. This

shortening of the subtests has worked to the disadvantage of the reliabilities of the factors.

In spite of the apparent shortcomings of the test, the Primary Mental Abilities test remains one of the better factored, group tests for use in the schools. The modest reliabilities of the factors, however, will result in a conservative test of the hypotheses.

2. Grade Point Averages: Grade point averages have all the weaknesses of any ranking system as a validating criteria. Ranking systems are notoriously unreliable.

3. Socio-economic Class Index: In a progress report of a study being conducted at Michigan State University (40) under the auspices of the United States Office of Education, a method is reported for the determination of a socio-economic-educational index. Weightings for the variables--mother's educational level, father's educational level, and prestige ranking of father's occupation are used. These weightings, however, were determined for college freshmen and are, therefore, not applicable to the present study. The specific procedures for deriving the S-E-E index has been reported by Hagood and Price.(20:527)

In an unpublished study, C. Farquhar(14) has presented the composite index weightings for a group of elementary school children. On an a priori basis it was decided to use her weightings in the present investigation. The formula adopted reads:

$$\text{Index scores} = .074X_1 + .460X_2 + .548X_3$$

where, X_1 = father's occupational rating,

X_2 = father's educational weighting, and

X_3 = mother's educational weighting.

A copy of the questionnaire distributed to obtain the needed information is found in the Appendix.

4. Age: Ages for the subjects included in our sample ranged from nine years, zero months, to thirteen years, zero months. The ages of the children at the time of the administering of the achievement tests in February were used.

CHAPTER IV

ANALYSIS OF THE DATA

The entire sample was divided into two validation groups by means of a table of random numbers. Since a great number of correlations and inter-correlations were to be obtained, members of the sample for whom there existed incomplete data were deleted in order to render our groups less shifting and thereby more comparable. Members of the validation groups were then separated according to sex. There were fifty-one males and forty-one females in the validation group, and forty males and forty-four females in the cross validation group.

The data for testing the hypotheses in this study are found in Tables 1 through 11. The statistics recorded in the tables were obtained through the use of the Michigan State University computer facilities. The data were processed independently upon four different occasions to check the accuracy of the print-outs. An asterisk placed beside a figure in a table indicates that the correlation (or value of $\underline{t}$ as the case may be) is significant at the .05 level of confidence.

Results for Hypotheses One Through Six

Hypotheses one through six deal with the relationship between scores on the Wartegg and fifteen validating criteria. These validating criteria were the I.Q. scores and nine factors on the Science Research Associates Primary Mental Abilities test, age, grade point average, reading achievement scores, arithmetic achievement scores, and socio-economic status. Tables 1 and 2 present the results of this investigation. Table 1 offers the correlations between the Wartegg scores using Scoring System I (hereafter referred to as Wartegg I), while Table 2 offers the correlations between the Wartegg scores using Scoring System II (hereafter referred to as Wartegg II).

In Table 1 it will be seen that among the males in the validation group the Wartegg I scores proved to be significantly related to all of the validating criteria except age and the Perceptual factor on the Primary Mental Abilities test.* Only the Spatial factor held up, however, in the cross validation. The Perceptual factor while not significant in the validation group proved significant in the cross validation group.

Among females in the validation group ten of the fifteen validating criteria proved significantly related to the

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*Hereafter the nine factors on the Science Research Associates Primary Mental Abilities test will be referred to independently to the test of which they are parts. A discussion of these factors may be found on pages 49 and 50.

TABLE 1

TABULATED DATA CORRELATING WARTEGG I SCORES WITH FIFTEEN VALIDATING CRITERIA

Criteria	Validation		Cross Validation	
	Male	Female	Male	Female
I.Q.	.483*	.407*	.149	.553*
Age	-.212	.152	.179	.021
Grade Point Average	.514*	.475*	.181	.246
Reading	.584*	.349*	.219	.491*
Arithmetic	.569*	.371*	-.054	.494*
Verbal (words)	.475*	.302*	.044	.419*
Verbal (pictures)	.423*	.225	.054	.430*
Verbal	.521*	.308*	.064	.463*
Spatial	.357*	.266*	.420*	.469*
Reasoning (words)	.491*	.331*	.197	.362*
Reasoning (figures)	.301*	.244	.105	.332*
Reasoning	.482*	.342*	.203	.429*
Perceptual	.083	.309*	.455*	.512*
Numerical	.311*	.231	-.015	.212
Socio-Economic	.391*	.222	-.030	-.131

*Significant at the .05 level.

Wartegg scores. These were I. Q., grade point average, reading achievement, arithmetic achievement, and the Verbal (words), Verbal, Spatial, Reasoning (words), Reasoning and Perceptual factors. All of these variables, except grade point average, held up in the cross validation. In addition the Verbal (words) and Reasoning (figures) factors proved significant in the cross validation but not in the validation group.

Table 2 presents the results using the Wartegg II scores. Among the males in the validation study all of the variables except age and the Reasoning (figures) and Perceptual factors were significantly related to the Wartegg II scores. Five of these twelve variables held up in the cross validation study. These were I.Q., reading achievement, and the Spatial, Reasoning (words) and Reasoning factors. The Perceptual factor proved significant in the cross validation but not in the validation group.

Among the females on the validation study nine variables proved significant. These were I.Q., grade point average, reading achievement, arithmetic achievement and the Verbal (words), Verbal, Spatial, Reasoning (words) and Reasoning factors. All of these variables held up in the cross validation study. Four additional variables proved significant among the females in the cross validation study. These were the Verbal (pictures), Reasoning (figures), Perceptual, and Numerical factors.

TABLE 2

TABULATED DATA CORRELATING WARTEGG II SCORES WITH FIFTEEN VALIDATING CRITERIA

	Validation		Cross Validation	
Criteria	Male	Female	Male	Female
I.Q.	.414*	.365*	.259*	.540*
Age	-.177	.074	.112	-.005
Grade Point Average	.487*	.423*	.227	.301*
Reading	.537*	.385*	.298*	.482*
Arithmetic	.540*	.358*	.055	.523*
Verbal (words)	.424*	.315*	.135	.431*
Verbal (pictures)	.436*	.221	.125	.448*
Verbal	.488*	.320*	.151	.472*
Spatial	.292*	.258*	.431*	.411*
Reasoning (words)	.457*	.278*	.298*	.420*
Reasoning (figures)	.123	.226	.193	.294*
Reasoning	.357*	.297*	.312*	.403*
Perceptual	.101	.161	.472*	.505*
Numerical	.404*	.192	.081	.270*
Socio-Economic	.356*	.044	-.072	-.141

*Significant at the .05 level.

Results for Hypothesis Seven

Hypothesis seven deals with sex differences in the Wartegg scores. The data to test this hypothesis are presented in Tables 3 and 4. The distribution of scores for each variable was checked for homogeniety of variance. No significant sex differences were obtained for any of the variables in the validation study. Significant differences between the means for the sexes were obtained for Wartegg I and Proportionality in the cross validation group. The difference in both cases was in favor of the females.

Results for Hypothesis Eight

The data for the sub-hypotheses in hypothesis eight are presented in Tables 5 through 11. Each of the sub-hypotheses deal with one of the scoring variables on Wartegg II. Table 5 offers correlational data for integration. Among males Integration was not significantly related to any of the variables in the validation study and only to the Spatial factor in the cross validation. Among females only the Numerical factor in the validation group and the Perceptual factor in the cross validation group proved significantly related to Integration.

Table 6 presents the correlational data for Repetition. Among both males and females in the validation study none of the variables proved significantly related. Grade point average and reading achievement scores were significantly related to Repetition among males in the cross validation and

TABLE 3

MEANS, STANDARD DEVIATIONS AND t VALUES OF THE WARTEGG SCORING SYSTEMS AND THEIR VARIABLES FOR MALES AND FEMALES IN THE VALIDATION STUDY

	Males N=51		Females N=41		Heterogeneous Variables	d.f.	t Values
	Mean	S.D.	Mean	S.D.			
Wartegg I	14.51	2.48	14.91	2.34	1.12	90	N.S.
Wartegg II	138.23	9.32	138.93	8.47	1.21	90	N.S.
Meaningfulness	21.60	2.72	22.22	2.40	1.28	90	N.S.
Dimensionality	16.29	1.37	16.06	.39	12.3*	39	N.S.
Proportionality	12.00	3.71	17.40	3.03	1.49	90	N.S.
Integration	23.68	.87	23.47	1.61	3.42*	39	N.S.
Detail	12.62	.449	.3100	4.41	1.03	90	N.S.
"Bursting the Frame"	24.00	.00	23.86	.62	.38	90	N.S.
Repetition	22.82	1.61	22.75	1.46	1.21	90	N.S.

*Significant at the .05 level.

TABLE 4

MEANS, STANDARD DEVIATIONS AND t VALUES OF THE WARTEGG SCORING SYSTEMS AND THEIR VARIABLES FOR MALES AND FEMALES IN THE CROSS VALIDATION STUDY

	Males N=40		Females N=44		Heterogeneous Variables	d.f.	t Values
	Mean	S.D.	Mean	S.D.			
Wartegg I	13.44	3.50	15.40	2.43	2.07*	38	2.96*
Wartegg II	134.45	12.06	141.88	10.74	1.26	82	N.S.
Meaningfulness	20.87	4.47	22.36	2.36	3.58*	38	N.S.
Dimensionality	15.77	.75	16.93	2.34	9.73*	38	N.S.
Proportionality	16.32	3.87	18.20	3.38	1.31	82	2.36*
Integration	22.75	3.16	23.31	1.78	3.15*	38	N.S.
Detail	12.35	4.26	14.00	4.85	1.29	82	N.S.
"Bursting the Frame"	23.95	.31	24.00	.00	.09	82	N.S.
Repetition	22.50	2.15	23.06	1.43	2.26*	38	N.S.

*Significant at the .05 level.

TABLE 5

TABULATED DATA CORRELATING THE INTEGRATION SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

Criteria	Validation		Cross Validation	
	Male	Female	Male	Female
I.Q.	.021	.147	.093	.230
Age	.145	-.144	.044	.022
Grade Point Average	-.111	.039	.003	.187
Reading	.073	.127	.113	.167
Arithmetic	.062	.209	.005	.121
Verbal (words)	-.021	.097	.072	.217
Verbal (pictures)	.105	.235	.154	.198
Verbal	.027	.163	.112	.209
Spatial	.129	.113	.316*	.071
Reasoning (words)	-.144	.030	.167	.174
Reasoning (figures)	.149	.163	-.025	-.016
Reasoning	-.008	.125	.110	.071
Perceptual	-.072	-.026	.141	.339*
Numerical	.164	.421*	-.090	.229
Socio-Economic	.178	-.004	.084	.136

*Significant at the .05 level.

TABLE 6

TABULATED DATA CORRELATING THE REPETITION SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

Criteria	Validation		Cross Validation	
	Male	Female	Male	Female
I.Q.	.041	-.056	.126	.166
Age	-.074	.083	.004	-.036
Grade Point Average	.073	-.017	.345*	.289*
Reading	.21	-.049	.268*	.230
Arithmetic	-0.13	.003	.043	.267*
Verbal (words)	.042	-.046	.183	.164
Verbal (pictures)	-.153	-.074	.234	.331*
Verbal	-.034	-.063	.222	.218
Spatial	.198	-.016	-.128	.124
Reasoning (words)	.029	.017	.051	.156
Reasoning (figures)	.056	-.042	-.076	.060
Reasoning	.033	.008	-.023	.084
Perceptual	.108	-.068	-.041	.008
Numerical	.085	.026	.72	-.022
Socio-Economic	.104	-.098	.012	.055

*Significant at the .05 level.

grade point average, arithmetic achievement, and the Verbal (pictures) factor among females in the cross validation.

Table 7 presents the correlation data for "Bursting the Frame." Among males in the validation study and females in the cross validation "Bursting the Frame" was a constant since no member of those groups were guilty of this infraction. Consequently, there was absolutely no correlation between "Bursting the Frame" and the fifteen validating criteria for these groups. A significant, negative correlation was found to exist between the Reasoning factor and "Bursting the Frame" in the male cross validation group and between the Spatial, Reasoning (figures) and Perceptual factors and "Bursting the Frame" in the female cross validation group.

Table 8 presents the correlational data for Dimensionality. Among males in the validation study four variables proved significant. These were I.Q., reading achievement, and the Verbal (words) and Verbal factors. Only reading achievement held up in the cross validation group. Four additional variables proved significant in the cross validation study. These were reading achievement and the Spatial, Reasoning (words) and Perceptual factors.

Among females in the validation study grade point average and the Reasoning (figures) proved significant. Both of these variables held up in the cross validation. Ten additional variables proved significant. These were I.Q., reading achievement, arithmetic achievement, and the

TABLE 7

TABULATED DATA CORRELATING THE "BURSTING THE FRAME" SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA[a]

	Validation		Cross Validation	
Criteria	Male	Female	Male	Female
I.Q.	.0	-.114	.185	.0
Age	.0	.085	-.025	.0
Grade Point Average	.0	-.039	.194	.0
Reading	.0	-.218	.080	.0
Arithmetic	.0	.029	.104	.0
Verbal (words)	.0	-.093	.010	.0
Verbal (pictures)	.0	.054	.069	.0
Verbal	.0	-.015	.036	.0
Spatial	.0	-.038	.465*	.0
Reasoning (words)	.0	-.175	.050	.0
Reasoning (figures)	.0	-.182	.314*	.0
Reasoning	.0	-.263*	.159	.0
Perceptual	.0	.052	.346*	.0
Numerical	.0	-.252	.143	.0
Socio-Economic	.0	.047	-.218	.0

*Significant at the .05 level.

[a] "Bursting the Frame" was a constant for the male validation and female cross validation. Consequently the correlations were zero.

TABLE 8

TABULATED DATA CORRELATING THE DIMENSIONALITY SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

Criteria	Validation		Cross Validation	
	Male	Female	Male	Female
I.Q.	.260*	.182	.244	.409*
Age	-.106	.041	.123	-.154
Grade Point Average	.105	.258*	.348*	.290*
Reading	.236*	.093	.367*	.342*
Arithmetic	.119	.100	.213	.290*
Verbal (words)	.340*	.095	.213	.275*
Verbal (pictures)	.206	.159	.193	.308*
Verbal	.321*	.158	.232	.304*
Spatial	.118	.053	.288*	.043
Reasoning (words)	.114	.067	.283*	.485*
Reasoning (figures)	.097	.256*	.076	.285*
Reasoning	.143	.162	.249	.426*
Perceptual	.032	.066	.292*	.350*
Numerical	.111	.057	.057	.263*
Socio-Economic	.185	.180	.130	-.212

*Significant at the .05 level.

Verbal (words), Verbal (pictures), Verbal, Reasoning (words), Reasoning (figures), Reasoning, Perceptual and Numerical factors.

Table 9 presents the correlational data for Proportionality. Among the males in the validation study all of the variables except age, socio-economic status, and the Reasoning (figures) and Perceptual factors proved significant. Only I.Q. and the Spatial, Reasoning (words) and Reasoning factors held up in the cross validation study.

Among females in the validation study nine variables proved significantly related to Proportionality. These were I.Q., grade point average, reading achievement, arithmetic achievement, and the Verbal (words), Verbal, Spatial, Reasoning (words), and Reasoning factors. Eight of these held up in the cross validation. These were I.Q., reading achievement, arithmetic achievement, and the Verbal (words), Verbal, Spatial, Reasoning (words) and Reasoning factors. The Verbal (pictures), Reasoning (figures) and Perceptual factors also showed significance in the cross validation study.

Table 10 presents the correlational data for Detail. Among the males in the validation study ten variables proved significantly related to the amount of detail in the Wartegg drawings. These were I.Q., grade point average, reading achievement, arithmetic achievement, socio-economic status, and the Verbal (words), Verbal (pictures), Verbal, Reasoning (words) and Numerical factors. None of these variables held

TABLE 9

TABULATED DATA CORRELATING THE PROPORTIONALITY SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

Criteria	Validation		Cross Validation	
	Male	Female	Male	Female
I.Q.	.350*	.321*	.256*	.481*
Age	-.084	.000	.051	.081
Grade Point Average	.503*	.351*	.072	.241
Reading	.436*	.362*	.243	.451*
Arithmetic	.351*	.355*	.044	.544*
Verbal (words)	.316*	.365*	.154	.407*
Verbal (pictures)	.312*	.184	.158	.340*
Verbal	.351*	.336*	.189	.429*
Spatial	.231*	.338*	.390*	.384*
Reasoning (words)	.429*	.314*	.360*	.321*
Reasoning (figures)	.179	.107	.139	.298*
Reasoning	.373*	.255*	.315*	.387*
Perceptual	.115	.069	.483*	.405*
Numerical	.289*	.033	.011	.210
Socio-Economic	.180	.168	-.129	-.164

*Significant at the .05 level.

TABLE 10

TABULATED DATA CORRELATING THE DETAIL SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

	Validation		Cross Validation	
Criteria	Male	Female	Male	Female
I.Q.	.331*	.374*	.200	.435*
Age	-.217	.068	-.059	-.069
Grade Point Average	.392*	.396*	.101	.197
Reading	.543*	.402*	.251	.356*
Arithmetic	.514*	.318*	.004	.404*
Verbal (words)	.368*	.332*	.110	.440*
Verbal (pictures)	.410*	.228	-.022	.412*
Verbal	.437*	.325*	.069	.422*
Spatial	.229	.178	.052	.433*
Reasoning (words)	.332*	.289*	.177	.264*
Reasoning (figures)	.030	.220	.232	.191
Reasoning	.229	.303*	.242	.249
Perceptual	.090	.161	.345*	.386*
Numerical	.335	.160	.136	.211
Socio-Economic	.381*	.036	.108	-.090

*Significant at the .05 level.

up in the cross validation study. However, the Perceptual factor proved significant in the cross validation group.

Among the females in the validation study eight variables proved significant. These were I.Q., grade point average, reading achievement, arithmetic achievement, and the Verbal (words), Verbal, Reasoning (words) and Reasoning factors. Six of these variables held up in the cross validation study. These were I.Q., reading achievement, arithmetic achievement, Verbal (words), Verbal and Reasoning (words) factors.

Table 11 presents the correlational data for Meaningfulness. Among males in the validation study five variables proved significant. These were reading achievement, arithmetic achievement, and the Verbal (pictures), Verbal and Reasoning (words) factors. None of these variables held up in the cross validation. However, the Spatial and Perceptual factors showed significance in the cross validation.

Only grade point average proved significant for the females in the validation study. This variable failed to hold up in the cross validation study. However, the Spatial and Perceptual factors showed significance in the cross validation.

Intercorrelations on Wartegg II

Tables 12 through 15 present the intercorrelations among the scoring variables on the Wartegg II for each of the validation and cross validation groups. The data were

TABLE 11

TABULATED DATA CORRELATING THE MEANINGFULNESS SCORING VARIABLE ON WARTEGG II WITH FIFTEEN VALIDATING CRITERIA

	Validation		Cross Validation	
Criteria	Male	Female	Male	Female
I.Q.	.177	.111	.22	.193
Age	-.149	.170	.260*	.159
Grade Point Average	.192	.297*	.227	.015
Reading	.274*	.174	.108	.211
Arithmetic	.446*	.080	.047	.226
Verbal (words)	.186	.016	-.031	.017
Verbal (pictures)	.264*	-.083	-.018	.050
Verbal	.256*	-.016	-.027	.075
Spatial	.067	.050	.532*	.257*
Reasoning (words)	.295*	.061	.127	.200
Reasoning (figures)	.011	.168	.207	.210
Reasoning	.195	.116	.222	.239
Perceptual	-.086	.206	.390*	.318*
Numerical	.110	.108	.048	.073
Socio-Economic	.185	-.067	-.249	-.148

*Significant at the .05 level.

TABLE 12

INTERCORRELATIONS AMONG THE WARTEGG SCORING VARIABLES FOR THE MALE VALIDATION GROUP
(N = 51)

	Wartegg I	Wartegg II	Meaning-fulness	Dimen-sionality	Propor-tionality	Integra-tion	Detail	Bursting the Frame	Repeti-tion
Wartegg I	1.0*								
Wartegg II	.879*	1.0*							
Meaning-fulness	.700*	.711*	1.0*						
Dimension-ality	.343*	.479*	.282*	1.0*					
Proportion-ality	.692*	.713*	.388*	.203	1.0*				
Integra-tion	.199	.175	.064	.044	-.127	1.0			
Detail	.700*	.810*	.520*	.293*	.329*	.205	1.0*		
Bursting the Frame	.000	.000	.000	.000	.000	.000	.000	1.0*	
Repeti-tion	-.151	-.026	-.301*	-.021	.078	.141	-.214	.000	1.0*

*Significant at the .05 level.

TABLE 13

INTERCORRELATIONS AMONG THE WARTEGG SCORING VARIABLES
FOR THE MALE CROSS VALIDATION GROUP
(N = 40)

	Wartegg I	Wartegg II	Meaningfulness	Dimensionality	Proportionality	Integration	Detail	Bursting the Frame	Repetition
Wartegg I	+1.000*								
Wartegg II	.917*	+1.000*							
Meaningfulness	.877*	.859*	+1.000*						
Dimensionality	.579*	.569*	.625*	+1.000*					
Proportionality	.751*	.837*	.623*	.348*	+1,000*				
Integration	.653*	.660*	.636*	.351*	.432*	+1.000*			
Detail	.492*	.630*	.337*	.179	.500*	.110	+1.000*		
Bursting the Frame	.249*	.218	.317*	.164	.220	-.063	.088	+1.000*	
Repetition	-.186	-.115	-.234	.023	-.172	-.190	.272*	-.111	+1.000*

*Significant at the .05 level.

TABLE 14

INTERCORRELATIONS AMONG THE WARTEGG SCORING VARIABLES
FOR THE FEMALE VALIDATION GROUP
(N = 41)

	Wartegg I	Wartegg II	Meaning-fulness	Dimen-sionality	Propor-tionality	Integra-tion	Detail	Bursting the Frame	Repeti-tion
Wartegg I	1.0*								
Wartegg II	.844*	1.0*							
Meaning-fulness	.684*	.624*	1.0*						
Dimension-ality	.525*	.411*	.249	1.0*					
Proportion-ality	.712*	.824*	.434*	.377*	1.0*				
Integra-tion	.202	.314*	-.022	.056	.095	1.0*			
Detail	.699*	.881*	.423*	.272*	.602*	.221	1.0*		
Bursting the Frame	-.148	-.169	-.161	.038	-.186	-.071	-.170	1.0*	
Repeti-tion	-.072	.092	-.210	.030	.146	-.113	-.004	-.186	1.0*

*Significant at the .05 level.

TABLE 15

INTERCORRELATIONS AMONG THE WARTEGG SCORING VARIABLES FOR THE FEMALE CROSS VALIDATION GROUP
(N = 44)

	Wartegg I	Wartegg II	Meaningfulness	Dimensionality	Proportionality	Integration	Detail	Bursting the Frame	Repetition
Wartegg I	+1.000*								
Wartegg II	.850*	+1.000*							
Meaningfulness	.682*	.672*	+1.000*						
Dimensionality	.393*	.519*	.221	+1.000*					
Proportionality	.831*	.838*	.539*	.271*	+1.000*				
Integration	.187	.395*	.188	.103	.306*	+1.000*			
Detail	.773*	.861*	.467*	.289*	.681*	.137	+1.000*		
Burning the Frame	.000	.000	.000	.000	.000	.000	.000	+1.000*	
Repetition	-.078	.151	-.061	.143	-.096	.054	.046	.000	+1.000*

*Significant at the .05 level.

consistent in showing that for each group Meaningfulness, Dimensionality, Proportionality, and Detail were significantly related to both the Wartegg I and Wartegg II scoring systems. This evidence strongly suggests that Integration, "Bursting the Frame," and Repetition contributed little to the discriminatory power of the test. It would appear that these three scoring variables could be deleted without decreasing the validity of the test substantially.

Furthermore it will be noted that the correlation between Wartegg I and Wartegg II was in each case extremely high (ranging from .844 to .917). Such a relationship suggests that we have in effect one rather than two scoring systems.

Concerning the Sample

A careful scrutiny of the correlational tables for each of the groups will indicate that the male cross validation group consistently showed lower correlations with the various validating criteria than did the other groups. A number of hand calculations were made to check the accuracy of the machine calculations for this group. In each case the correlations were identical. An inspection of the scores for the groups bore out the observation that generally there existed less agreement among the variables for the male cross validation group than for any other. It appears that such differences can only be accounted for on the basis of sampling error in assigning members to the validation and cross validation groups.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

The problem.--The purpose of this study was to investigate the usefulness of the Wartegg Drawing Completion Test as a test of intelligence among public school children in the United States. For practical purposes the sample was limited to the fourth grade population of a local school system. A set of fifteen validating criteria, all believed to be related to intelligence, was adopted. Scores on the Wartegg from two different scoring systems were compared with the validating criteria. Seven of the eight hypotheses of the study dealt with comparisons of the Wartegg scores (or variables within the Wartegg scoring system) with the validating criteria. An eighth hypothesis was concerned with possible sex differences on the Wartegg scores.

The sample.--The sample for the study consisted of the fourth grade population of the Waverly School System near Lansing, Michigan. The sample suffered some attrition due to incomplete data for certain members. Members of the sample were separated according to sex and further separated into a

validation and cross validation group. There were fifty-one members in the male validation group, forty-one in the female validation group, forty in the male cross validation group, and forty-four in the female cross validation group.

Methodology.--The data for the study were collected in the following manner. Each of the ten classrooms used in the sample was administered the Wartegg test in a standardized manner. Much of the data for the validating criteria was obtained from the cumulative record folders or from the pupil personnel central files for the system. The data for the socio-economic index were obtained through the use of a questionnaire.

The resulting data were carefully arranged, punched on I.B.M. cards and processed through an appropriate program (Correlation, Communality, Principle Axes Factor Analysis Sequence) at the Michigan State University Computer Facilities Laboratory. The results were tabled and in some cases hand calculated as an additional check on the accuracy of the results. In all, seven hundred and twenty correlations and ninety-six means and standard deviations were calculated. Each correlation was checked to see if it were significantly different from zero. Each of the means and standard deviations was checked for homeogeniety of variance and appropriate t tests were run to check the significance of the differences between the means of the sexes for each variable in question.

The findings.--Hypothesis 1 suggested that a significant correlation would be found between Wartegg scores and scores obtained on the Science Research Associates Primary Mental Abilities test. Significant correlations were found between the Wartegg scores and the derived I.Q. on the Primary Mental Abilities test. Furthermore, significant correlations were also found between the Wartegg scores and many of the factors on the Primary Mental Abilities test. Since the reliability of the various factors on the Primary Mental Abilities test is considerably less than that for the derived I.Q., one would hardly expect that every factor should prove significantly correlated with the Wartegg scores. The Verbal (words), Verbal, Spatial, Reasoning (words), and Reasoning factors were all significantly related in at least three of the four validation groups. The results of this study appear to support Hypothesis 1; i.e., there is a significant relationship between scores on the Wartegg test and the Primary Mental Abilities test.

Hypothesis 2 suggesting a significant correlation between the Wartegg scores and the arithmetic scores on the Stanford Achievement Test likewise was supported by three of the four validation groups.

Hypothesis 3 suggested that a significant correlation would exist between the Wartegg scores and the reading scores on the Stanford Achievement Test. All four of the validation

groups showed a significant relationship between reading achievement and the Wartegg II scores. Three of the four validation groups showed a significant relationship between reading achievement and the Wartegg I scores. The results, therefore, tend to support Hypothesis 3.

Hypothesis 4 suggested a significant correlation between the Wartegg scores and grade point average. The male and female validation groups showed a significant relationship between grade point average and the Wartegg I scores, while three of the four groups showed significance between grade point average and the Wartegg II scores. While the results in this case are less conclusive than for the previous hypotheses, one could hardly interpret the results as disproving Hypothesis 4.

Hypothesis 5 suggesting a significant correlation between the Wartegg scores and age found no support from the data. In each validation group the correlation failed to gain significance. With reasonable confidence we, therefore, reject Hypothesis 5. However, it is highly likely that the correlation suffered markedly due to the limited range of ages involved in the study. The limitation of the age range was due to the fact that all members of the sample were fourth graders.

Hypothesis 6 suggesting a significant correlation between the Wartegg scores and socio-economic status was supported only in the case of the male validation group. The evidence seems less than clear in respect to this hypothesis.

Hypothesis 7 suggesting significant sex differences in regard to scores on the Wartegg was supported only in the case of the Wartegg I scores and scores on Proportionality (a scoring variable on Wartegg II) in the cross validation. In each case the difference favored the females. While the results are not unequivocal, nevertheless with reasonable confidence we can reject the hypothesis that there exists significant sex differences in the Wartegg scores in each validation group.

Hypothesis 8 consisted of a series of sub-hypotheses all suggesting significant correlations between one of the seven scoring variables on the Wartegg II and I.Q., arithmetic achievement, reading achievement, grade point average, age, and socio-economic status. The following summarizes the results for each of the seven scoring variables:

(a) Integration of stimuli. This scoring variable failed to show a significant relationship to any of the validating criteria mentioned above. However, it appeared significantly related to the Wartegg II total scores in three of the four groups. Perhaps a more refined treatment of this variable such as is presently being suggested by Kinet could have significantly improved the performance of the variable in this study.

(b) Repetition of drawing themes. A significant relationship was shown to exist between this variable and grade point average in both the male and female groups of the cross validation study. No significant correlations were found

between Repetition and grade point average in the validation study however. One of the four groups showed a significant correlation between Repetition and reading achievement and another of the groups showed a significant correlation between Repetition and arithmetic achievement. I.Q., age, and socio-economic status failed to attain significance for any of the groups. In general, there does not seem to be sufficient evidence to support the hypothesis that Repetition is significantly correlated with the validating criteria mentioned. Furthermore, Repetition did not appear to be contributing greatly to the total Wartegg scores since in none of the groups did it appear significantly correlated with total Wartegg scores.

(c) "Bursting the Frame." The incidence of this infraction in the drawings of the children within the sample were so few as to result in nonsignificant correlations between this variable and each of the validating criteria. None of the four groups showed significant correlations for any of these criteria. One might conjecture that very few such infractions would likely occur with a group of "normal" fourth grade children, that such an infraction is much more likely for cerebral palsied children (or children with other motor disabilities), or for severely mentally retarded children.

(d) Dimensionality. This variable proved significantly correlated with I.Q. in the male validation and female cross validation groups, with grade point average in all of the groups except the male validation, with reading achievement

in all of the groups except the female validation, and with arithmetic achievement only in the case of the female cross validation group. In none of these groups was there a significant correlation with age or socio-economic status. This variable appears to be contributing markedly to the Wartegg total score since for each group it correlated significantly with the Wartegg total scores.

(e) Proportionality. This variable proved significantly correlated with I.Q. in all four of the validation groups, with grade point average in two of the four and with reading and arithmetic achievement in three of the four groups. The correlations with age and socio-economic status proved to be nonsignificant for each of the groups. It appears, therefore, to be contributing significantly to the Wartegg total scores.

(f) Detail. In three of the four validation groups Detail was found to be significantly correlated with I.Q., reading achievement and arithmetic achievement. In two of the groups it was significantly correlated with grade point average, in one of the groups with socio-economic status, and in none of the groups with age. This scoring variable correlated significantly with the Wartegg scoring system and consequently appeared to be contributing heavily to the total score obtained on the Wartegg test.

(g) Meaningfulness. This variable was not significantly correlated with I.Q. in any of the validation groups, was significantly correlated with grade point average only in the female validation group, with age in the male cross validation

group with reading achievement in the male validation group, and with arithmetic achievement in the male validation group. Nevertheless, this variable appeared to be contributing significantly to the total scores on the Wartegg since it correlated highly with this system in each of the validation groups.

Conclusions

1. The effect of this study has been to suggest that the Wartegg Drawing Completion Test can be used as a test of intelligence among children represented by our sample. The many significant correlations between the Wartegg and validating criteria strongly suggest that there is a relationship between a child's performance on this test and his general intelligence, and academic achievement.

2. Significant correlations between the Wartegg and factors on the S.R.A. Primary Mental Abilities test were relatively evenly distributed among the various factors. This suggests that the significant correlation between the Wartegg scores and the Primary Mental Abilities I.Q.'s was not due to the Wartegg's correlation with only a few of the factors on the Primary Mental Abilities test.

3. The two Wartegg scoring systems used in this study do not appear to be significantly different. The high correlations found between the two suggest that in the main we have one scoring system, not two.

4. The limited range of possible scores for any one variable on the Wartegg test likely results in low reliability coefficients for that variable. While the total scores on the Wartegg have proven to be moderately reliable, any single scoring variable with a much shorter range of possible scores probably has markedly lowered reliability. Poor reliability among the various scoring variables probably contributed negatively to significant relationships between the scoring variables and the validating criteria with which they were compared. The variables which correlated highly with the Wartegg total scores were in general those which also obtained a number of significant correlations with the validating criteria. This, of course, is as one would expect.

5. The total scores on the Wartegg appeared to depend in large measure upon the contribution of five variables. These were Meaningfulness, Dimensionality, Proportionality, Integration, and Detail. "Bursting the Frame" and Repetition appeared to be offering little to the total score obtained on the Wartegg. The contribution of Integration to the total Wartegg score was not as convincingly demonstrated as was the contribution of the other four variables.

Implications for Further Research

1. In future work with this instrument it is recommended that the scoring variables undergo further refinement. Descriptions of the scoring variables could become more definitive and thus render the scoring more objective. Such a refinement

should improve the reliability of the instrument and could, as a result, improve its validity.

2. The two variables, "Bursting the Frame" and Repetition should be deleted from the scoring system since they do not appear to be contributing to either the total score of the Wartegg nor to the Wartegg's correlation with validating criteria.

3. The scoring variables should be reinterpreted so as to result in a wider range of possible scores. This should also contribute to the test's reliability.

4. A larger, more representative sample of American public school children of all grades should be worked with in the future in order to check the validity of the results of this study. It will be noted that generalizations from this present study cannot with confidence over reach the fourth grade population of the Waverly school system since the sample was drawn entirely from this group. There were no recognizable characteristics so peculiar to this group as to suggest that the sample is unrepresentative of the fourth grade population of the United States public school system, but one can not assume this with great assurance. A further study with a larger, more representative sample of public school children throughout the United States is needed to evaluate the results and conclusions reached in this study.

5. Age norming is very much needed before the test can be used with a wide range of children. At present all

that one can indicate from a given Wartegg score is whether it is above or below the mean for fourth grade children within our sample. One must first establish age norms before a score on the Wartegg can be interpreted meaningfully.

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APPENDIX

WAVERLY SCHOOL DISTRICT
June 1, 1962

Dear Parent:

In bringing up-to-date our records it has become necessary to gain further information concerning the job distribution and educational level of parents in our community. Your cooperation in this effort will be extremely valuable to us.

Our sample will include parents of pupils within the fourth grades only. These booklets were originally designed for use by the pupils themselves. However, it is now felt that it could be filled out more accurately by parents. We would appreciate it very much if these cards and booklets could be returned the day after they are received.

Thank You For Your Cooperation,

John Grabow,
Waverly Schools
Coordinator of Guidance

EDUCATIONAL LEVEL OF PARENTS

DIRECTIONS:

Fill in your name, school and birthdate on the Data Card.

Listed below are eight (8) categories describing eight (8) different educational levels. Read the complete list of categories and select the one category that describes the educational level of your Father. Record this category number on the designated space provided on the Data Card. Then select the category number that described the educational level of your Mother, and record this number on the designated space provided on the Data Card.

EDUCATIONAL CATEGORIES

Category numbers	
1.	If attended grade school (grades 1 to 8) but did not finish
2.	If completed grade school through grade 8
3.	If attended high school (grades 9 to 12) but did not finish
4.	If graduated from high school
5.	If attended college but did not graduate
6.	If graduated from college
7.	If attended graduate school or professional school but did not attain a graduate or professional degree
8.	If graduated from graduate or professional school

PLEASE DO NOT WRITE ON THIS BOOKLET

OCCUPATIONAL INFORMATION ABOUT PARENTS

DIRECTIONS:

Listed on the following pages are names of occupations or jobs which are listed in alphabetical order. Each occupation listed has a number after it.*

EXAMPLE:

Occupation	Number
Truck Driver	54

Look carefully through the following list for your Father's occupation. Write the name of your father's occupation and the number that follows it in the space provided on the Data Card. Also select your Mother's occupation from the same list (if other than housewife) and record the name and the number on the Data Card.

If you have any questions or cannot find your father's or mother's occupation, raise your hand.

PLEASE DO NOT WRITE ON THIS BOOKLET

*The following pages, in the original booklet submitted for this study was double spaced, two columns to a page. However, it has been single spaced herein to limit the length in this dissertation.

Accountant - 78
Accountant, Certified Public - 81
Accountant, Tax, Gas Company - 80
Accountant for a large business - 81
Actuarial Assistant, Life insurance - 74
Actuary - 78
Advertising Man, Metropolitan Paper -70
Advertising Manager - 78
Advertising promoter - 72
Advertising Writer - 70
Aeronautical Engineer - 83
Agent, Internal Revenue - 77
Agent, Purchasing - 68
Agent, Rental - 68
Airline Pilot - 83
Airway Operation Specialist - 74 (control airport traffic)
Analyst, Service - 66
Appraiser, Real Estate (commercial property) - 68
Arborist for city - 73
Architect - 86
Artist, Advertising - 74
Artist, Technical - 69
Artist who paints pictures to exhibit in galaries - 83
Assembler at aircraft plant - 59
Assistant Editor-small town paper - 74
Assistant Floor Manager - 69
Assistant Manager-Restaurant -67
Attendant, Tool Crib - 57
Audiologist - 75
Auditor, Bank - 80
Auditor, Insurance Company-state - 79
Author of Novels -80
Auto Buffer - 56
Auto Mechanic-partnership - 66
Automobile Dealer - 77
Automotive Space Parts Specialist - 62
Auto Salesman - 70
Baker - 62
Baker-owner - 68
Bakery Worker - 48
Bank Auditor - 80
Bank Cashier - 70
Banker - 88
Bank Examiner - 75
Bank Inspector - 74
Bank Teller - 67
Bar (co-owner and operator) - 60
Barber - 59
Barber (owner and employer of 1) -63
Bar Owner - 62
Bartender - 44
Baseball Player-minor league - 67

Beer Dispatcher - 67
Billing Clerk - 59
Biochemist - 85
Biologist - 81
Blueprint Reader - 67
Boards children at home - 59
Boilermaker - 66
Boilermaker's helper - 60
Bookbinder - 60
Bookkeeper - 68
Brakeman-railroad - 63
Branch Manager-large company - 71
Bricklayer - 60
Brickmason - 65
Brick Setter - 60
Broker, Manufacturer's - 70
Broker, Motor Freight Company - 71
Broker, Real Estate - 72
Broker, Stock - 79
Buffer, Auto - 56
Builder of homes-supervises work - 69
Building Contractor - 79
Building Inspector - 68
Building Superintendent - 52
Bulldozer Operator - 59
Busboy - Busgirl - 43
Bus Driver-city - 57
Butcher - 59
Buyer for Department store for single department - 70
Buyer for Furniture store - 71
Buyer for Hardware store - 70
Cabinet Maker - 66
Cabinet Member - Federal Government - 92
Calculating Machine Operator - 64
Captain-Army - 80
Captain in city Fire Department - 70
Carpet Layer - 54
Carton Maker - 55
Cashier - 62
Cashier, Bank - 70
Cement Contractor - 74
Cement Finisher - 52
Ceramic Engineer - 80
Certified Public Accountant - 81
Chairman-surveying - 62
Checker-metal assembly line - 64
Chemist - 86
Chemist, Ink (no formal education) - 64
Chief of a Bureau, within a Department in State Government - 81
Chief of Police, city of 350,000 - 80
Chiropodist - 77
Chiropractor - 75
Church Worker-female (office, etc.) - 74

Civil Engineer - 84
Claims Adjuster-insurance - 70
Clerk, Actuarial in an insurance - 65
Clerk, Billing - 59
Clerk, Chief, Railroad Freight Office - 68
Clerk, General Office Worker - 62
Clerk, Payroll - 66
Clerk, Postal - 65
Clerk, Shipping Factory - 59
Clerk, Stock - 51
Clerk, Store - 58
Clerk, Technical - 66
Clothespresser in Laundry - 46
Coal Elevator Operator - 51
Coalminer - 49
Commercial Photographer - 72
Common Laborer - 40
Concessionaire - 62
Construction Engineer - 86
Construction Laborer - 50
Contractor, Building - 79
Contractor, Cement - 74
Contractor, General Painting - 74
Coordinator, Management - Labor - 75
Coordinator, Oil Company - 74
Coppersmith-railroad - 62
Corporal in Army - 60
Cosmetologist - 58
County Agricultural Agent - 77
County Judge - 87
Crane Operator - 59
Credit Investigator - 61
Cytologist - 80
Dairyman - 66
Dealer, Automobile - 77
Dealer, Hardware - 66
Department Head - Department Store - 73
Department Head - Large Company - 78
Department Head - Assistant in Department Store - 70
Department Leader - Steel Fabrication - 65
Designer, Dress - 75
Designer, Tool - 75
Diesel Operator - 62
Dietician - 78
Diplomat, U. S. Foreign Service - 92
Dishwasher - 33
Dispatcher, Chief Highway Motor Carrier Company - 69
Dispatcher, Train, railroad - 67
Distributor, Beer - 70
Distributor, Oil Business - 69
District Sales Manager - large company - 72
Dock Worker - 47
Draftsman - 69

Dress Designer - 75
Dressmaker - 62
Driller, Diamond Core - 68
Driver, City bus - 57
Driver, Greyhound Bus - 63
Druggist, Wholesale - 70
Dry Cleaning plant owner - 75
Economist - 79
Editor - 81
Electrical Engineer - 83
Electrician - 73
Electric Motor Tester - 62
Electrotyper - 66
Embalmer-owner - 72
Engineer, Aeronautical - 83
Engineer, Ceramic - 79
Engineer, Construction - 80
Engineer, Consulting - 86
Engineer, Electrical - 83
Engineer, Heating - 68
Engineer, Industrial - 82
Engineer, Maintenance - 64
Engineer, Mechanical -
Engineer, Mechanical Assistant Research - 78
Engineer, Operating-city - 70
Engineer, Process - 77
Engineer, Radio - 77
Engineer, Railroad - 77
Engineer, Research - 82
Engineer, Sales - 73
Engineer, Sales-gas heating - 68
Engineer, Stationary - 62
Engineer, Surveying - 78
Engineer, Tool - 75
Engineer, Time Study - 75
Engineer, T. V. - 75
Engineering Aids, Senior - 72
Engineman, Railroad - 65
Examiner, Bank - 75
Examiner, Tax - 77
Executive, Junior Advertising Firm - 70
Executive, Large Manufacturing Plant - 81
Executive, Publicity Director for a large Department Store-78
Executive, Publishing Company - 81
Executive, Telephone Company - 78
Executive, Transportation - 79
Expeditor, Aviation Company - 66
Express Messenger, supervisor on express train - 66
Factory Laborer - 47
Factory Manager - 68
Factory Worker - 50
Factory Worker (semi-skilled) - 55
Farmer, Owner and operator - 76

Farmer, Tenant - 68
Farm Hand - 50
Farm Laboaer, part time - 40
Feed Mill-part owner and operator - 67
Fieldman, Producers Livestock cooperative - 70
Filling Station Attendant - 52
Fireman, Captain in City - 70
Fireman, City - 65
Fireman, Railroad - 65
Fireman, Stationary - 53
Fisherman-owns own boat - 58
Fitter-female - 61
Flagman, Railroad - 60
Folder and Trimmer
Foreman, Assembly line - 66
Foreman, Dock for Trucking Company - 66
Foreman, Light Company - 66
Foreman, Main crew, factory - 67
Foreman, Maintenance of school - 52
Foreman, Railroad roundhouse - 66
Foreman, Shipping Department, Casket Company - 69
Freezer Operator - 59
Funeral Director - 72
Furniture maker, Church - 67
Garage Mechanic - 62
Garbage Collector - 35
Gas Company Accountant - 80
Gas Station Operator - non owner - 60
Gas Station Owner and operator - 70
Gas Station Part Owner - 69
General Office Worker, Clerk - 62
Glass Worker - 59
Governess - 69
Greyhound Bus Driver - 63
Grinder, Bearing - 67
Grinder, Casting - 60
Grinding, General - 59
Grocery Store Owner - 70
Guard - 55
Guard, Railroad - 55
Hardware Dealer - 66
Heating Engineer - 68
High School Superintendent - 80
Home Builder-supervises work - 69
Horticulturist - 77
Hospital Aide, Psychiatric - 61
Housekeeper - 53
Housekeeper, private - 54
Iceman - 50
Industrial, Engineer - 82
Inseminator - 61
Inspector, assembly line - 66
Inspector, Bank - 74

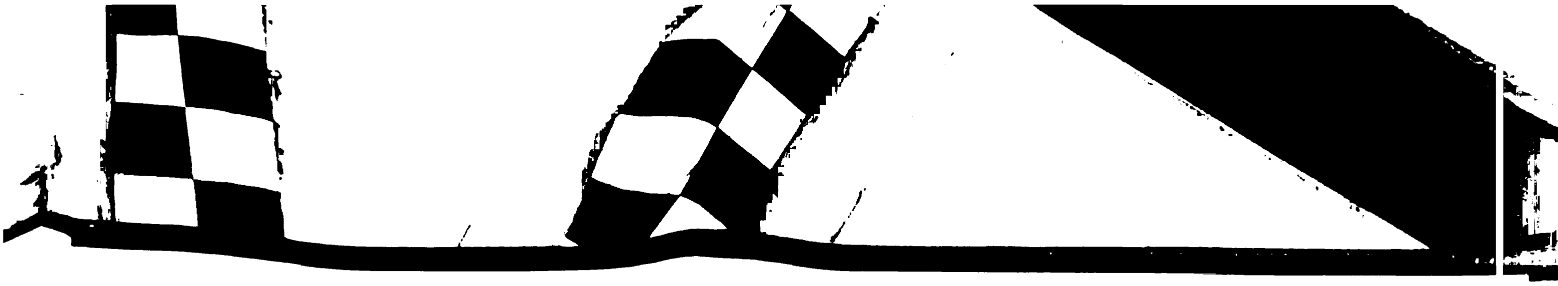
Inspector, Building - 68
Inspector, Factory - 65
Inspector, Machine shop - 67
Inspector, Railroad Steel Car - 60
Inspector, Refrigerator controls in plant - 62
Inspector, Water supply company (traveling) - 70
Installer, Canopy in jet planes - 63
Installer, Escalator - 62
Instructor, Ceramic (makes and sells) - 78
Insurance Group Leader, Veterans' Administration - 74
Insurance Underwriter - 69
Internal Revenue Agent - 77
Interviewer, Personnel - 71
Investigator, City Tax Division - 71
Investigator, Credit - 61
Iron Worker, Ornamental - 68
Iron Worker, Structural - 63
Janitor - 44
Jeweler - 72
Jeweler, Manufacturing - 73
Jig and Furniture Builder - 68
Job Setter - 69
Justice, U. S. Supreme Court - 96
Knife Maker and Sharpener - 44
Laboratory Aide - 60
Laborer, Common - 40
Laborer, Construction - 50
Laborer, Factory - 47
Labor Management Coordinator - 75
Labor Union-local official - 62
Labor Union-official of an international - 75
Laundress - 45
Leader of dance band - 70
Librarian - 74
Librarian, Museum - 76
Lieutenant, Air Force - 75
Lieutenant, Police-railroad - 69
Life Insurance Actuarial Assistant - 74
Lineman, Telephone Company - 63
Linotype, Operator - 67
Loan Officer - Bank
Loan Service Office Job - 76
Lumberjack - 53
Machine Operator-factory - 69
Machinist Master - 70
Machinist Trained - 73
Machinist's Helper-railroad - 59
Maid - 48
Mail Carrier - 66
Mail Handler at Depot - 62
Maintenance Engineer - 64
Maintenance Man - factory - 55
Maintenance Worker in furnished apartments - 48

Major, Air Force - 81
Manager, Advertising - 78
Manager, Assistant Floor - 69
Manager, Assistant Parts, factory - 65
Manager, Assistant Restaurant - 67
Manager Branch, large company - 71
Manager, Car Sales (new) Large metro company - 75
Manager, Chain Retail Grocery Store - 72
Manager, Credit, Van & Storage company - 70
Manager, Department, Newspaper - 76
Manager, Dime Store - 69
Manager, Display, single department of Department Store - 68
Manager, District, Heat Regulation Company - 70
Manager, District Sales for large company - 72
Manager, Division, Wholesale Cooperation - 72
Manager, General, Manufacturing plant that employs over 100 -77
Manager, Dry Cleaning Store - 88
Manager, Dry Goods store - 69
Manager, Garage - 68
Manager, Grill - 67
Manager, Hotel - 78
Manager, Large Company - 72
Manager, Large Department store - 80
Manager, Life Insurance Company - 75
Manager, Lumber Yard-small city chain - 72
Manager, Movie Theater - 70
Manager, Office - 70
Manager, Parts, factory - 68
Manager, Plant, large company - 75
Manager, Poolroom - 58
Manager, Production Control - 79
Manager, Promotion - 74
Manager, Public Utility - 81
Manager, Regional Claims-Life Insurance - 70
Manager, Sales - 70
Manager, Sales--salesman who supervises 7 to 12 salesmen - 70
Manager, Service Station - 68
Manager, Small Store in City -69
Manager, Transportation and Moving Company - 70
Manager, T. V. Service (wholesale) - 70
Mason - 68
Mayor, large city - 90
Mechanic, Airplane - 67
Mechanic, Auto (partnership) - 66
Mechanical, Engineer
Mechanic, Cash Register - 66
Mechanic, Elevator - 65
Mechanic, Field, Road, Building Machinery - 67
Mechanic, Garage - 62
Mechanic, Gas Meter - 62
Mechanic, Maintenance - 63
Mechanic, Radio - 67
Mechanic, Refrigeration - 67

Medical Technologist - 74
Melter Loader - 61
Member, Board of Directors of Large Company - 86
Messenger for Armored Car Company - 57
Metallurgist - 80
Metal Plate Worker - 58
Mica Layer in factory - 58
Milk Bottler (unskilled) - 50
Milk Route Man - 54
Milk Truck Owner & Operator (rural) - 59
Millwright - 60
Minister - 87
Minister, (no theological training, High School Education)- 72
Motel Business Owner - 72
Movie Projector Operator - 62
Multigraph Operator - 63
Musician in Symphony Orchestra - 81
Newspaper Columnist - 74
Nightwatchman - 47
Nurse (hospital) - 76
Nurse, Practical - 66
Nurse, Registered - 78
Nurse with B.A. and M.A. degree, teaching Nurses - 80
Nursing or Rest Home Operator - 67
Office Manager - 70
Officer, Trust - 78
Officer, Security - 67
Office Supervisor - 68
Operator, Beauty Shop - 60
Operator, Bulldozer - 59
Operator, Calculating Machine - 64
Operator, Coal Elevator - 51
Operator, Crane - 59
Operator, Diesel - 62
Operator, Equipment, Army Depot - 58
Operator, Freezer - 59
Operator, Linotype, Printing Shop - 67
Operator, Movie Projector - 62
Operator, Multigraph - 63
Operator, Radio, Airport Tower - 67
Operator, Radio Telephone - 64
Operator, Steam Shovel - 59
Operator, Telephone - 59
Optometrist - 83
Owner, Bakery - 68
Owner, Dry Cleaning Plant - 75
Owner-Factory employing 100 people - 82
Owner, Grocery Store - 70
Owner, Large Wholesale Business - 82
Owner, Machine Shop - 73
Owner, Operator Lunch Stand - 62
Owner, Operator Printing Shop - 74
Owner, Shoe Repair Shop - 65

Owner, Small Manufacturing Plant - 78
Owner, Small to Med. Restaurant in City - 68
Owner (co), Insurance Corporation - 78
Owner (co), Motel Business - 72
Owner (co), Small Store in City - 72
Owner-operator, Automobile Repair Shop-employs 3 people - 67
Owner-operator, Beauty Shop - 65
Owner-operator, Cigarette Vending Machine Company - 69
Owner-operator, confectionary - 66
Owner-operator, Cleaning Business (one store) - 68
Owner-operator, Farm - 76
Owner-operator, Grocery and Butcher Shop - 72
Owner-operator, Radio & T. V. Shop - 72
Owner-operator, Real Estate Agency - 73
Packer - 54
Painter - 60
Parts, Factory Manager - 68
Pattern Maker (wood & metal) - 67
Patrolman, State Highway - 68
Payroll Clerk - 66
Personnel Interviewer - 71
Personnel (testing) - 76
Pharmacist - 75
Photographer, Commercial - 72
Physical Therapist - 68
Physician - 93
Physicist-Nuclear - 86
Piano Tuner - 69
Pipefitter - 58
Plant Manager, Large Company - 75
Plant Superintendent - 74
Plasterer - 60
Player in Dance Band - 65
Play Ground Director - 67
Plumber - 65
Police Lieutenant -
Policeman - 67
Police Officer (Railroad) - 66
Political Party Worker-full time - 75
Poolroom Manager - 58
Porter - 44
Postal Clerk - 65
Practical Nurse - 66
President, Large Retail Chain Store - 84
President, Wholesale Company - 81
Press Feeder-printing shop - 59
Priest - 86
Printer, Newspaper - 68
Printing Pressman - 66
Process Engineer - 77
Production Control Manager - 79
Professor - 89
Promoter, Advertising - 72

Promotion Manager - 79
Proof Reader - 67
Proprietor, Sheet-metal Business - 71
Psychologist - 85
Publicity Man - Large Companies - 71
Publisher - 84
Purchasing Agent - 68
Radio, Airport Tower Operator - 67
Radio, Announcer - 75
Radio, Engineer - 77
Radio Mechanic - 67
Radio Technician - 68
Radio, Telphone Operator - 64
Rag Sorter - 39
Railroad Brakeman - 63
Railroad Conductor - 67
Railroad Engineer - 77
Railroad Section Hand - 48
Railroad Switchman - 60
Real Estate Appraiser for Commercial Property - 68
Real Estate Broker - 72
Recreation Director (Y.M.C.A.) - 70
Registered Nurse - 78
Repairman, Automobile - 63
Repairman, Office Machine - 67
Repairman, Salesman-appliance - 66
Repairman, Shoe - 57
Repairman, Shoe (cobbler)- 60
Repairman, Telephone Company - 62
Repairman, T. V. - 67
Repairman, Washing Machine - 65
Repairman, Watch - 67
Rental Agent - 68
Reporter - Daily Paper - 71
Representative, U. S. Congress - 89
Research Engineer - 82
Restaurant Cook - 54
Restaurant Partner - 66
Restaurant Waiter - 48
Roofer - 60
Sales Correspondent-Division local branch of nationwide Manufacturer - 70
Sales Engineer - 73
Sales Manager - 70
Salesman, Auto - 70
Salesman-Retail, not involving canvassing or traveling - 68
Salesman, Route - 60
Salesman Route Driver - 56
Salesman Traveling for a wholesale concern - 68
Salesman-wholesale, not involving travel - 68
Sales Promotion Worker - 72
Sales Representative - 68
Saw Sharpener - 50



Scientist - 89
Scientist, Government - 88
Seamstress - 57
Secretary-Treasurer, Large Company - 76
Secretary, University Department - 65
Security Officer - 67
Sergeant, Army - 66
Servant, Domestic - 47
Service Analyst - 66
Share Cropper - 40
Sheet Metal Worker - 54
Shoe Repair Shop Owner - 65
Shoe Shiner - 33
Showman of animals at Fair - 55
Singer in Night Club - 52
Social Worker - 74
Sociologist - 82
Soda Fountain Clerk - 45
Soil Conservationist - 76
Specifier, Order Department - 66
State Government-Chief of Bureau
State Government-Head of Department - 87
Statistician, Department of Agriculture - 78
Steam Shovel Operator - 59
Steel Mill Worker - 50
Steel Temperer - 60
Stenographer - 66
Stock Clerk - 51
Stock Broker - 79
Stockhandler - 50
Stockkeeper, Municipal Division of Electricity - 64
Stockman in Linen Supply Company - 52
Stock Selector - 58
Streetcar Motorman - 58
Street Sweeper - 54
Student, Senior Medical - 79
Student, University - 74
Superintendent, Building - 52
Superintendent, Construction company roads and streets - 77
Superintendent, High School - 80
Superintendent, Piping - 69
Superintendent, Plant - 74
Superintendent, Railroad - 75
Superintendent, Steel Mill - 72
Superintendent, Truck Stop - 65
Supervisor, Coal Company - 64
Supervisor, Office - 68
Surveying Chairman - 62
Surveying Engineer - 78
Tailor - 67
Tax Accountant - 80
Taxi Driver - 49
Teacher, Public School - 78

Teacher, Rural School - 75
Technical, Artist - 69
Technical Clerk - 66
Technician, Aircraft - 78
Technician, Dental - 73
Technician, Radio - 68
Technologist, Medical - 74
Telephone Operator - 59
Tennant Farmer - 68
Timekeeper - 68
Time Study Engineer - 75
Tool Crib Attendant - 57
Tool Designer - 75
Tool Engineer - 75
Train Dispatcher, Railroad - 67
Tree Surgeon-self employed - 76
Tree Trimmer for Public Utility - 51
Truck Driver - 54
Truck Gardener - 66
T. V. Engineer - 75
T. V. Repairman - 67
T. V. Service Manager (wholesale) - 70
Undertaker - 72
Upholsterer - 62
U. S. Employee-Quartermaster Purchasing - 69
Veternarian - 84
Vice President, Large Wholesale Food Company - 80
Vice President, Real Estate Company - 84
Vocational Rehabilitator, Veterans Administration - 78
Waitress - 50
Warehouse Worker - 51
Watchmaker - 74
Watch Repairman - 67
Welder - 59
Welfare Worker for City Government - 73
Writer in Public Relations Department - 74
X-ray Technician with Degree - 79
Yardmaster, Railroad - 73

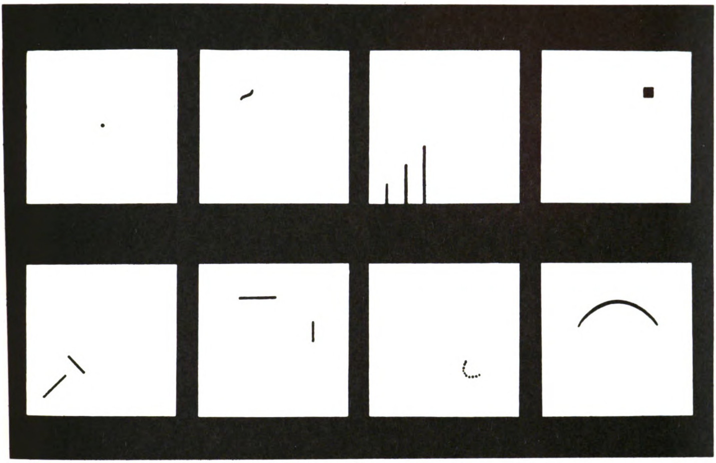


Figure 4. Wartegg Drawing Completion Test Blank

Kenneth B. Matheny

Candidate for the degree of

Doctor of Philosophy

Date of Examination: January 22, 1963, 10:00 A.M., College of Education.

Dissertation: An Assessment of the Usefulness of the Wartegg Drawing Completion Test As A Measurement of Intelligence Among Children.

Outline of Studies:

Major area--Guidance and Counseling
Minor area--Psychology, Professional Education

Biographical Items:

Birthdate -- October 15, 1930, Huntington, West Virginia.

Undergraduate Studies -- Olivet Nazarene Collage, A.B.
Kankakee, Illinois

Graduate Studies -- Nazarene Theological Seminary, B.D.
Kansas City, Missouri

University of Kansas City, M.A.
Kansas City, Missouri

Johannes Gutenberg Universitaet
Mainz, Germany

Michigan State University
East Lansing, Michigan 1959-1963

Experience:

United States Army, Wiesbaden, Germany -- 1957-1959
Chaplain (1st/Lt.)
Ingham County Schools, Mason, Michigan -- 1959-1962
School Diagnostician
Michigan State University, East Lansing, Michigan
Instructor in Education - Summer, 1961
Lansing Community College, Lansing, Michigan -- 1961-Present
Instructor in Psychology -- 1961-1962
Chairman, Division of Arts & Sciences -- 1962-Present

Membership held in American Psychological Association, American Personnel and Guidance Association, Michigan Psychological Association, Michigan Educational Association, American Association for the Advancement of Science, Council for Exceptional Children.