

VIKTOR LOWENFELD'S VISUAL-HAPTIC TESTS. A CRITIQUE  
OF ONE APPROXIMATION AND ONE ORIGINAL VERSION

by

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Thesis submitted to the Faculty of the Graduate School of  
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VIKTOR LOWENFELD'S VISUAL-HAPTIC TESTS. A CRITIQUE OF  
ONE APPROXIMATION AND ONE ORIGINAL VERSION

Thesis and Abstract Approved

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Problem:

Lowenfeld's proposed method of discovering two drawing types, the "visual" and the "haptic", consists in the giving of a series of five tests. A modification of one of these, the "Test of Integration of Successive Impressions" and his original "Test of Visual vs. Haptical Word Association", were the subject of study undertaken by this thesis.

Four questions were asked about these two tests:

1. To what extent is a modification of Lowenfeld's "Test of Integration of Successive Impressions" a reliable testing instrument?
2. To what extent is a modification of Lowenfeld's "Test of Integration of Successive Impressions" a valid measure of the "visual", "haptic", or "indefinite" type?
3. To what extent is Lowenfeld's "Test of Visual vs. Haptical Word Association" a valid measure of the "visual", "haptic", or "indefinite" type?
4. To what extent are Lowenfeld's "Test of Visual vs. Haptical Word Association" and a modification of his "Test of Integration of Successive Impressions" correlated with each other?

### Procedure:

To answer these four questions, two modified forms of Lowenfeld's "Test of Integration of Successive Impressions", (Test 1-A and 2-A), and a replica of his "Test of Visual vs. Haptical Word Association", (Test 1-B), were constructed.

The reliability of Test 2-A was determined by correlating scores in a test and re-test situation of 109 University of Maryland students. The validity of the test was determined by correlating test scores with Rorschach Ink Blot Test performance and judgment of individual tendency by a panel of art experts.

The validity of Test 1-B was determined by correlating the number of "visual" or "haptical" words used by twenty-three subjects with a judgment of his individual tendency made by a panel of art experts. The significance of the difference was determined between the mean score on Test 2-A of 117 University of Maryland students and the mean score on the same test of those who were classed as either "visual" or "haptic" by their performance on Test 1-B.

Further intercorrelations were determined between the Test 2-A scores of 117 University of Maryland students and the number of "visual" or "haptical" words with which each responded on Test 1-B.

### Findings:

Lowenfeld's "Test of Integration of Successive Impressions" appears to be the more fruitful test of the two studied, and

may be capable of further refinement and validation in the future. However, the reliability of a modified version of it is not yet high enough, (.57), to warrant its use in comprehensive validity studies.

However, the "Test of Visual vs. Haptical Word Association" does not reveal the same optimistic future. The visual type of person does tend to respond with a maximum of only two haptical words, while the haptics and indefinites may respond with as few or with many more haptical words. Therefore, the only use for this test at present seems to lie in using it to validate a belief that a particular person is not a visual type.

## ACKNOWLEDGMENTS

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To each of the following men is owed an especial "thank you" for their patient and encouraging guidance - to my adviser, Dr. R. Lee Hornbake, for his very careful scrutiny of the form of the dissertation, to Dr. Harold Benjamin for his encouragement of a more expressive phrasing, to Dr. Charles N. Cofer for his assistance in improving the rationale of the conclusions, and to Viktor Lowenfeld for his expert advice on test construction and refinement. In addition, deep appreciation is expressed to Dr. Gladys A. Wiggin for continuous advice given during the organizational stage of the dissertation.

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## CHAPTER I. STATEMENT OF THE PROBLEM

Ten years ago, the American art teacher's discourse was liberally sprinkled with such phrases as "art a way of life", "design for living", and "all children are artists". Appreciation, creation and consumer education were the key terms that defined the nature of the art teacher's principal concerns.

Today, added to this developing vocabulary, there are two new words which are gradually gaining in importance. Recorded on the printed page by Viktor Lowenfeld, and thrust into the art teacher's vocabulary of conscious concerns by the impetus of the child-study movement, "visual" and "haptic"<sup>1</sup> are rapidly becoming passwords in the art education field.

Viktor Lowenfeld has coined these new terms to define two widely different types of personalities which he feels the art teacher can and should identify in his classes. Each, he feels, possesses certain unique traits, different enough in their patterning to result in the "haptic" or "visual" types' producing a greatly differing art product, if properly stimulated.

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<sup>1</sup>According to Lowenfeld, the "visual" type, when drawing, depends completely on his visual experience of the outside world; the "haptic" type depends upon touch and kinesthesia. A more complete definition of the two types will be found on pp. 16-18.

"It is obvious that it would disturb and greatly inhibit a visually minded person to be stimulated only by means of haptic impressions," states Lowenfeld, "or to be asked not to use sight and to orientate himself only by means of touch, bodily feelings, muscular sensations and kinesthetic fusions. It is, however, not so clear that 'seeing' may also become an inhibiting factor when forced upon an individual who does not use his visual experiences for creative work."<sup>1</sup> To aid in identifying these types, Viktor Lowenfeld has devised five tests which, when properly weighted, give a numerical score that indicates a "visual", "haptical" or "indefinite" type person. In reporting on the nature and results of these five tests,<sup>2</sup> Lowenfeld appeared to imply that there was an intercorrelation among them, since he did state that high or low scores on each were indicative of "visual" or "haptic" tendency, yet no actual statistical correlations were reported in the article nor have they been found in subsequent writings by him. The author of this paper has also failed to find any statements as to the reliability or validity of these five tests.<sup>3</sup>

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<sup>1</sup>Viktor Lowenfeld, The Nature of Creative Activity, New York: Harcourt, Brace and Co., p. 100, 1939.

<sup>2</sup>Viktor Lowenfeld, "Tests for Visual and Haptical Aptitudes," American Journal of Psychology, 58:100-111, 1945.

<sup>3</sup>The above Journal article and his more recent book, Creative and Mental Growth, are the two works which have been thoroughly searched by the author for these statistical data.

The purpose of this study then, is to examine Lowenfeld's theory of the two types, and to study two of his five tests of "visual" or "haptic" aptitude, through using certain relatively objective measures and answering the following questions:

1. To what extent may a modification of Lowenfeld's "Test of Integration of Successive Impressions" be made into a reliable testing instrument?
2. To what extent is a modification of Lowenfeld's "Test of Integration of Successive Impressions" a valid measure of the "visual", "haptic", or "indefinite" type as determined by the opinion of art experts and performance in the Rorschach Ink Blot Test?
3. To what extent is Lowenfeld's "Test of Visual vs. Haptical Word Association" a valid measure of the "visual", "haptic", or "indefinite" type?
4. To what extent are Lowenfeld's "Test of Visual vs. Haptical Word Association" and a modification of his "Test of Integration of Successive Impressions" correlated with each other?

To answer these four questions, the various studies undertaken are noted in the table appearing on the following page.

QUESTION POSED

HOW THE ANSWER WAS DERIVED

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1. To what extent may a modification of Lowenfeld's "Test of Integration of Successive Impressions" be made into a reliable testing instrument?
  
2. To what extent is a modification of Lowenfeld's "Test of Integration of Successive Impressions" a valid measure of the "visual", "haptic", or "indefinite" type?
  
3. To what extent is Lowenfeld's "Test of Visual vs. Haptical Word Association" a valid measure of the "visual", "haptic", or "indefinite" type?

1. Two modified forms of Lowenfeld's "Test of Integration of Successive Impressions", Test 1-A and 2-A), and a replica of his "Test of Visual vs. Haptical Word Association" (Test 1-B), were constructed. Test 2-A was then given to 109 men and women students at the University of Maryland, on two separate occasions, and a coefficient of correlation between the test and retest situation was computed.
  
2. Test 1-A scores of 27 University of Minnesota students were compared with the consensus of at least three faculty members of the Department of Art staff at the University as to the "visual", "haptic", or "indefinite" tendency of each.  
  
Nine University of Maryland students who scored "high" and nine who scored "low" on Test 2-A were given the Rorschach Ink Blot Test. The personality patterns of the "high" and "low" scorers were then examined in the light of 20 Rorschach factors.
  
3. The number of "visual" and "haptical" words used by 23 University of Minnesota students on Test 1-B were compared with the consensus of at least three faculty members of the Department of Art staff as to the "visual", "haptic", or "indefinite" tendency of each.

QUESTION POSED

HOW THE ANSWER WAS DERIVED

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4. To what extent are Lowenfeld's "Test of Visual vs. Haptical Word Association" and a modification of his "Test of Integration of Successive Impressions" correlated with each other?

The significance of the difference was determined between the mean score of 117 University of Maryland students on Test 2-A and the mean score of 21 students from this group who were classed as "visual" on Test 1-B.

The significance of the difference was determined between the mean score of 117 University of Maryland students on Test 2-A and the mean score of 21 students from this group who responded with the greatest number of "haptical" words on Test 1-B.

4. The coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "visual" words with which each responded on Test 1-B.

The coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "haptical" words with which each responded on Test 1-B.

## Limitations of the Problem

1. The sampling: The original Lowenfeld tests were given to a total of 1128 adult subjects<sup>1</sup> and it is from the performance of this group that Lowenfeld maintains he has found the emergence of the "visual" and "haptical" types. Various samplings used by the author of this dissertation, for the purpose of determining the reliability or validity of the two tests investigated, varied from 18 to a maximum of 109 adult subjects.
2. The tests: Since it was not feasible to conduct experimentation with all five of Lowenfeld's tests, only the two mentioned earlier were used. Furthermore, only one of these, the "Test of Visual vs. Haptical Word Association" was used in its original form. The other "Test of Integration of Successive Impressions" was built from two original illustrations reproduced by Lowenfeld in his article published in the American Journal of Psychology,<sup>2</sup> to which eight were added by the author in the first form of the test, and to which ten additional items, also originated by the author, were later added to constitute the second expanded form of the test.<sup>3</sup>

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<sup>1</sup>Viktor Lowenfeld, "Tests for Visual and Haptical Aptitudes," American Journal of Psychology, 58: p. 111, 1945.

<sup>2</sup>Ibid., p. 110.

<sup>3</sup>Since the author found only two of Lowenfeld's ten test items reproduced in the previously mentioned Journal article, and did not request a reprint of the balance of Lowenfeld's original test, the additional test items were built without the benefit of Lowenfeld's advice.

3. The test administration: Some limitations, as well as advantages believed to be inherent in the administration of the tests were apparent and will be discussed fully in Chapter III.

CHAPTER II. THE SEARCH FOR A NATURAL MODE OF ART EXPRESSION FOR CHILDREN: LOWENFELD'S HYPOTHESIS OF THE "VISUAL" AND "HAPTIC" TYPES

One of the most intriguing and inconclusive tasks undertaken by art educators in the last 120 years has been the search for a natural method of art expression which could be defined with sufficient clarity to constitute a kind of year-by-year sequence through which the art student could be prodded, cajoled or led. From Rembrandt Peale and William Bentley Fowle in the early 1800's to Schaefer-Simmern and Viktor Lowenfeld in 1950, a series of champions of individual systems of teaching art have presented the American teacher with their solutions through pamphlets, textbooks, and lectures. Each has had a theory behind his system, and each has stated, in more or less definite terms, the sequence of steps through which the goals of his system could be realized. And the "natural way to draw" was, in each case, a part, if not the core of each proponent's system.

In 1827 it was the colorful "Master Fowle", son of a skilled artisan, who published, along with many other treatises on geography and grammar, a translation from M. Francoeur called "An Introduction to Linear Drawing".<sup>1</sup> With bold confidence, Fowle, perhaps sensing

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<sup>1</sup>William B. Fowle, An Introduction to Linear Drawing, Boston: Hilliard, Gray, Little and Wilkins, 86 pp., 1927.



the importance of relieving the feelings of inadequacy shared by most art teachers at that time, stated a firm and conclusive position in the introduction to his book.

The translator appeals to experience when he asserts that not one in fifty of those who have gone through a course of instruction in drawing can do more than copy such drawings as are placed before them. Being ignorant of the certain rules of the art (and they are the most certain because mathematical), they are always in leading strings, and, unless endowed with uncommon genius, never originate any design, and rarely attempt to draw from nature. It is to remedy this defective mode of teaching that the translator has been induced to present this little work on the elements of drawing to the American public.

Then, in the contents of this book, many geometrical figures were presented, arranged according to the difficulty of their execution, with suitable instructions as to how the students could gradually be led through the mastery of these figures, with the highest class to be taught "under the master".

But Fowle's system, like later variations introduced by Rembrandt Peale, William Minifie, William Bartholomew and Walter Smith, appears to have been inspired by the inductive, logical approach of Pestalozzi, from which each of these men received some inspiration. As a result, from Fowle's first book, published in 1827, to Smith's "Teacher's Manual for Freehand Drawing",<sup>1</sup> published in 1874, the same inductive approach can be observed from the drawing of simple lines and shapes to the combining of these lines and shapes into increasingly complex forms. One learned to draw objects from life by

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<sup>1</sup>Walter Smith, Teacher's Manual for Freehand Drawing in Primary Schools, Boston: James R. Osgood and Co., 171 pp., 1874.

drawing in just this fashion from the very first. One learned to draw complex objects by learning first to draw the simple components of these objects. The system had logic, and it produced results. The students did learn to draw complex shapes.

Yet, functionally speaking, the continuance of the "object-drawing" approach did not achieve the goals for which it was intended. Originally, it had been the American industrialist, alarmed at the continuing popularity of European industrial art products, who had helped to promote the introduction of art into the public schools.<sup>1</sup> His aim was simple. He wanted technicians capable of designing products which had as much visual attractiveness as those of the Europeans. Yet by 1890, the American manufacturer found little that appeared to indicate any appreciable gain in the esthetic appeal of his products.<sup>2</sup>

Fortunately, psychologists were taking an increasing interest in children's drawing, and with the impetus given by a developing child-study movement, an increasing number of experimenters began publishing studies in the psychology of children's drawing expression. In the United States, Lukens<sup>3</sup>, O'Shea<sup>4</sup>,

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<sup>1</sup>Isaac E. Clarke, Art and Industry. Education in the Industrial and Fine Arts in the United States, Washington: Govt. Printing Office, 489 pp., 1885.

<sup>2</sup>Francis Belshe, A History of Art Education in the Public Schools of the United States, Yale University, Ph.D. Thesis, 1946. (Passim)

<sup>3</sup>Herman T. Lukens, "A Study of Children's Drawings in the Early Years", Pedagogical Seminary, Oct., 1896.

<sup>4</sup>Michael V. O'Shea, "Children's Expression Through Drawing", Proceedings of the N.E.A., pp. 1015-1023, 1894.

Barnes<sup>1</sup>, Judd<sup>2</sup> and Cowling, and others were conducting experiments. In Germany, Albien<sup>3</sup> and Meumann<sup>4</sup> were also contributing valuable material. But the approach of these men, unlike the earlier art educators mentioned, was not directed at externals. They were not interested in applying an educational theory to the development of a series of sequential drawing lessons. Rather were they interested in finding out how the internal dynamics of individual expression functioned. For this reason, all of them chose a form of the experimental approach in which drawings of many children were compared, both laterally and longitudinally, while being encouraged to draw and paint according to their own developing percepts. From an inspection of trends present within a particular age level, it was then possible to describe a "normal" performance at any particular level, and to trace the changes in that performance through time.

Three types of research tended to emerge from those early experiments. When a child creates a painting he must act. When he acts he must make choices. As the result of choices made,

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<sup>1</sup>Earl Barnes, "A Study of Children's Drawings", Pedagogical Seminary, pp. 451-463, Dec., 1893.

<sup>2</sup>Charles H. Judd and Donald J. Cowling, "Studies in Perceptual Development", Psychological Review, 1897.

<sup>3</sup>Gustav Albien, "Der Anteil der nach Konstruierenden Tätigkeit des Auges und der Apperception an dem Behalten und der Wiedergabe einfacher Formen", Zeitschrift für experimentelle Pädagogik, V.v., VI., Bd., 1907.

<sup>4</sup>Ernst Meumann, "Die Analyse des Zeichnens und des Modellierens". Leipzig: Englemann, Vorlesungen zur Einführung in die Experimentelle Pädagogik, pp. 693-775, 1914.

a product emerges. Research into drawing expression then, tended to group itself about the drawing act, choices made, and the nature of the product.

Among the early drawing product analysts, such as Lukens<sup>1</sup>, Luquet<sup>2</sup>, Rouma<sup>3</sup>, Kerschensteiner<sup>4</sup>, and Burk<sup>5</sup>, Luquet's method of study and tentative conclusions were typical. After keeping an intensive biographical record of the work of a little girl from age three through nine, he postulated the existence of four developmental levels through which her creativity developed:

Involuntary Drawing. The child has perceived that the drawings of others represent objects and that he is able to trace lines himself. He does not realize, however, that he can represent similarly with his own lines. He notes the accidental similarity of his drawings after he has made them and then calls attention to "his" drawing. It is not yet an intentional creation.

Synthetic Incapacity. The child determines to represent the visual appearance of objects. From then on he varies only in his manner of expressing realism. In this stage he is overcome by diverse obstacles, the chief of which is his synthetic incapacity to assemble the different details which have gained his attention into a coherent whole.

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<sup>1</sup>Herman T. Lukens, op. cit., p. 225, as translated by Fred C. Ayer, The Psychology of Drawing, Baltimore: Warwick and York, Inc., p. 76, 1916.

<sup>2</sup>Georges H. Luquet, Les Dessins d'un Enfant, Paris: Alcan, 262 pp., 1913.

<sup>3</sup>Georges Rouma, Le Language Graphique de L'Enfant, Paris: Alcan, 1913.

<sup>4</sup>George Kerschensteiner, Die Entwicklung der Zeichnerischen Begabung, Munich: Gerber, 1905.

<sup>5</sup>Frederick Burk, "The Genetic vs. the Logical Order in Drawing", Pedagogical Seminary, Sept. 1902.

Logical Realism. This age is characterized by logical realism. The child deliberately attempts to reproduce not only what he is able to see of an object, but all there is. He gives a typical form to each part.

Visual Realism. In this stage the child arrives at visual representation, submitting with more or less lack of skill in execution to the principles of perspective. He has arrived, as far as drawing is concerned, to the period of the adult.<sup>1</sup>

Typical of the study of choices of children was the work of Lena Partridge.<sup>2</sup> Seven hundred girls from the ages of 7 through 13 were asked to "describe the prettiest thing you have ever seen and say why you thought it pretty". Among the results of the study were such conclusions as: "The feeling of beauty with the children seven and eight years old, gathers mainly around flowers, animals, and dolls....In their attitude toward pretty things these children work from simple units, such as flowers and dolls, to things recognized as complex, such as landscapes and spectacles".<sup>3</sup>

Most of the contributions to the third area of research, the analysis of the nature of the drawing act, came from the increasing number of studies concerned with the problem of perception and retention. Although in 1907 Albien<sup>4</sup> had postulated the existence of two more or less distinct types of personalities, through an analysis of the way in which they approached

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<sup>1</sup>Lukens, op. cit., p. 225, as translated by Ayer, p. 76.

<sup>2</sup>Lena Partridge, "The Prettiest Thing", Studies in Education, 2:pp. 180-194, 1902.

<sup>3</sup>Ibid., p. 193.

<sup>4</sup>Albien, op. cit.

the task of drawing, Sir Francis Galton had already mentioned the existence of such a phenomenon in his "Inquiries into Human Faculty and its Development", published in 1883. According to Herbert Read<sup>1</sup>,

Long before the hypothesis of the eidetic image was put forward, Francis Galton carried out his famous inquiry into the function of mental imagery. He found that the power is higher in the female sex than in the male, and is somewhat, though not appreciably, higher in public school boys than in men....There is reason to believe that it is very high in some young children, who seem to spend years of difficulty in distinguishing between the subjective and objective world.

It was with Albien's later definitive study of the drawing act however, that a "visual" and a "constructive" type of personality were fully described and their differing methods of drawing and performing carefully illustrated. Albien<sup>2</sup> found that his subjects, in drawing certain exercises, exhibited a tendency to draw in one of two ways. These two separate approaches to the drawing task he identified as belonging to either the "visual" or the "constructive" type. The "visual" type he maintained had a visual image of his work at all times and tended to record direct objective impressions in drawing. His "constructive" type had little ability to visualize and tended to depend upon reflection and subjective construction for his drawing. Parallel research in perception, conducted by Judd and Cowling, also seemed to indicate

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<sup>1</sup>Herbert Read, Education Through Art, New York: Pantheon Books, pp. 46-47, 1945.

<sup>2</sup>Albien, op. cit., as related by Ayer, p. 93.

the existence of two opposing types. "One type appeared to achieve an early mastery of the general form and a later mastery of the details. The second type began immediately to master the details of the figure to the temporary neglect of the general form."<sup>1</sup>

With the impetus given by the early work of Galton, Judd, Cowling and others, an increasing number of research workers turned their attention to the examination of these early hypotheses. It is one of the more recent workers in this area, Viktor Lowenfeld, whose postulations will be described in the rest of this chapter, and then examined in the light of certain criteria.

In the preface to Lowenfeld's first book,<sup>2</sup> which outlines the research through which he evolved his theory of the "visual" and "haptical" types of artist, he states that:

The material for these investigations is the work of many thousands of children and more mature people and is the product of my teaching of the weak sighted and blind in Vienna at the Hohe Warte Institute for the Blind, directed by Siegfried Altmann. For about fifteen years, (1924-1939) I have been intensely concerned with the artistic problems of the blind and those of weak sight and for the same period have taught normal people. In addition, I have myself been deeply interested in the general problems of art....Ten years ago I came into contact with Dr. Ludwig Münz, and it was due to him that the theoretical foundations for research into the plastic work of the blind were laid....It was his work,

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<sup>1</sup>Ayer, op. cit., p. 93.

<sup>2</sup>Viktor Lowenfeld, The Nature of Creative Activity, New York: Harcourt, Brace and Co., 1939.

"Die Plastische Arbeiten Blinden", particularly in the second part where he defines the common basis of the formal and spatial conceptions of the blind and of the seeing and with it their relative capacity for the articulation of these conceptions, that provided in many essential points the theoretical premises for my scientific work. His penetrating analysis of the plastic work of the blind stressed for the first time the importance of such subjects as the articulation of representative signs, the overemphasis of significant details, muscular modes of perception, autoplasmic experience of form, the symbolic representation of space and time, the affective articulation of space, and the form and space conceptions of the blind. Münz shows that these laws of formal comprehension hold equally for the blind and the seeing, and thus on many decisive points his work provides a new foundation for research on modes of expression in artistic activity generally.

Out of a study of the subjects Münz stressed in his earlier analysis, Lowenfeld has defined two types of personalities, who by the inclusion or exclusion of these discrete characteristics of expression, exhibit markedly differing personality characteristics. For the purpose of brevity, only a summary of the pertinent characteristics of each type will be attempted below. It is hoped that additional illustrations will give each of the descriptions a semblance of reality.

#### A. Characteristics of the Visual Type:

1. The visual type "feels as a spectator". He "usually approaches things from their appearance."<sup>1</sup> In other words, he prefers to act as a kind of observer or recorder of events, looking at a particular scene from the outside.

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<sup>1</sup>Viktor Lowenfeld, Creative and Mental Growth, New York: The Macmillan Company, p. 133, 1947.



2. He sees "first the whole without an awareness of details," then proceeds to...."analyze this total impression into detailed or partial impressions" and finally synthesizes...."these parts into a new whole ....Starting with the general outline, partial impressions thus are integrated into a whole, simultaneous image".<sup>1</sup>
3. Since he is visually minded, he has... "a tendency to transform kinesthetic<sup>2</sup> and tactile<sup>3</sup> experiences into visual experiences. If, for instance, a visual-minded person acquaints himself with an object in complete darkness, he tries to visualize all tactile and kinesthetic experiences. 'How it looks' is the first reaction to any object met in darkness."<sup>4</sup>
4. Since he acts as a spectator, he seeks experience primarily from the visual world outside himself rather than from within. This is amply borne out by Lowenfeld's statement that he...."is concerned with the subjective experience of the self only in so far as any creative activity is an individual mental act. 'Being bound to the self' in this sense is not what we shall understand by the term later, because (he) does not seek....experience in bodily sensations but outside the body. The self merely applies judgments of value to the experience."<sup>5</sup>

#### B. Characteristics of the Haptic Type:

1. The haptic type "feels as a participator", for in the author's own words.... "the self is projected as the true actor of the picture....The haptic type, therefore, is primarily a subjective type."<sup>6</sup>
2. Normally, he is quite satisfied with a series of partial bodily impressions and does not move to

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<sup>1</sup>Ibid., p. 133.

<sup>2</sup>Refers to inter-muscular sensations.

<sup>3</sup>Refers to touch sensations.

<sup>4</sup>Ibid., p. 134.

<sup>5</sup>Viktor Lowenfeld, The Nature of Creative Activity, New York: Harcourt, Brace and Co., p. 82, 1939.

<sup>6</sup>Viktor Lowenfeld, Creative and Mental Growth, New York: The Macmillan Co., p. 184, 1947.

synthesize these impressions into a whole, as is true of the visual type, unless...."he becomes emotionally interested in the object itself".<sup>1</sup>

3. Since he is haptically oriented, he...."does not transform kinesthetic and tactile experiences into visual ones, but (is) completely content with the tactile or kinesthetic modality itself. If a haptically minded person acquaints himself with an object in complete darkness, he (remains) satisfied with his tactile or kinesthetic experiences."<sup>2</sup> "How it looks" is apparently of little interest to him.
4. Since he acts "as a participator", rather than seeking experience primarily from the visual world, he confines his world...."to things that can be perceived by means of touch or bodily sensations. In this world the eye does not mediate between validity and the concept."<sup>3</sup> In other words, the haptic "is primarily concerned with his own body sensations and with the tactual space around him".<sup>4</sup>

A short statement from another study which Lowenfeld undertook, seems to provide a suitable summary of the two types. "An extreme haptical type of individual - by no means rare, is a normal person who uses his eyes only when he is compelled to do so; otherwise he reacts as would a blind person who is entirely dependent upon touch and kinesthesia. An extreme visually minded person, on the other hand, is one who is entirely lost in the dark, one who depends completely on his visual experiences of the outside world."<sup>5</sup>

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<sup>1</sup>Ibid., p. 134.

<sup>2</sup>Ibid., p. 134.

<sup>3</sup>Viktor Lowenfeld, The Nature of Creative Activity, New York: Harcourt, Brace and Co., p. 85, 1939.

<sup>4</sup>Ibid., p. 87

<sup>5</sup>Viktor Lowenfeld, "Tests for Visual and Haptical Aptitudes", American Journal of Psychology, 58: p. 101, 1945.

To dramatize the characteristics of the two types, let us imagine that John V., a "visual" painter, and John H., a "haptic" painter, have both been commissioned by the United States Army to paint an incident from an actual battle which both have witnessed. John V., crouching in his slit trench, peers over the rim of his trench and sweeps his eye rapidly over the combat area. He gets an almost immediate image of a series of small hills in the distance, a fringe of trees on the left, an indistinct line of something on the right. He makes a quick sketch of these main masses on his drawing pad. Then, with further study, he notes that on each of the three hills to the left is a gun emplacement. Two are cover for machine-gun emplacements, shooting an almost continuous cross-fire at the American soldiers dug in on his right, and the third is occupied by a mortar squad, dropping their charges at intervals. The "indistinct line" to the right he finds to be an uneven finger of barbed wire running on a low ridge directly in front of him. He notes these details on his rough sketch, changes the contours materially, because of the more careful form delineation possible, and unites the separate details into a whole which roughly approximates the scene which a camera might reproduce of the same vista.

John H., however, crouching low in his trench, raises his head over the rim only for an instant, then recoils with fear and terror at the sight upon which his eyes had momentarily fixed. Many hours later, when he is once again transported

to the safety of a town sheltered from the din and smoke of battle, he sits down to re-live the emotional experience of that moment, and to paint a vigorous, slashing and terrifying scene of a machine-gun, spitting fire into the bodies of the American soldiers. His is a grim and awesome picture, almost devoid of detail, except for the few which are necessary to dramatize the intensity of the emotion of that moment.

#### Lowenfeld's Method of Identifying the Two Types.

In order to determine the extent of haptical or visual tendency present in an individual, Lowenfeld reports the use of five tests, individually administered, which, when properly scored, give a numerical total which indicates the individual's tendency.<sup>1</sup>

Since two of these five tests will be examined by the author, a brief description of the two is noted here.

#### A. Test of Integration of Successive Impressions.

The subject is seated before a board on which he can see a card, with a  $\frac{1}{2}$ "x6" horizontal slot cut in its face. Behind this slot the experimenter places a smaller card on which an abstract symbol, about 3"x4", has been drawn. The experimenter then pulls this card slowly towards him, while the subject watches the sections of the moving symbol as they are revealed through the slot. (Plate 1) "After the whole symbol has passed behind the slot, (the subject) is instructed to recognize the correct symbol out of several similar figures."<sup>2</sup> (Plate 2)

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<sup>1</sup>Ibid., pp. 100-111.

<sup>2</sup>All subsequent quotations relating to the five afore-mentioned tests are taken from Lowenfeld's "Test for Visual and Haptical Aptitudes", American Journal of Psychology, 58: pp. 100-111, 1945.

"The score is so determined that more complex symbols have an adequately higher score than simpler ones. The final score shows to what amount and degree (the subject) is able to integrate the partial impressions into a whole image." A high score would presumably indicate visual aptitude.

### B. Test of Subjective Impressions.

The subject is given two separate tests, a "Table Test" and one called the "Think-of-a-Building Test".

The "Table Test" is as follows: The subject is asked two questions.

- "Draw a table with a glass on top."
- "Draw a table with a chessboard on top."

Dr. Lowenfeld finds that the visual type tends to draw the table in a similar manner in response to both questions, normally in a perspective view. The haptic tends to draw the first table as though seen from the side, and the second table as though seen from above. Lowenfeld apparently feels that in each case, the table is so drawn as to most effectively dramatize the affective quality which the haptic feels is present in each case. (Plate 3) The third type, the "indefinite" type, tends to draw no table at all. He draws the objects only.

In the "Think-of-a-Building Test", the subject is asked to "think of a very familiar building (house of your friend, courthouse, town hall, dormitory), a building which you know from outside and inside, which is neither your home nor your school nor office building".

1. How many floors has the building?
2. Were you (a) sure; (b) not quite sure; (c) unsure of the given number?
3. When you thought of the number of floors, did you think of (a) how many floors you have to climb? (b) Did you count the floors singly? (c) Did you think of the whole building as it appears from the outside?

If the subject visualized an outside view of the building, and then counted the floors, he is given a "visual" score. If he thought of climbing the stairs to each floor, in the process of counting them, he is given a "haptic" score. If he counted the floors singly, he is scored in the "indefinite" category.

### C. Test of Visual vs. Haptical Word Association.

The subjects are given twenty words to which they are asked to...."write down your immediate reaction after reading each single word." (Plate 4) The score is determined by adding up the visual responses and similarly totalling the haptic responses. Visual responses Lowenfeld illustrates as those referring to the environment.

<u>Stimulus word</u>	<u>"Visual" response</u>
climbing	mountain
running	hill

Haptic responses he believes are those referring to the bodily self, as indicated in actions.

<u>Stimulus word</u>	<u>"Haptic" response</u>
climbing	hard
running	fast

"If (the subject) gave at least 12 answers in one direction, (visual or haptic) he was considered to show visual or haptic aptitude."

### D. Visualization of Kinesthetic Experience Test.

"Different stencils of geometric figures of increasing complexity are cut into a thick cardboard or plywood. On a tablet the same geometric figures are drawn in scale. (Plate 5) When blindfolded, (the subject) follows with one finger the line along the cut stencil while a finger of his other hand remains at the starting point as a guide." After removing the blindfold, the subject then tries to recognize the symbol he has felt by being asked to find it among six somewhat similar figures presented on a card, only one of which is the correct one. If he is correct in 12 out of 20 trials with as many different symbols, he is considered to have visual aptitude.

### E. Test of Tactile Impressions.

"Single figures as large as the palm of a hand are singly put into a bag. (The subject) has before him the same tablet used in the preceding test. He puts his hand into the bag and, by holding, touching, and

moving the figure in his hand, he is required to recognize the correct figure on the tablet which is before him." The score is determined as in Test D, except that 12 out of 20 correct trials is a sign of haptic aptitude.

The method of summarizing the test scores, in order to arrive at a final numerical judgment of the individual's tendency, is reproduced in Plate 6.

### CHAPTER III. DESIGN, ADMINISTRATION, AND SCORING OF THE TESTS DEVELOPED BY THE AUTHOR

Since the author did not request copies of Lowenfeld's original testing devices, the first requirement necessary in order to begin conducting experiments to answer the four proposed questions was to construct suitable measuring tools, as much like Lowenfeld's as was possible. For this reason three separate "tools" were built, and will be henceforth referred to as follows:

Test 1-A will be the first form of Lowenfeld's "Test of Integration of Successive Impressions".

Test 1-B will be the first form of Lowenfeld's "Test of Visual vs. Haptical Word Association".

Test 2-A will be the second form of Lowenfeld's "Test of Integration of Successive Impressions".

#### Design and Administration of Tests 1-A and 1-B

The first step taken in designing Test 1-A was to develop a hand-operated model built as nearly like Lowenfeld's original test as was possible. As will be recalled, Lowenfeld's original test consisted of:



- ten abstract symbols, about 3"x4", each drawn on a separate cardboard card. The symbols were presumably drawn in black on a white ground,<sup>1</sup>
- a cardboard cover plate, into which a 6"x $\frac{1}{2}$ " horizontal slot had been cut,<sup>2</sup>
- a series of ten answer cards, each displaying five abstract figures.<sup>3</sup>

Since only two of Lowenfeld's ten abstract symbols were reproduced in the body of his article in the American Journal of Psychology, the author made as accurate a copy of these two symbols, and the two answer cards, as was possible. Eight additional symbols and eight additional answer cards were then designed by the author. The complete set of 10 symbols and 10 answer cards are reproduced in Plates 7 and 8. In addition, an "ANSWER SHEET" was developed and mimeographed, upon which the subject recorded his responses. (Plate 9)

- "Grade in school" and "age" were asked for in case these data might prove of value later in pursuing correlations between each of these factors and test performance.

- "Father's occupation" and "description of his duties" were included in order to derive an approximate estimate of socio-economic level. Again, these factors were included in case a correlation between this factor and test performance might prove of value.

- "Number of semesters of art classes taken" was included in order later to investigate the possible influence of previous art training on test performance.

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<sup>1</sup>This was inferred from an inspection of the two drawings reproduced in Lowenfeld's article published in the American Journal of Psychology to which reference has already been made. All future references to the design of Lowenfeld's tests will be based upon the contents of this particular reference.

<sup>2</sup>The exact size was not stated in the article.

<sup>3</sup>The exact size was not stated in the article.

- "Test II." Under this heading, the ten numbers in two vertical columns refer to the 10 test items, or symbols. The five numbers, (1 2 3 4 5), to the right of each symbol number, are the numbers of the five alternate symbols on the answer card from which the subject chooses and encircles the number of the symbol he believes to be the one he saw moving behind the slot. (This operation will be clarified in the following chapter.)

- The symbols at the bottom of the answer sheet are:

- I.Q. - Intelligence Quotient
- GR - Grade in school
- AGE - Age in years
- SEC - Socio-economic class
- SEX -
- SEM.ART - Semesters of art classes taken
- V - The number of "visual" words with which the subject responded in the word association test. (Test 1-B)
- H - The number of "haptical" words with which the subject responded in the word association test. (Test 1-B)
- II. - The number of symbols correctly identified from the ten presented to the subject. (This will be explained more fully in the following paragraphs.) (Test 1-A)

None of these factors has as yet been investigated. An intensive investigation of possible intercorrelations among these factors is proposed for the near future.

The first form of the second test, Test I-B, was printed on the reverse side of the answer sheet and consisted of Lowenfeld's original list of twenty words comprising his word association test. (Plate 4) These were arranged in two vertical columns. Opposite each word was a space where the subject was to place the first word response which came to mind.

The test was administered in the following manner. The experimenter and the subject, at his right, were seated in front of a table. On the table top a slanted 24"x18" board was placed, on which the cover plate was in view. The 10 symbols and 10 answer cards were arranged in two piles, face down, on the experimenter's left. At the right of the 24"x18" board a pile of answer sheets was placed. (Plate 10) After the subject was seated, he was asked to take an answer sheet and fill in the necessary data at the top. The experimenter then explained the nature of the test.

I'm going to show you a series of ten abstract symbols. None of them is recognizable as a familiar object. Each of them is drawn on a card and looks something like this. (The experimenter then drew a small sketch of a simple half circle on a piece of paper.) I will take a symbol, just as I am taking this one, and place it under this cover plate and towards the top. Then I will pull it slowly towards me, like this, (experimenter illustrated this movement), and you will, of course, see only parts of this symbol as I pull it through. Then, when the symbol has been pulled completely by the slot, I will show you an answer card on which you will see five symbols. One of those symbols will be the one you have seen being pulled through behind this slot. Each one of these five symbols on the answer card will be numbered. Choose which symbol you think you saw going behind the slot, and circle its number on this answer sheet. Is that clear?

The experimenter then asked the subject to shut his eyes momentarily, during which interval he inserted the first symbol face up behind the cover plate and pushed it well towards the top. The subject was then asked to open his eyes and watch the slot on the cover plate. The experimenter then began

pulling the symbol slowly towards him until it had all passed by the opening. In previous practice trials, the author found that eleven seconds was the average time it took for this last operation. He tried to maintain that speed as well as he could but did not use a stop watch in the actual test performance. After the first symbol had been pulled through, the subject was shown the first answer card. After encircling his choice on the answer sheet, he was asked to close his eyes while the experimenter removed the first symbol and inserted the second. The same process was then repeated for the balance of the test.

The scoring of the test was done by recording the number of symbols correctly identified in the box below "II." (See Plate 9)

Test 1-B, the word association test, was then given (Plate 4).

Now, I'm going to give you a word association test. Please keep your answer sheet face down. On the back side of that sheet you will find 20 words. Opposite each word is a space. As you read each word, just put opposite it the first word or phrase you think of, no matter what it is. But don't think. I want the very first word that flashes into your mind. For instance, if I should say "table", what do you think of? (The subject may answer "chair".) That's what I mean. Give me the very first thing you think of. And remember, this is also a speed test. I'm going to time you. When one minute has elapsed, I will write "1" on this pad. When two minutes has gone by, I'll write "2" etc. When you finish, just put the number of minutes in the right-hand corner. After about three and one-half minutes I shall ask you to stop, whether you've finished or not. Is that clear? All right. Now when I say

"go", you turn your answer sheet over, like this, (experimenter illustrated with another answer sheet), and begin work. Ready. Go.

After completing the test, the score was determined by counting the total number of "visual" or "haptical" words<sup>1</sup> written by the subject, and recording the number of each in the two boxes on the front of the answer sheet labeled "V" for "visual" and "H" for "haptic".

This hand-operated model, used to administer Test 1-A, proved to have serious drawbacks:

1. Variation in environmental control: It was difficult to maintain a similarly lighted and sound-proofed room for each subject. Often, lighting conditions varied greatly from one test to another, since daylighting was used. Interruptions were frequent, because of the multi-purpose function of the room in which the tests were given.

2. Variation in test administration: The author also found that the time taken to pull one symbol completely through behind the slot varied from 9 to 13 seconds. Moreover, a smooth, continuous movement of the symbol behind the slot was difficult to achieve.

3. Since the test had to be individually administered it was a time-consuming operation to test even a relatively small sampling of 25. Since the total time for administration of the 10 symbols took approximately 30 minutes, even the most ideal scheduling of 25 subjects would consume 13 hours of the experimenter's time.

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<sup>1</sup>Both types of words were selected through using the criteria suggested by Lowenfeld. Lowenfeld defined a visual word as a word involving a reaction to the environment (e.g., climbing--mountain). He defined a haptical word as one referring to the bodily self (e.g., climbing--hard). The reliability of scoring, using these criteria, was not investigated by the author, and was not reported by Lowenfeld.

For these reasons the following steps were taken: Through an arrangement made with the University of Minnesota Film Service, the operation involved in pulling each of the 10 symbols behind the slot was photographed on 16 millimeter film. In addition, each of the 10 answer cards was photographed on 2"x2" slides. The administration of the test then proceeded as follows: A regular classroom, seating fifty subjects, was suitably darkened by pulling all window shades and black-out curtains to within 3 inches of the window sill. A screen was placed on one end wall. A 16 millimeter "silent speed" film projector and a 2"x2" slide projector were placed 30 feet from the screen, throwing an image about 4'x3½'. (Plate 11) The 50 subjects then took seats in 6 rows, parallel to the screen. Those who were near or far-sighted were asked to sit wherever they could see most comfortably. Answer sheets and pencils were passed out to each subject, and the experimenter, standing before the group, gave these directions:

Each of you has an "Answer Sheet" before you. Letter your name on the top line, last name first, enter your grade in school, and your age in years and months. Now enter the title of your father's position, such as "grocery clerk", "mechanical engineer", "medical doctor", etc. Under that, give a brief description of his duties. Here, I am interested in knowing, in particular, the degree of responsibility which his job entails. For instance, if he works in a grocery store, describe his duties. Is he an employee, is he the manager, or is he the owner? Then, under "number of semesters of art classes taken", note the total number of semesters taken in each type of school noted. Now for the test itself.

Test 1-B, the word association test, was administered first. Then Test 1-A was given. Instructions and demonstrations were the same as previously noted. However, in the actual administration of Test 1-A, the experimenter operated a moving picture projector, and a 2"x2" opaque slide projector. After the explanations were made as to the nature of Test 1-A, the experimenter took his position at the rear of the classroom, by the two projectors. First, the moving picture projector was used to run off the filming of the first symbol as it moved through the slot. After the filmed operation of pulling the first symbol through behind the slot had been completed, the film projector was stopped. One second later, the first answer card, photographed on a 2"x2" glass slide, was projected onto the screen from the second projector. Subjects were told they could take as long as they wished. When all were finished and had been cautioned to choose one of the five alternate answers, "even if it is a wild guess", the subjects encircled their chosen answer on the Answer Sheet, the slide projector was turned off and the film projector was used again for the next symbol. This process was repeated for each of the 10 symbols and answer cards.

At the completion of the test, the lights were turned on and all answer sheets were collected.

The author believes that the following advantages were apparent in giving tests 1-A and 1-B under these conditions:

1. Variations in environmental stimuli, as they may affect test performance, were substantially reduced.
2. If a school auditorium is used, it is possible to test as many as 250 subjects at one time.
3. Variations in administration were materially reduced, since the actual operation of pulling the symbols behind the slot was fixed on film.

### Design of Test 2-A

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In the course of giving Test 1-A the author found that the relative difficulty of the items varied greatly. From the test performance of 54 art education majors at the University of Minnesota, the difficulty of each of the 10 items was computed by deriving the percentage of the total group who missed each item.

Item Number	Percent who missed item
1.	31
2.	7
3.	87
4.	17
5.	52
6.	22
7.	30
8.	39
9.	46
10.	46

Item 2, missed by only 7 percent, seemed far too easy, in the sense that such an easy item rarely discriminates between "good" and "poor" performers. Item 3 seemed too difficult, since it was missed by 87 percent of the group and had no discrimination power. This fact, plus the belief that a longer test should prove more reliable, resulted in the plan to lengthen Test 1-A



to 20 items. However, in designing the additional items, a thorough study was made of the items near 50 percent difficulty. (Items 5, 8, 9, 10) In comparing these items with item 2, the "easy" item, the two characteristics found to be shared by items 5, 8, 9, 10 and absent in item 2, were:

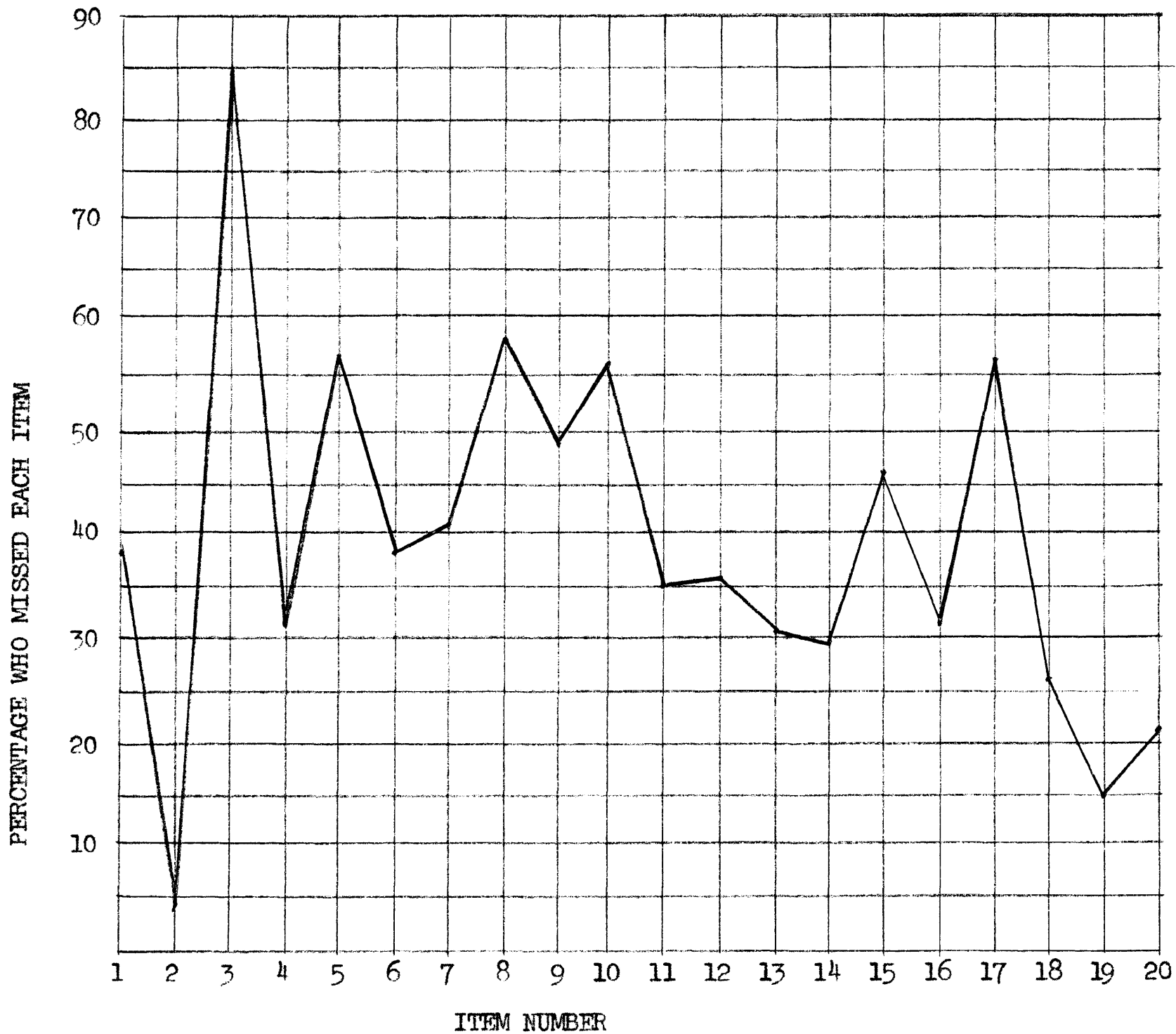
-the use of the double line, calling for keeping two reference points simultaneously in mind as the symbol is pulled through behind the slot,

-the use of a minimum of four changes in the direction of the line, as opposed to only one change in direction in item 2.

The ten additional items, incorporating these two characteristics, were then designed, filmed, and spliced to the original film of the first ten items. (This new test of 20 items will henceforth be called Test 2-A. See Plate 12.) Ten additional answer cards were then designed and 2"x2" slides were made of these cards. (Plate 40) Test 2-A was then given to a total of 220 University of Maryland undergraduate students, and the difficulty of all 20 items was computed. The computation of the difficulty of the new items revealed that none was either too difficult nor too easy, with the possible exception of item 19. (15 percent missed it.)

Item number	Percent who missed item	Item number	Percent who missed item
1.	38	11.	35
2.	3	12.	36
3.	87	13.	30
4.	31	14.	29
5.	67	15.	47
6.	38	16.	31
7.	41	17.	56
8.	58	18.	26
9.	49	19.	15
10.	56	20.	22

The range of difficulty of the 20 items in Test 2-A, based upon the performance of 220 undergraduate students at the University of Maryland, can be graphically summarized as follows:



PERCENTAGE OF 220 UNIVERSITY OF MAYLAND UNDERGRADUATE STUDENTS WHO MISSED EACH OF THE 20 ITEMS ON TEST 2-A

Administration of Test 2-A was conducted in the same way as Test 1-A.

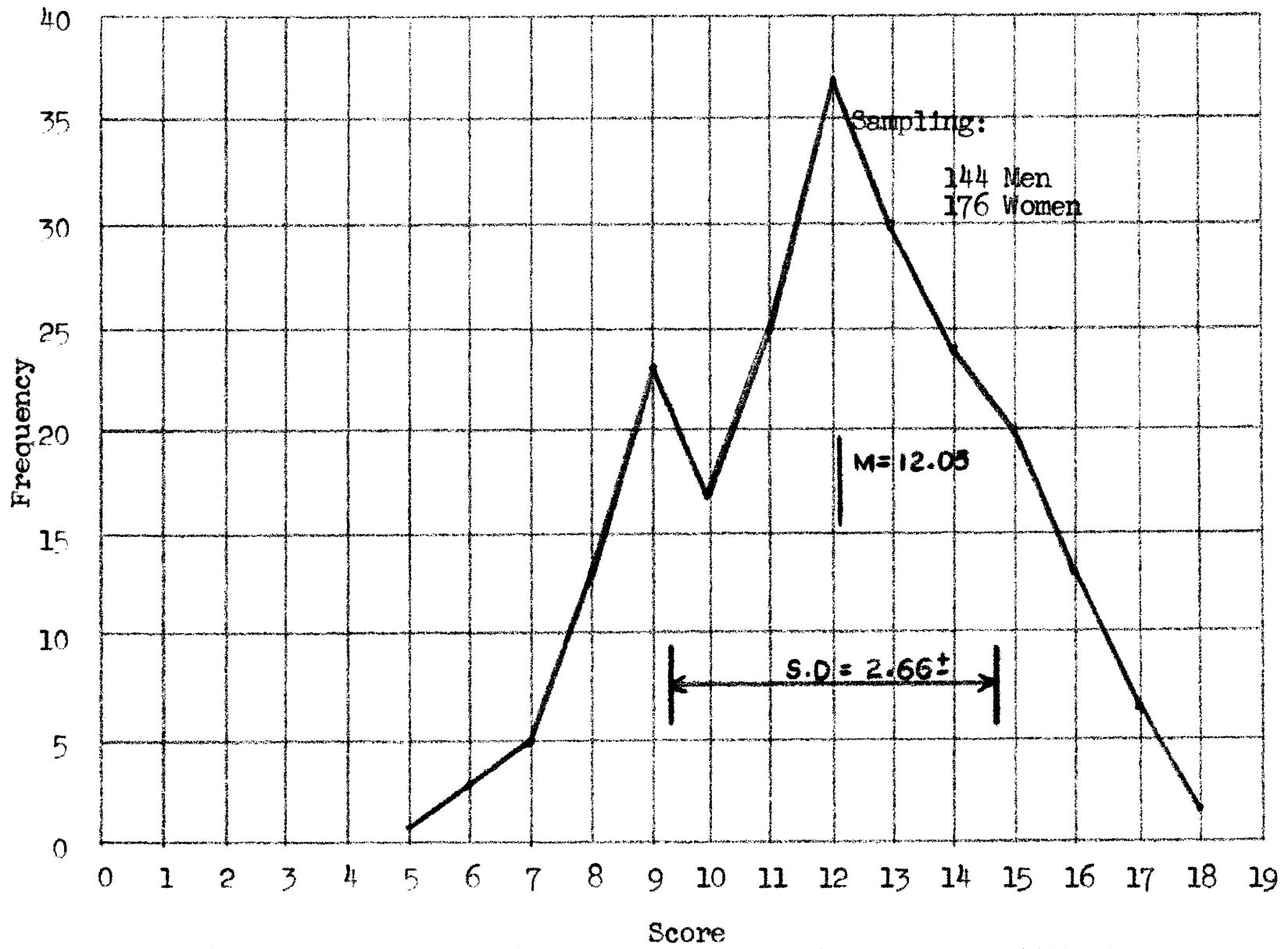
### Observations and Conclusions about Tests 1-A, 1-B, 2-A

Observations based upon well over thirty trials with these three tests have revealed the following data:

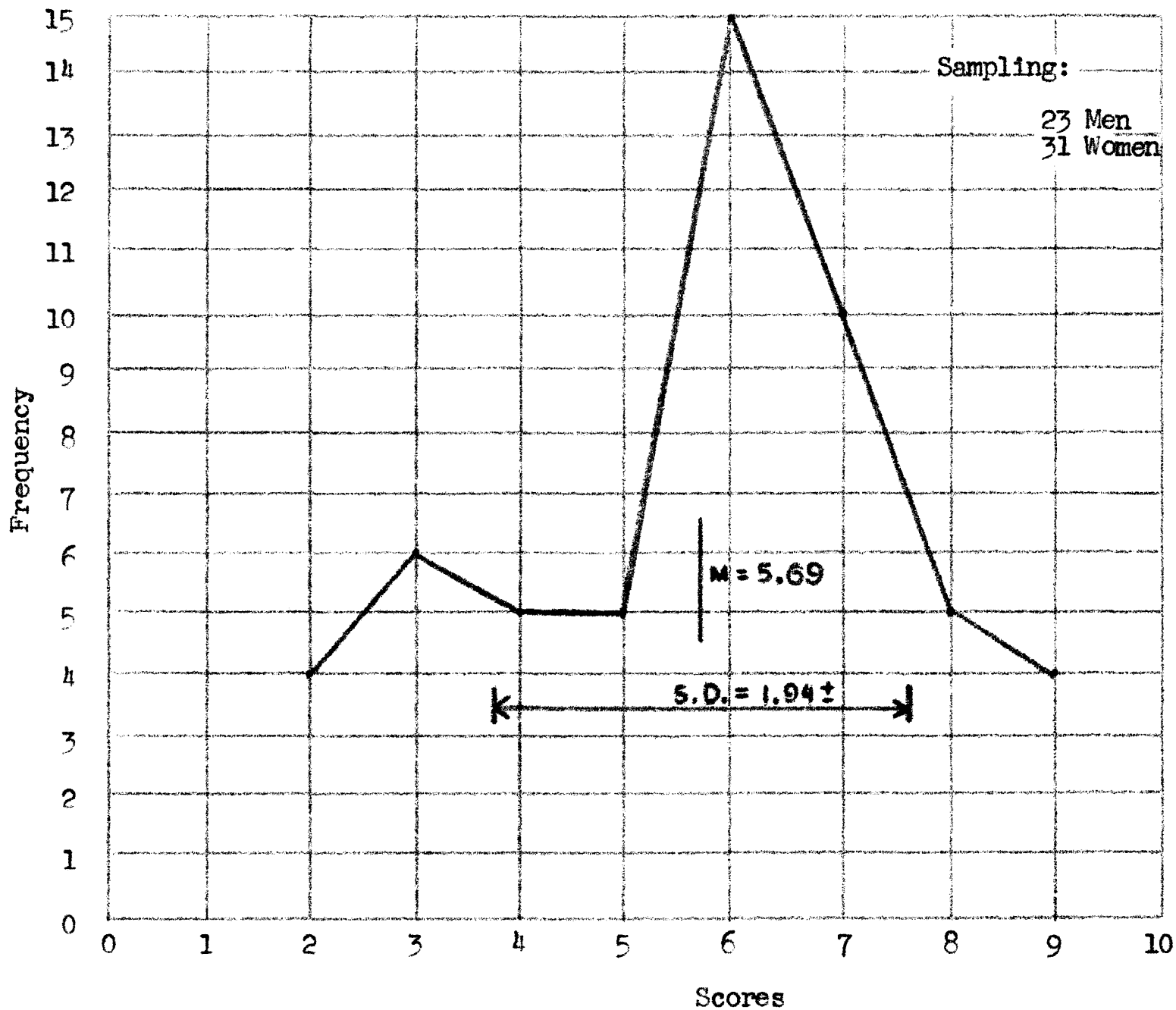
1. From an examination of the frequency graphs of scores made on Tests 1-A and 2-A, a bi-modal distribution appears common to both. (See the two graphs on the pages immediately following.) Since Lowenfeld's hypothesis of the visual and haptic types implies that the two differ greatly in personality make-up, it seems reasonable to assume that a valid testing device should result in a bi-modal distribution of scores. If we further assume that Test 2-A does have a measure of validity, then both a further refining of the validity of the test, coupled with a compilation of the scores of at least five hundred subjects on this newer version would yield further positive or negative evidence as to the presence of a true bi-modal distribution.
2. In the actual giving of Test 2-A, one timing factor appears to be crucial. During some trials with small groups, the author experimented with varying the interval between the stopping of the film and the flashing of the appropriate answer

card on the screen. Many subjects commented upon this operation. Some felt that an instantaneous flashing of the answer card, after the film was stopped, would materially aid their recall of the symbol seen. Others felt that a time interval of one second was preferable between the two operations. The author did no further experimenting with this factor, but a careful study of the most effective time interval might be time well-spent.

3. Since items 2, 3, and 19, on Test 2-A, are either very easy or very difficult, it would be wise to determine the discrimination power of these three items and, if the results bear out doubts as to their worth, a suitable improving of them should increase the effectiveness of the test.
4. No attempt was made to determine the reliability of scoring Test 1-B, and although the author experienced little difficulty in finding "visual" and "haptic" word responses, according to Lowenfeld's criteria, a reliability study, using these criteria, should be undertaken. The author did feel, however, that many words referring to body states, such as "swimming-cool", or "running-hot", should be studied to determine whether they might not fit under the "haptic" category.



FREQUENCY DISTRIBUTION OF SCORES MADE BY 220 UNIVERSITY OF MARYLAND UNDERGRADUATE STUDENTS ON TEST 2-A



FREQUENCY DISTRIBUTION OF SCORES MADE BY 54 UNIVERSITY OF MINNESOTA  
ART EDUCATION MAJORS ON TEST 1-A

CHAPTER IV. RELIABILITY AND VALIDITY OF AN APPROXIMATION OF LOWENFELD'S "TEST OF INTEGRATION OF SUCCESSIVE IMPRESSIONS" AND HIS ORIGINAL "TEST OF VISUAL VS. HAPTICAL WORD ASSOCIATION"

RELIABILITY OF TEST 2-A

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In order to determine the reliability of Test 2-A, 109 undergraduate education students at the University of Maryland were given the same test twice. The interval between the first testing and the retest was 14 days. On both occasions, the test was given in the same classroom, an auditorium, at the same time, (8:00 A.M.), and under approximately the same lighting conditions. All blinds were drawn, but four imperfect blinds provided sufficient light for the subjects to see their "Answer Sheets".

The performances of each subject on the test and retest were paired, (Plate 14), and the Pearson Product-Moment Coefficient of Correlation was obtained, based upon the correlation between the number of correct responses on each of the two trials. The correlation coefficient was .57 with a standard error of .07. (See Plates 15 and 16 for computations.) The 1% confidence interval was .387 to .753. Although the coefficient of correlation was not high, a practice effect may have been operating, since the mean score of the first trial was 12.07, while the mean score for the second trial was 13.70.



Determination of the reliability of Test 2-B was not attempted.

#### VALIDITY OF TESTS 1-A, 2-A, 1-B

In order to determine the validity of a modification of Lowenfeld's "Test of Integration of Successive Impressions" and "Test of Visual vs. Haptical Word Association", the following studies were made:

#### Studies to Investigate the Validity of a Modification of Lowenfeld's "Test of Integration of Successive Impressions".

1. Test 1-A scores of 27 University of Minnesota Art Education majors were compared with the consensus of at least three faculty members of the Department of Art staff at the University of Minnesota as to the "visual", "haptic" or "indefinite" tendency of each.
2. Test 2-A scores of nine University of Maryland students who scored "high" and nine students who scored "low" were given the Rorschach Ink Blot Test. The personality patterns of the "high" and "low" scorers were then examined in the light of 20 Rorschach factors.

#### Studies to Investigate the Validity of Lowenfeld's "Test of Visual vs. Haptical Word Association".

3. The number of "visual" and "haptical" words used by 23 University of Minnesota art education majors on Test 1-B were compared with the consensus of at least three faculty members of the Department of Art staff as to the "visual", "haptic" or "indefinite" tendency of each.
4. The significance of the difference was determined between the mean scores of 117 students on Test 2-A and the mean scores of 21 students from this group who were classed as "visual" on Test 1-B.
5. The significance of the difference was determined between the mean scores of 117 students on Test 2-A and the mean scores of 21 students from this group who responded with the greatest number of "haptical" words on Test 1-B.

6. The coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "visual" words with which each responded on Test 1-B.
  7. The coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "haptical" words with which each responded on Test 1-B.
- A. COMPARISON OF TEST 1-A SCORES AND FACULTY JUDGMENTS AS TO THE INDIVIDUAL'S "VISUAL", "HAPTIC", OR "INDEFINITE" TENDENCY.

According to Cook,<sup>1</sup> "a measure of the validity of a test is secured by computing a coefficient of correlation between scores on the test and an outside criterion". He distinguishes four types of criteria:

1. Product ratings: "In the fields of English, composition, art, industrial arts, home economics, and the like, achievement may be presented by products which have been created. These products may be rated by experts, and the ratings used as criterion measures in determining the validity of tests of achievement."<sup>2</sup>
2. Behavior ratings: "In the fields of literary appreciation, social behavior, speech, English usage, and the like, the behavior of individuals may be rated by competent judges and the composite rating used as a criterion measure."<sup>3</sup>
3. School marks: "The use of school marks in determining the validity of achievement tests is a common procedure."<sup>4</sup>
4. Previously validated tests: In determining the validity of shorter tests or tests employing a

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<sup>1</sup>Walter W. Cook, "Achievement Tests". A mimeographed pamphlet published by the University of Minnesota, p. 16.

<sup>2</sup>Ibid., p. 16.

<sup>3</sup>Ibid., p. 16.

<sup>4</sup>Ibid., p. 17.

new technique, long tests or tests with established validity are frequently used as criteria."<sup>1</sup>

Cook further states that "because of the usual low reliability of product ratings, behavior ratings, and school marks, validity coefficients based on them are usually low."<sup>2</sup>

Since the validity criterion used for this study was a type of "behavior rating", Cook's warning should be borne in mind. "Product ratings" were not used because the author felt that an estimate of "visual" or "haptic" tendency involved a type of personality analysis which should be continuous through time, in order to gain a better idea of the personality dynamics of the individual. "School marks", as a criterion, was eliminated because the author could find no studies correlating this criterion with "visual-haptic" tendency. "Previously validated tests" were not used as a criterion because the author failed to find any other such tests of "visual-haptic" tendency with the exception of the Lowenfeld tests under discussion.

1. Procedure:

Sixty-two junior and senior students in art education at the University of Minnesota were given Test 1-A. After completion of the test, 16 Department of Art

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<sup>1</sup>Ibid., p. 17.

<sup>2</sup>Ibid., p. 17.

faculty members were contacted, in whose classes these 62 students were registered. Each was sent the following information:

- a letter explaining the nature of the project, (Plate 17),
- a complete description of the three types, (visual; haptic; indefinite) (Plate 18),
- a score sheet consisting of the 62 subjects with space provided for indicating the tendency of each student, (whether "visual", "haptic", or "indefinite"), (Plate 19)
- a "follow-up" or "reminder" letter. (Plate 20)

If any of the 62 students was registered in the class of a particular faculty member, he was asked to observe the student over a period of 8 weeks, in order that his judgment would be as carefully considered as possible. When the score sheets of the 16 faculty members were returned, the students finally selected were those upon whom a minimum of three faculty members had rendered a judgment.

The final classification of each of the 27 students was made as follows:

- To be rated as "visual" or "haptic", a simple majority of all faculty judgments must concur in the conclusion.
- If a majority of the judgments did not favor either the "visual" or "haptic" classification, the student was placed in the "indefinite" category.

## 2. Results: (Plates 21, 22)

The Test 1-A scores of each of the 27 students, with their classification, according to the faculty, is

reproduced in Plate 21. Since the sampling of students in each of the categories was so small, it was felt that developing a coefficient of correlation between Test 2-A scores and faculty classifications would be meaningless. For this reason, the "inspection graph" in Plate 22 has been devised. According to the faculty, the group was composed of:

3 "haptics"  
 10 "visuals"  
 14 "indefinites"

The Test 1-A scores of these three groups are indicated opposite each of them, (Plate 22).

### 3. Conclusions:

Inspection of Plate 22 reveals that, on Test 1-A, there is an evident tendency for the "haptics" to score the lowest, the "indefinites" to range about the middle, and the "visuals" to score the highest.

In conclusion then, the following statement can be made about a modification of Lowenfeld's "Test of Integration of Successive Impressions": On the basis of the small sampling used, and assuming that Test 1-A is representative of Lowenfeld's actual test, performance on the test is positively correlated with "visual", "haptic", or "indefinite" tendency, as judged by art experts.

B. COMPARISON BETWEEN THE PERFORMANCE OF 9 HIGH SCORERS AND 9 LOW SCORERS ON TEST 2-A AND THEIR PERSONALITY PATTERNS AS REVEALED BY THE RORSCHACH INK BLOT TEST.

Recent research has placed increasing stress on the role of personality factors in conditioning the perception of all visual phenomena. Stagner, author of the recent "Psychology of Personality", believes "that the basic pattern of personality is, in most instances, a visual frame of reference...."<sup>1</sup> Hunt and Guilford<sup>2</sup>, Voth<sup>3</sup>, and Sexton<sup>4</sup> have all reported significant differences in the visual perception of differing personality types, both normal and abnormal.

Since "visual" and "haptic" refer to basic personality types, it seemed logical to assume that a second estimate of the validity of Lowenfeld's "Test of Integration of Successive Impressions" could be obtained by examining the extent to which scores on this test could be correlated with basic personality factors. In order to examine this premise, 18 subjects were given the Rorschach Ink Blot Test as well as Test 2-A.

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<sup>1</sup>Ross Stagner, Psychology of Personality, New York: McGraw-Hill Book Co., Inc., p. 331, 1948.

<sup>2</sup>Joseph McV. Hunt and Joy P. Guilford, "Fluctuation of an Ambiguous Figure in Dementia Praecox and in Manic Depressive Patients", Journal of Abnormal Social Psychology, 27: pp. 443-452, 1933.

<sup>3</sup>Albert C. Voth, "Individual Differences in the Autokinetic Phenomenon", Journal of Experimental Psychology, 29: pp. 306-322, 1941.

<sup>4</sup>M. C. Sexton, "Autokinetic Test: Its Value in Psychiatric Diagnosis and Prognosis", American Journal of Psychiatry; 102: pp. 399-402, 1945.

1. Procedure:

From the original group of 117 University of Maryland students who took Test 2-A, the 9 highest and 9 lowest scorers were given the Rorschach Ink Blot Test. The two extreme groups were chosen on the assumption that if Test 2-A proves to have an actual validity, the lowest and highest scorers should show some significant differences in personality patterns.

Their scores on Test 2-A were as follows:

High Scorers		Low Scorers	
1.	19	109.	10
2.	18	110.	9
3.	18	111.	9
4.	18	112.	8
5.	18	113.	8
6.	18	114.	7
7.	18	115.	7
8.	18	116.	4
9.	18	117.	4

The Rorschach Ink Blot Tests were administered by the author.

Since the author was aware that his own prejudices could conceivably influence the overall interpretation of each record, Carr's system of quantitative analysis was used.<sup>1</sup> In the Carr method, twenty Rorschach factors are extracted and a quantitative evaluation of each factor is made. In the scoring of these factors, two operations are involved:

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<sup>1</sup>Arthur C. Carr, "Evaluation of Nine Psychotherapy Cases by the Rorschach", Journal of Consulting Psychology 13: No. 3, pp. 196-205, 1949.

- The factor, (whether "R" total, "M" total, etc.) must be identified by examining the nature of each response the subject makes to the ink blots.
- The quantitative measure of this factor is merely an arithmetical summation or percentage determinant of the number of times this factor appears in the whole record.

In the interpretation of the arithmetical total derived for each factor, Carr sets up a numerical maximum or minimum. For instance, Carr states that the "M" total must be at least "3" or above. If it is, then the factor is evaluated as "satisfactory". If the "M" total is less than 3, then it is judged "unsatisfactory". The final score is merely the summation of "satisfactory" and "unsatisfactory" factors, the total equaling 20.

A listing<sup>1</sup> of the twenty factors, with their recommended "satisfactory" or "unsatisfactory" ratings, is described in Plate 23 in order that the results of the study of the high and low scorers can be better understood and evaluated.

## 2. Results: (Plates 24, 25)

A summary of the results in Plate 24 indicates that, among the high scorers on Test 2-A, one subject received more "unsatisfactory" than "satisfactory" scores. Among the low scorers, three subjects received more "unsatisfactory" than "satisfactory" scores.

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<sup>1</sup>Ibid., pp. 197-198.



In Plate 25, the percentage of high and low scorers who were judged "unsatisfactory" in each of the Rorschach factors is also tabulated. The 20 factors have been so ranked that number 1, factor "S", is that factor in which a greater percentage of high scorers were graded "unsatisfactory". Number 20, factor "FC", represents the opposite end of the scale, and is that factor in which a greater percentage of low scorers were graded "unsatisfactory".

An inspection of Plate 25 reveals that:

-A greater percentage of high scorers were graded "unsatisfactory" in only three factors:

S total  
C total  
Total R's

-A greater percentage of low scorers were graded "unsatisfactory" in twelve factors:

H+A/Hd+Ad  
P total  
F%  
A%  
FV+VF+V(wt)  
H-Hd  
M+FC-(CF+C)  
M total  
FC-(CF+C)  
W%  
Total R's to VIII - X  
FC total

If Carr's definitions as to the meaning of an "unsatisfactory" performance on each of the factors is applied, then the low scorers on Test 2-A, in contrast to the high scorers, appear to possess the following personality characteristics: (reading from number 9 through number 20 from Plate 25)

9. They tend to see more parts of humans and animals, rather than wholes,
10. possess less capacity and interest in thinking along normal lines,
11. are more constricted,
12. find it necessary to achieve greater conformity and stereotypy,
13. have greater feelings of inferiority,
14. have a greater tendency towards anxiety trends and depression,
15. are less mature emotionally,
16. appear to repress creative powers to a greater extent,
17. are less emotionally stable,
18. see more parts than wholes of figures,
19. are less responsive to outside stimuli and more prone to color shock,
20. exhibit poorer control over emotional concomitants.

### 3. Conclusions:

On the basis of a study of Rorschach factors present in the Rorschach protocols of nine high scorers and 9 low scorers on Test 2-A, the following tentative statements can be made as to the personality characteristics of the subjects scoring high or low on an approximation of Lowenfeld's "Test of Integration of Successive Impressions":

- a. There appears to be some difference between the overall personality pattern of a high scoring and low scoring group.

- b. The high scorers tend to
  - see more whole figures,
  - exhibit more emotional control,
  - react more overtly to environmental stimuli,
  - appear more emotionally mature,
  - be less constricted,
  - exhibit less conformity and stereotypy.
  
- c. The low scorers tend to
  - see more parts of figures,
  - have less emotional control,
  - be less affected by environmental stimuli,
  - appear more emotionally immature,
  - be more constricted,
  - exhibit more conformity and stereotypy.

C. COMPARISON OF TEST 1-B SCORES AND FACULTY JUDGMENTS AS TO THE INDIVIDUAL'S "VISUAL", "HAPTIC", OR "INDEFINITE" TENDENCY.

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1. Procedure:

The same 62 junior and senior art education students used in the previous study were given Test 1-B. Then, this group, as with the previous study, was classified by those Department of Art faculty members in whose classes each student was registered. The same stipulations were set forth as to the method by which each should be classified. From this group of 62 students, all those were chosen on whom at least three faculty members could render a judgment. Again, the final classification arrived at was determined as in the previous study. In addition, the Test 1-B results of the 23 students who comprised this final group were

studied to determine the number of "visual" and "haptical" words used by each.<sup>1</sup> Plate 26 presents a summary of:

- the number of "visual" and "haptical" words each student used on Test 1-B,
- the "haptic", "visual" or "indefinite" classification of the student according to faculty judgment.

2. Results: Plates 26, 27, 28)

According to Lowenfeld, a person is classified as "visual" on the "Test of Visual vs. Haptical Word Association" if he responds with at least 12 "visual" words. (Refer to Plate 6.) An inspection of Plate 27 reveals that, of the 7 students classified as "visual",

- three responded with 12 or more "visual" words,
- four responded with less than 12 "visual" words.

Lowenfeld classifies a person "haptic" if he responds with at least 12 "haptical" words. Since none of the 23 students responded with 12 or more "haptical" words, a comparison on this basis is not possible. However, an inspection of Plate 28 does reveal that of the three groups, the "visuals" did respond with only 0, 1, or 2 haptical words. However, two of the three "haptics" also scored low as did five of the thirteen "indefinites".

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<sup>1</sup>Lowenfeld defines a visual word as a word involving a reaction to the environment (e.g., climbing--mountain). A "haptical" word he defines as referring to the bodily self (e.g., climbing--hard).

### 3. Conclusions:

The following statement can be made about Lowenfeld's "Test of Haptical Word Association": On the basis of the small sampling used, performance on the test can not be used as a valid predictor of "haptic", "visual", or "indefinite" tendency, as judged by art experts. However, if the art experts judge an individual as "visual", he will tend to respond with no, one, or two haptical words. No relationship appears to exist between the number of "visual" words used, and the individual's "haptic", "visual" or "indefinite" tendency, as judged by art experts.

#### D. SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEAN SCORE OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A AND THE MEAN SCORE OF 21 STUDENTS FROM THIS GROUP WHO SCORED "VISUAL" ON TEST 1-B.

##### 1. Procedure:

One hundred and seventeen University of Maryland students were given Test 2-A. The mean and standard deviation of these scores were then computed. This same group was also given Test 1-B and the number of "visual" words each used was determined. The total group was then ranked in order, according to the number of "visual" words with which each responded on Test 2-B. (Plate 29) Since Lowenfeld feels that a person who responds with 12 or more "visual" words on this test is a "visual" type, all those who responded with 12 or more "visual" words were sorted out and classified as "visual" types. The mean and standard

deviation of the scores of this latter group of 21 students on Test 2-A were also computed. The significance of the difference was then determined between the mean scores of the two groups on Test 2-A.

2. Results: (Plates 29, 30, 31, 32)

The mean and standard deviation of the scores made by the 117 University of Maryland students on Test 2-A were:

$$\begin{aligned} M &= 13.82 \\ S.D. &= 2.90 \end{aligned} \quad 1$$

The mean and standard deviation of the scores on Test 2-A made by the 21 students who responded with 12 or more "visual" words were:

$$\begin{aligned} M &= 12.76 \\ S.D. &= 2.14 \end{aligned} \quad 2$$

The assumption was made that for a difference to be significant, it must be significant at the 2% level.<sup>3</sup> In this case, the significance ratio must exceed 2.33.<sup>4</sup> Since the significance ratio between the two means was 1.93, the difference is not significant at the 2% level.

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<sup>1</sup>Refer to Plate 30 for computations of the mean and standard deviation.

<sup>2</sup>Refer to Plate 31 for computations of the mean and standard deviation.

<sup>3</sup>Everet F. Lindquist, A First Course in Statistics, Boston: Houghton Mifflin Co., p. 132, 1942.

<sup>4</sup>Ibid., p. 132.

It should be noted, however, that the difference would be significant at the 5.36% level, but in the reverse direction. If we apply Lowenfeld's hypothesis, the 21 students who responded with the most "visual" words on Test 1-B should have attained a higher mean score on Test 2-A. The reverse tendency is present here.

### 3. Conclusions:

On the basis of comparing the mean scores of 117 students on a modification of Lowenfeld's "Test of Integration of Successive Impressions", with the mean scores of 21 of these students who responded with 12 or more visual words on Lowenfeld's "Test of Visual vs. Haptical Word Association", there is no significant difference between the two means at the 2% level. There is a significant difference at the 5.36% level, but it is in the reverse direction from that expected by applying Lowenfeld's hypothesis.

## F. SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEAN SCORE OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A AND THE MEAN SCORE OF 21 STUDENTS FROM THIS GROUP WHO SCORED "HAPTIC" ON TEST 1-B.

### 1. Procedure:

From Test 1-B, given to the group reported under D, the number of haptical words each subject used

was counted.<sup>1</sup> The 117 students were again ranked in order, according to the number of "haptical" words with which each responded. (Plate 33)

The Test 2-A scores of the 21 students who responded with the greatest number of haptical words were then noted, and the mean score of this distribution was determined. The significance of the difference between the mean scores on Test 2-A of the whole group of 117 and the selected group of 21 was computed.

2. Results: (Plates 33, 34, 35)

The mean and standard deviation of the scores made by 117 University of Maryland students on Test 2-A were:

$$\begin{aligned} M &= 13.82^2 \\ S.D. &= 2.90 \end{aligned}$$

The mean and standard deviation of the scores on Test 2-A made by the 21 students who responded with the greatest number of "haptical" words were:

$$\begin{aligned} M &= 14.71^3 \\ S.D. &= 2.25 \end{aligned}$$

As in the previous study, the assumption was made that a significant difference between two mean scores

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<sup>1</sup>As with the "visual" group, Lowenfeld states that, in order to classify a person as "haptic" he must have used a minimum of 12 haptical word responses. Since only one out of 117 responded with the required number, it was decided to use the 21 students who responded with the most haptical words, so that the number of scores in the sampling would be the same as was used under D.

<sup>2</sup>Refer to Plate 30 for computations of the mean and standard deviation.

<sup>3</sup>Refer to Plate 34 for computations of the mean and standard deviation.



must be significant at the 2% level. Since the actual significance ratio between the two means was 1.56, and the required ratio is 2.33, the difference is not significant at the 2% level.<sup>1</sup> It should be noted, however, that the difference would be significant at the 11.88% level, but in the reverse direction, as in the previous study.

### 3. Conclusions:

On the basis of comparing the mean scores of 117 students on a modification of Lowenfeld's "Test of Integration of Successive Impressions", with the mean scores of 21 of these students who responded with the most haptical words on Lowenfeld's "Test of Visual vs. Haptical Word Association", there is no significant difference between the two means at the 2% level.

There is a significant difference at the 11.88% level but it is in the reverse direction from that expected by applying Lowenfeld's hypothesis.

## F. THE COEFFICIENT OF CORRELATION BETWEEN THE SCORES OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A AND THE NUMBER OF "VISUAL" WORDS WITH WHICH EACH RESPONDED ON TEST 1-B.

### 1. Procedure:

The sampling used was the same group of 117 students previously reported. The data for the number of "visual" words used by each student, and his corresponding score on Test 2-A, were taken from Plate 29.

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<sup>1</sup>Refer to Plate 35 for computations.

A Pearson Product-Moment Coefficient of Correlation was determined by correlating the number of visual words each student used on Test 1-B with his score on Test 2-A.

2. Results: (Plates 36, 37)

The coefficient of correlation between the number of "visual" words used on Test 1-B and the score on Test 2-A was  $-.04$ , with a standard error of  $.09$ .<sup>1</sup>

3. Conclusions:

On the basis of comparing the scores of 117 University of Maryland students on a modified form of Lowenfeld's "Test of Integration of Successive Impressions" with the number of "visual" words each used in Lowenfeld's "Test of Visual vs. Haptical Word Association", there is no evidence of any statistically significant correlation.

G. THE COEFFICIENT OF CORRELATION BETWEEN THE SCORES OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A AND THE NUMBER OF HAPTICAL WORDS WITH WHICH EACH RESPONDED ON TEST 1-B.

1. Procedure:

The sampling used was the same group of 117 students previously reported. The data for the number of haptical words used by each student, and his corresponding score on Test 2-A, were taken from Plate 33. A Pearson Product-Moment Coefficient of Correlation was determined

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<sup>1</sup>Refer to Plate 36 for computations, Plate 37 for scatter diagram.

by correlating the number of haptical words each student used on Test 1-B with his score on Test 2-A.

2. Results: (Plates 38, 39)

The coefficient of correlation between the number of haptical words used on Test 1-B and the score on Test 2-A was .04 with a standard error of .09.<sup>1</sup>

3. Conclusions:

On the basis of comparing the scores of 117 University of Maryland students on a modified form of Lowenfeld's "Test of Integration of Successive Impressions" with the number of haptical words each used in Lowenfeld's "Test of Visual vs. Haptical Word Association", there is no evidence of any statistically significant correlation.

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<sup>1</sup>Refer to Plate 38 for computations, Plate 39 for scatter diagram.

## CHAPTER V. SUMMARY AND CONCLUSIONS

### A. Nature and Results of the Problem Investigated

One of the historic problems in the field of art education has been the relentless search for the "natural way to draw". From William Bentley Fowle in 1821 to Schaefer-Simmern and Viktor Lowenfeld in 1950, artist-educators have propounded their theories as to the overt patterning of the natural mode of art expression and its theoretically possible philosophical and psychological foundations.

The early art educators attacked the problem by postulating a theory of art expression based upon Pestalozzian principles of the perceptual comprehending of an object, developed and refined by the inductive method of proceeding from simple parts to the final, complete whole. However, this early attack appeared to lead to a dead end, since its primary thesis was the postulation of an ideal form of expression rather than a study of the source of that form. Later psychologists, aided by the questioning discipline of their profession, began a systematic study of the source, the individual child, and propelled into motion

an imposing array of analyses of the drawing act, the basis for making choices, and the observable product of that act.

Starting with Sir Francis Galton and Gustav Alben, analysts of the drawing act have gradually clarified a theory of the existence of two opposing types of artists - the "visual" and the "constructive" type. Continuing the search undertaken by these men, a recent psychologist, Viktor Lowenfeld, has refined these earlier concepts and, through his recent popular book, "Creative and Mental Growth", has captured the imagination and curiosity of the present-day art teacher, through clarifying the approaches of these two types and suggesting appropriate teaching methods for guiding them.

Lowenfeld's proposed method of discovering the two types, the "visual" and the "haptic", consists in the giving of a series of five tests. Two of these, the "Test of Integration of Successive Impressions", and the "Test of Visual vs. Haptical Word Association", were the subject of study undertaken by this thesis.

Four questions were asked about these two tests:

1. To what extent is a modification of Lowenfeld's "Test of Integration of Successive Impressions" a reliable testing instrument?

2. To what extent is a modified form of Lowenfeld's "Test of Integration of Successive Impressions" a valid measure of the "visual", "haptic", or "indefinite" type?
3. To what extent is Lowenfeld's "Test of Visual vs. Haptical Word Association" a valid measure of the "visual", "haptic", or "indefinite" type?
4. To what extent are Lowenfeld's "Test of Visual vs. Haptical Word Association" and a modification of his "Test of Integration of Successive Impressions" correlated with each other?

The eight studies undertaken to answer these questions, and the results, were as follows:

1. To answer question 1, two modified form of Lowenfeld's "Test of Integration of Successive Impressions", (Test 1-A and 2-A) and a replica of his "Test of Visual vs. Haptical Word Association", (Test 1-B) were constructed. Test 2-A was then given to 109 men and women students at the University of Maryland, on two separate occasions, and a coefficient of correlation between the test and retest situation was then computed. The Pearson Product-Moment Coefficient of Correlation between the number of correct responses of each of the students on the two administrations of the same test was .57 with a standard error of .07. The 1% confidence interval was .387 to .753.
2. To answer question 2, Test 1-A scores of 27 University of Minnesota students were compared with the consensus of at least three faculty members of the

Department of Art staff at the University as to the "visual", "haptic", or "indefinite" tendency of each. Results indicated that there was an evident tendency for the "haptics", as classified by the experts, to score the lowest on Test 1-A, the "indefinites" to range about the middle, and the "visuals" to score the highest.

Test 2-A scores of nine University of Maryland students who scored "high" and nine who scored "low" were given the Rorschach Ink Blot Test. The personality patterns of the "high" and "low" scorers were then examined in the light of 20 Rorschach factors.

Results indicated that there was some difference between the overall personality pattern of a high scoring and low scoring group. The high scorers tended to:

- see more whole figures,
- exhibit more emotional control,
- react more overtly to environmental stimuli,
- appear more emotionally mature,
- be less constricted,
- exhibit less conformity and stereotypy.

The low scorers tended to:

- see more parts of figures,
- have less emotional control,
- be less affected by environmental stimuli,
- appear more emotionally immature,
- be more constricted,
- exhibit more conformity and stereotypy.

3. To answer question 3, the number of "visual" and "haptical" words used by 23 University of Minnesota students

on Test 1-B were compared with the consensus of the Department of Art staff as to the "visual", "haptic", or "indefinite" tendency of each. Of the seven students classified as "visual" by the experts, three responded with 12 or more "visual" words, four responded with less than 12 "visual" words. All seven "visuals" responded with no more than two "haptical" words. The "haptics" and "indefinites" followed no consistent pattern in the number of haptical words they used.

The significance of the difference was determined between the mean scores of 117 students on Test 2-A and the mean scores of 21 students from this group who were classed as "visual" on Test 1-B. The significance ratio between the two means was 1.93. Since the necessary significance ratio at the 2% level of confidence must be 2.33, the difference was not significant.

Contrary to Lowenfeld's hypothesis, the mean score of the "visual" group was lower than the mean score for the whole group of 117 students. The difference between these two means was significant at the 5.36% level.

The significance of the difference was determined between the mean scores of 117 students on Test 2-A and the mean scores of 21 students from this group



who responded with the greatest number of "haptical" words on Test 1-B. The significance ratio between the two means was 1.56. Since the necessary significance ratio at the 2% level of confidence must be 2.33, the difference was not significant.

Again it was found that the means of the two groups were in reverse relationship to the expectation inferred from Lowenfeld's hypothesis. The mean score of the "haptic" group was higher than the mean score for the whole group of 117 students. The difference between these two means was significant at the 11.88% level.

4. To answer the last question, the coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "visual" words with which each responded on Test 1-B. The Pearson Product-Moment Coefficient of Correlation between the number of "visual" words used on Test 1-B and the scores on Test 2-A was  $-.04$ , with a standard error of  $.09$ .

The coefficient of correlation was determined between the scores of 117 University of Maryland students on Test 2-A and the number of "haptical" words with which each responded on Test 1-B. The Pearson Product-Moment Coefficient of Correlation between the number of "haptical" words used on Test 1-B and the scores on Test 2-A was  $.04$ , with a standard error of  $.09$ .

## B. Conclusions and Recommendations for Further Study

In sketching an over-all view of the data presented in this thesis, the following generalizations appear to emerge from the limited samplings and techniques used:

1. A modification of Lowenfeld's "Test of Integration of Successive Impressions" appears to be the more fruitful test of the two studied, and may be capable of further refinement and validation in the future. However, the reliability of a modified version of it is not yet high enough (.57) to warrant its use in comprehensive validity studies. Scores based upon only ten test items do correlate with faculty judgments as to a person's "visual", "haptic", or "indefinite" tendency; scores based upon a twenty-item test of the same nature may be correlated with certain factors culled from the Rorschach Ink Blot Test.
2. However, the "Test of Visual vs. Haptical Word Association" does not reveal the same optimistic future. The visual type of person does tend to respond with none, one, or two haptical words, but so do the haptics and the indefinites. Therefore, the only use for this test at present, seems to lie in using it to validate a belief that a particular person is the visual type. Limited results do reveal that if a person responds with more than two haptical words, he is not a visual person, but may be either a haptic or

indefinite type. The test seems to have value then, only as a means of negating an assumption that a person is a visual type, for it does not positively predict any of the three classifications.

3. A further study, not attacked in this thesis, is the questioning of Lowenfeld's apparent belief that the "visual" and "haptic" types are each "normal", in the sense that he believes each should continue in his particular mode of perceiving and reacting. It is possible that if the haptic type proves to be the more neurotic, as the Rorschach Ink Blot Test has indicated, then this type may actually represent an involuntary arresting of conceptual development, with concomitant limitation of developing visual perceptics, as a means of defense against the stimulation of insufficiently integrated emotion. Rorschach data have continued to reveal that, as a person depends solely upon tactile and kinesthetic experiences, to the neglect of visual form, (as does the haptic), he also tends to develop a highly introverted and often severely maladjusted personality.

Another area for further research then, is a more systematic study of the extent to which the so-called "haptic" may actually be a highly maladjusted personality type. If such research substantiates this

belief, then the art teacher should be encouraged to aid the child in acquiring greater powers of visualization, rather than continuing to feed the child's underdeveloped perceptual apparatus with more of the same unbalanced attitude towards himself and his environment.

4. A subsequent interview with Viktor Lowenfeld, after the writing of the body of this dissertation has revealed the belief that a substantial reduction in the total exposure time of each symbol in Test 2-A might raise the reliability of the test. Through Lowenfeld's own experimentation, he has found that verbal cues are increasingly used as the exposure time is lengthened. He believes this accounts for a concomitant lowering of reliability. However, when the exposure time is reduced to about four seconds (instead of the eleven second exposure used in Test 2-A) verbal cues are less used and reliability increases.

Lowenfeld has also stated he believes that if the exposure time can be found which results in the highest reliability on Test 2-A, the test might prove of appreciably greater value in validating his hypothesis.

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PLATE 1

FACSIMILE OF ORIGINAL SLOTTED CARD USED IN GIVING TEST 1-A

PLATE 2

ANSWER CARD

For first symbol - Test 1-A

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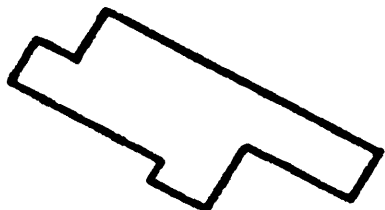
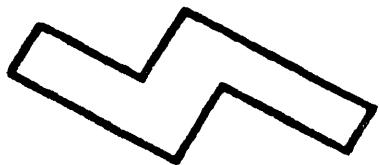
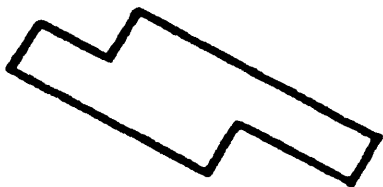
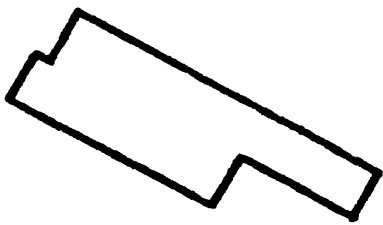
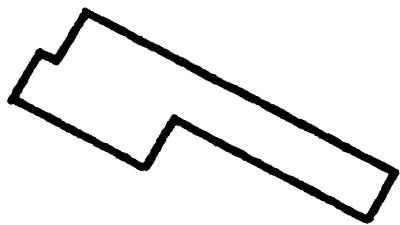


PLATE 3

FACSIMILE OF LORENZELI'S TEST OF SUBJECTIVE IMPRESSIONS  
Table Test

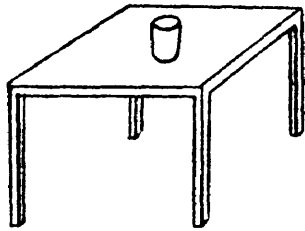


Table and glass

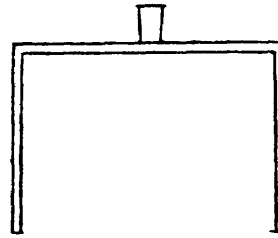


Table and glass

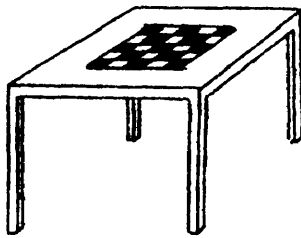


Table and chessboard

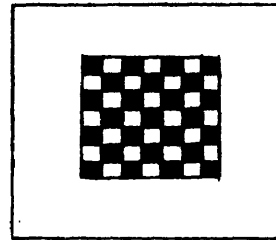


Table and chessboard

TYPICAL "VISUAL" CONCEPTS

TYPICAL "HAPTIC" CONCEPTS

PLATE 4

TEST 1-B

~~Facsimile of Loughfield's "Test of Visual vs. Haptical  
Word Association"~~

Directions: Write down your immediate reaction after reading each single word. If nothing comes to mind, leave the space blank.

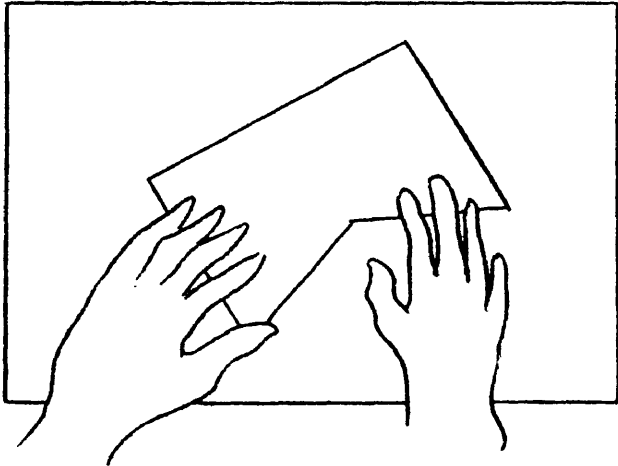
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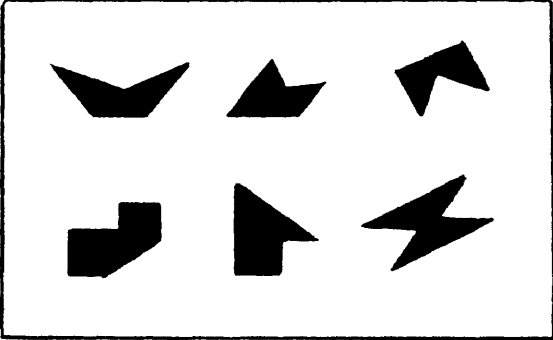
greeting	pulling
walking	swimming
looking	riding
climbing	running
talking	jumping
lifting	listening
thinking	reaching
drawing	touching
catching	stretching
hearing	breathing

7 mm

PLATE 1. HEAD OF VERMILION TAIL PHILIPINIC EUPHONIA  
(Resimile of one of the ten costs)



CUT-OUT SYMBOL TO BE EXPLORED  
WITH FINGERS WHILE BLIND-  
FOLDED



ANSWER TABLET

PLATE 6

LOWENFELD'S METHOD OF SUMMARIZING AND DETERMINING  
VISUAL OR HAPTIC APPETUDE

---



Kind of Test	Haptic	Visual	Indefinite
I. Integration of Successive Impressions Test (10 figures; each counts 2)			
(a) positive reactions		12-20	below 12
(b) negative reactions	12-20		below 12
II. Subjective Impressions Test			
1. Table Test			
(a) change of table representation (top and side views)	10		
(b) objective view without change		10	
(c) no table drawn, objects only			indefinite
2. Think-of-a-Building Test			
(a) outside view		10	
(b) thinking of climbing	10		
(c) counting floors singly			indefinite
III. Word-Association Test			
(a) actions	12-20		
(b) environment		12-20	
(c) neither action nor environment			indefinite
IV. Visualization of Kinesthetic Experience Test		12-20	below 12
V. Tactile Impressions Test	12-20		
	<hr/>	<hr/>	
	80*	80*	

\*Highest score possible

PLATE 7

TEST 1-A SYMBOLS

Modification of Lowenfeld's Test of Integration of  
Successive Impressions

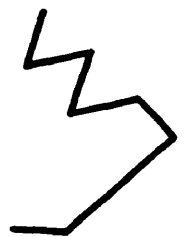
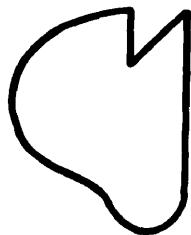
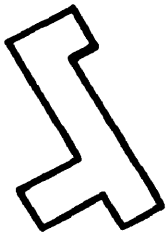
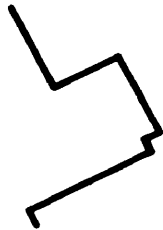
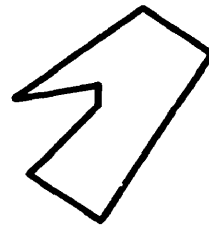


PLATE 8

ANSWER CARDS - TEST 1-A

Modification of Lowenfeld's "Test of Integration of  
Successive Impressions"

---

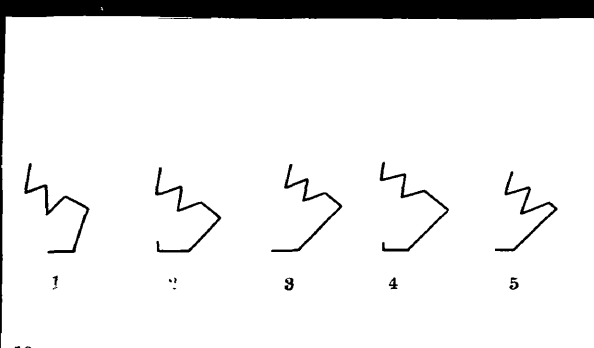
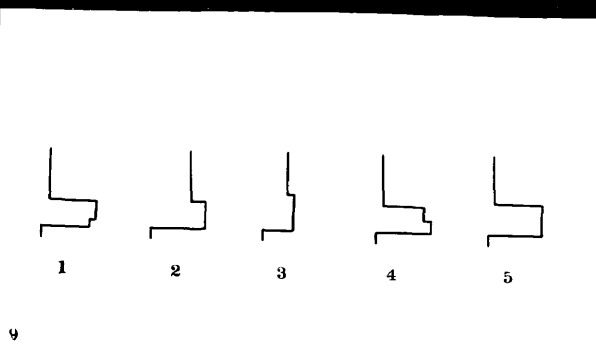
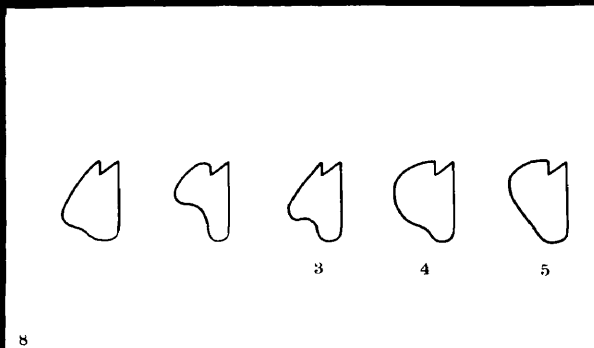
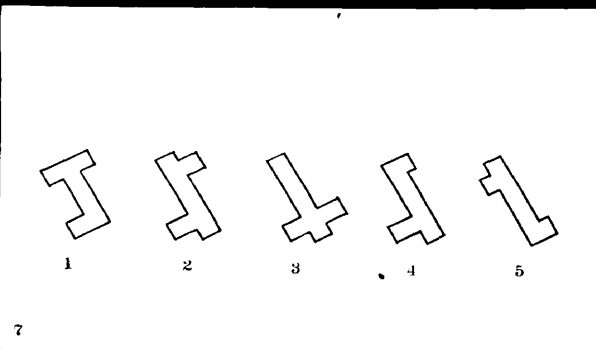
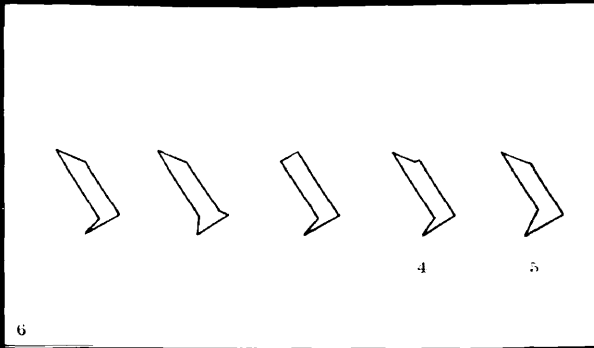
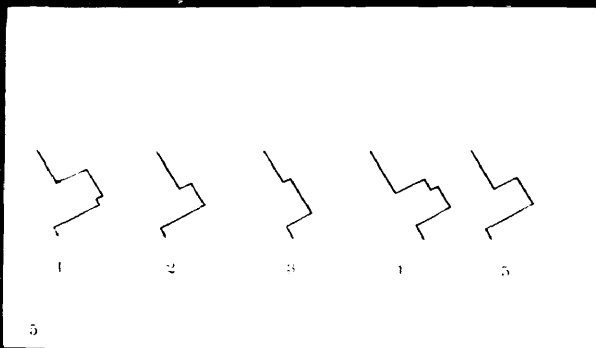
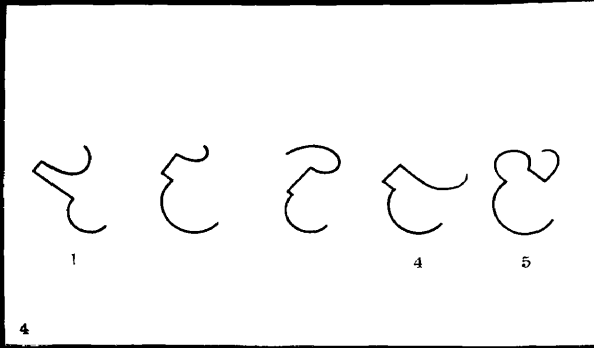
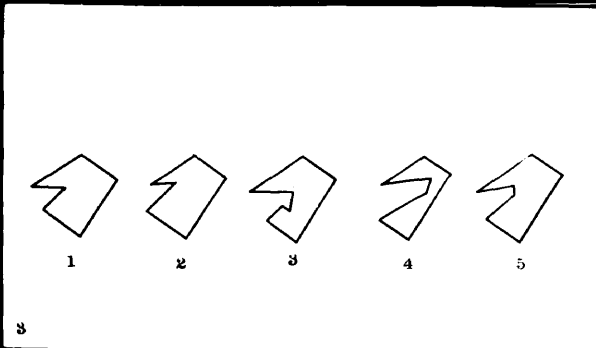
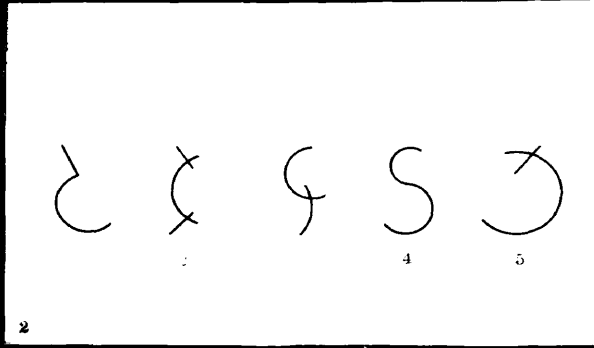
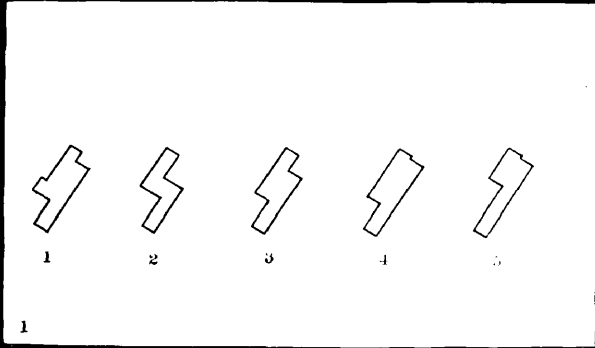


PLATE 9

ANSWER SHEET - TEST 1-A, 1-B



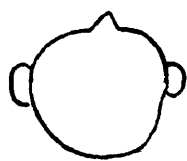
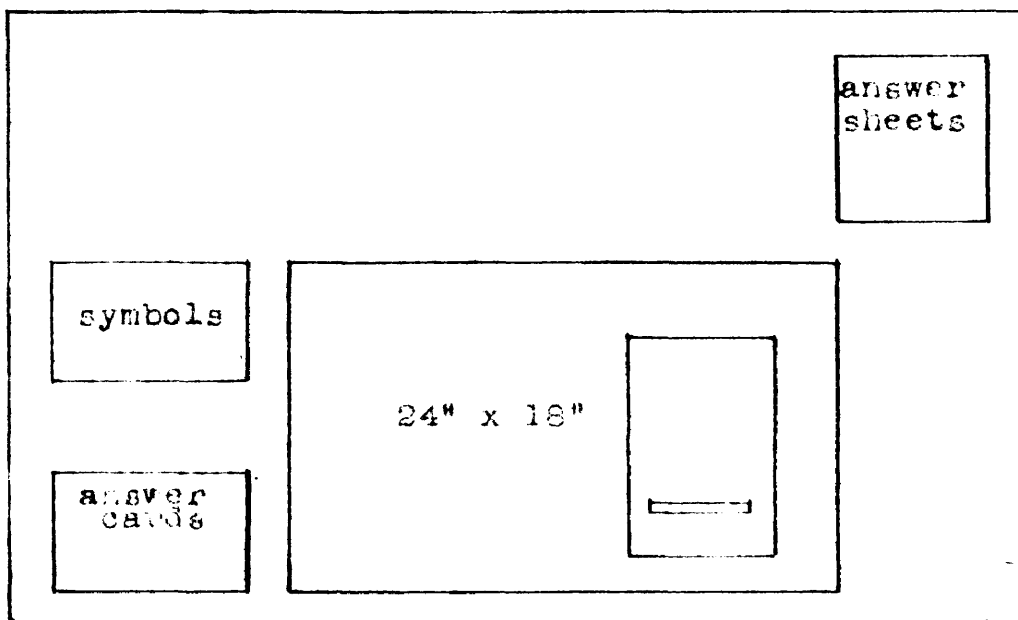
PLATE 10

TEST SITUATION FOR TEST 1-A, 1-B

Individually administered

Hand operated version





experimenter



subject

PLATE 11

APPEARANCE OF PROJECTED IMAGE - TEST 1-A  
Using 16 mm. silent speed film projector

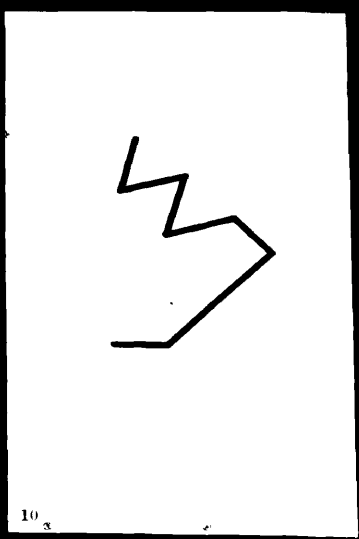
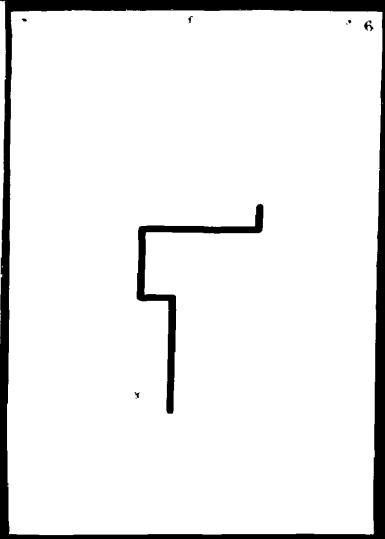
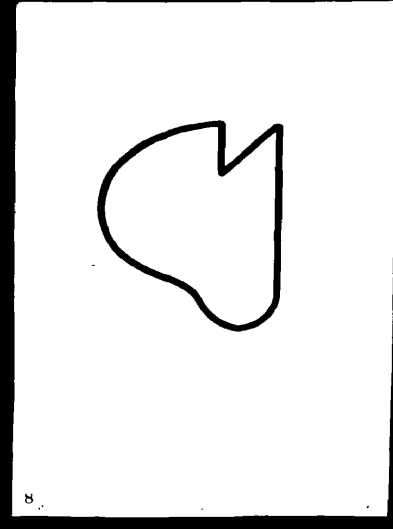
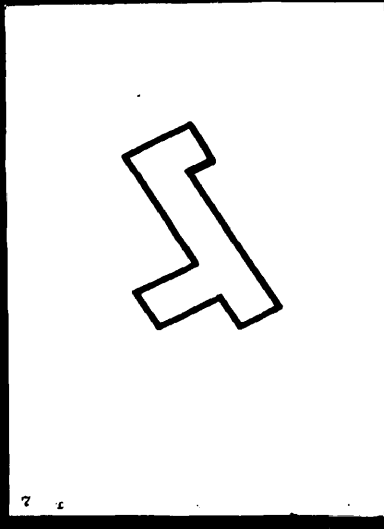
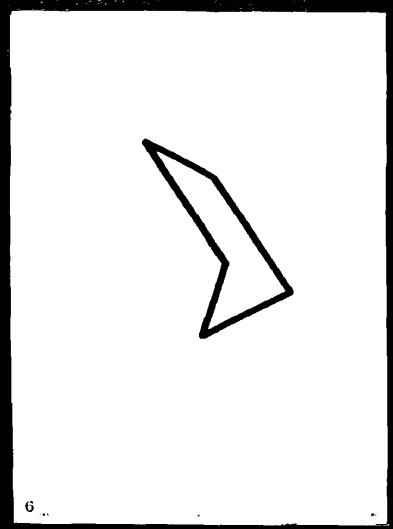
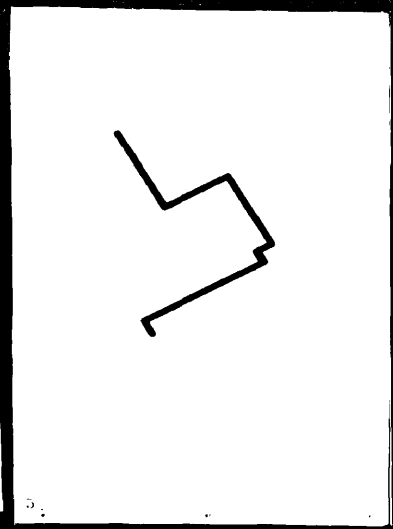
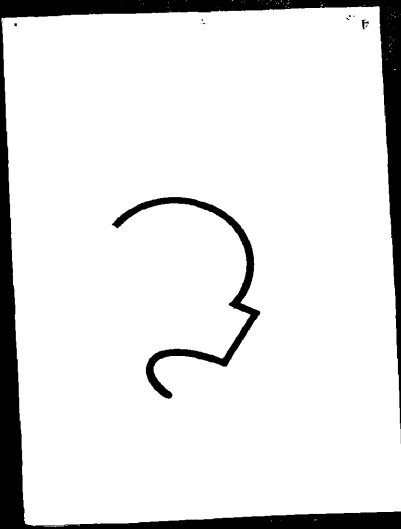
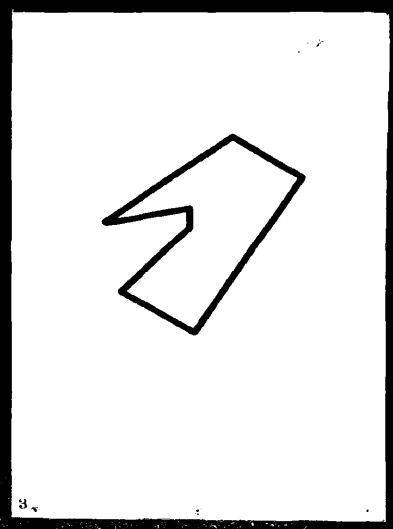
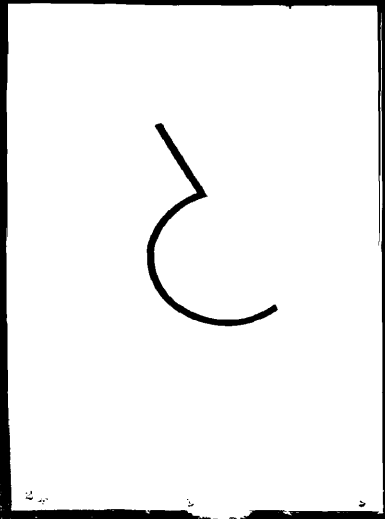
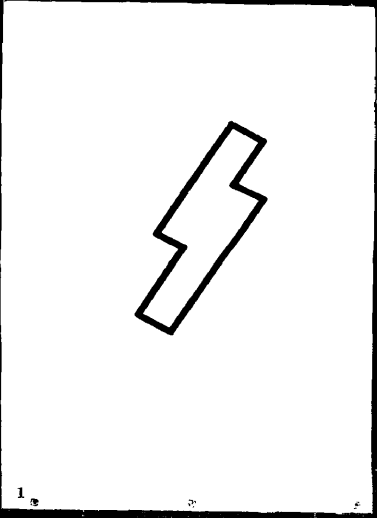
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PLATE 10

TEST 2-4 CYCLIC

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Extended and modified version of Lowenfeld's Test of Interpretation of Successive Impressions



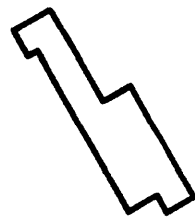
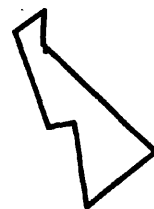
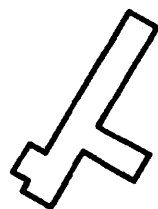
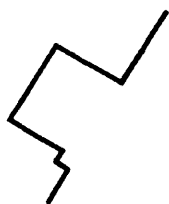
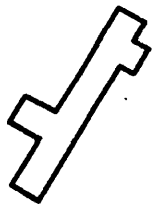


PLATE 13

ANSWER SHEET - TEST 2-A

---

KEEP THIS SIDE UP

Visual - Haptic Aptitude Test - prepared by  
 Richard G. Wiggin - College of Education  
 University of Maryland - College Park, Md.

\_\_\_\_\_

last name	first name	initial
-----------	------------	---------

Frosh \_\_\_\_\_ Soph \_\_\_\_\_ Junior \_\_\_\_\_ Senior \_\_\_\_\_ Grad \_\_\_\_\_ Age: \_\_\_\_\_ yrs \_\_\_\_\_ months Sex: M F

Major \_\_\_\_\_ Minor \_\_\_\_\_

Father's occupation: \_\_\_\_\_

Description of his duties: \_\_\_\_\_

Number of semesters of art classes taken:

- in Jr. High Schools \_\_\_\_\_
- in Sr. High Schools \_\_\_\_\_
- in art schools \_\_\_\_\_
- in College \_\_\_\_\_
- others \_\_\_\_\_

TEST II.

- |                 |                 |
|-----------------|-----------------|
| a. - 1 2 3 4 5  |                 |
| b. - 1 2 3 4 5  |                 |
| 1. - 1 2 3 4 5  | 11. - 1 2 3 4 5 |
| 2. - 1 2 3 4 5  | 12. - 1 2 3 4 5 |
| 3. - 1 2 3 4 5  | 13. - 1 2 3 4 5 |
| 4. - 1 2 3 4 5  | 14. - 1 2 3 4 5 |
| 5. - 1 2 3 4 5  | 15. - 1 2 3 4 5 |
| 6. - 1 2 3 4 5  | 16. - 1 2 3 4 5 |
| 7. - 1 2 3 4 5  | 17. - 1 2 3 4 5 |
| 8. - 1 2 3 4 5  | 18. - 1 2 3 4 5 |
| 9. - 1 2 3 4 5  | 19. - 1 2 3 4 5 |
| 10. - 1 2 3 4 5 | 20. - 1 2 3 4 5 |

I.Q.	GR	AGE	SEC	SEX	SEM. ART	V	H	II.

--	--

PLATE 14

SCORES OF 109 STUDENTS AT THE UNIVERSITY OF MARYLAND IN A  
TEST-RETEST SITUATION ON TEST 2-A

All scores represent the number of correct responses out of  
20 possible correct answers.



Number	A*	B**	Number	A	B	Number	A	B
1	18	14	37	13	12	73	11	12
2	17	14	38	13	12	74	11	13
3	17	16	39	13	13	75	11	14
4	17	16	40	13	14	76	11	14
5	17	18	41	13	14	77	11	15
6	16	13	42	13	14	78	11	15
7	16	14	43	13	15	79	11	15
8	16	15	44	13	15	80	11	16
9	16	15	45	13	15	81	10	4
10	16	16	46	13	15	82	10	10
11	16	17	47	13	16	83	10	11
12	15	13	48	13	16	84	10	11
13	15	15	49	13	16	85	10	13
14	15	15	50	13	17	86	10	14
15	15	15	51	13	17	87	10	14
16	15	16	52	13	19	88	10	15
17	15	17	53	12	4	89	10	15
18	15	17	54	12	12	90	9	7
19	15	18	55	12	12	91	9	8
20	14	12	56	12	13	92	9	11
21	14	13	57	12	14	93	9	12
22	14	13	58	12	14	94	9	14
23	14	14	59	12	15	95	9	14
24	14	14	60	12	15	96	9	15
25	14	15	61	12	15	97	9	16
26	14	15	62	12	16	98	8	9
27	14	16	63	12	16	99	8	9
28	14	16	64	12	16	100	8	10
29	14	16	65	12	17	101	8	12
30	14	17	66	12	17	102	8	12
31	14	18	67	12	18	103	8	16
32	14	18	68	11	8	104	7	10
33	14	18	69	11	10	105	7	11
34	14	18	70	11	11	106	7	13
35	13	10	71	11	11	107	6	12
36	13	10	72	11	12	108	5	7
						109	5	10

\*Scores made on first performance.

\*\*Scores made on second performance.

**PLATE 15**

**CORRELATION CHART FOR COMPUTATION OF THE PEARSON PRODUCT-MOMENT  
COEFFICIENT OF CORRELATION BETWEEN A TEST-RETEST SITUATION IN-  
VOLVING THE PERFORMANCE OF 109 STUDENTS AT THE UNIVERSITY OF  
MARYLAND ON TEST 2-A**

---

		Retest																						
		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	f	d	$\Sigma Y$	$\Sigma Y^2$	$\Sigma X$	$\Sigma Y$	
Test	19																							
	18																	1	6	6	36			
	17													20	20			4	5	20	100	40		
	16										-4			8	8	12		6	4	24	96	28	4	
	15										-3			9	6	18	12	8	3	24	72	45	3	
	14										-4	-4		4	12	6	32	15	2	30	66	54	8	
	13										-8	-4	-1	4	6	6		5	18	1	18	18	21	13
	12																	15						
	11					6			4	6	4	1		-3	-2			13	-1	-13	13	21	5	
	10	20							8	12		2		-4				9	-2	-18	36	42	4	
	9				21	18			9	6				-3	-6			8	-3	-24	72	54	9	
	8					40	16		16					-8				6	-4	-24	96	72	8	
	7						20	15		5								3	-5	-15	75	40		
	6									12								1	-6	-6	36	12		
	5				49				28									2	-7	-14	98	77		
	f	2			2	2	2	7	6	11	9	16	20	16	8	7	1	109		$\Sigma Y^3 = 808$	$\Sigma Y^4 = 606$	$\Sigma X^2 = 54$		
	d	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1			1	2	3	4	5			$\Sigma XY = 452$			
	$\Sigma X$	-20			-14	-12	-10	-8	-18	-22	-9			20	32	24	28	5			$\Sigma X^3 = -4$			
	$\Sigma X^2$				98	72	50	112	54	44	9			20	64	72	112	25			$\Sigma X^4 = 732$			

PLATE 16

COMPUTATIONS INVOLVED IN DERIVING THE PEARSON PRODUCT-MOMENT  
COEFFICIENT OF CORRELATION BETWEEN A TEST-RETEST SITUATION  
INVOLVING THE PERFORMANCE OF 109 STUDENTS AT THE UNIVERSITY  
OF MARYLAND ON TEST 2-A

---

$$\frac{\sum X'}{N} = \frac{-8}{109} = -.07$$

$$\left(\frac{\sum X'}{N}\right)^2 = (.07)^2 = .00$$

$$\frac{\sum X'^2}{N} = \frac{796}{109} = 7.30$$

$$\frac{\sum Y'}{N} = \frac{8}{109} = .07$$

$$\left(\frac{\sum Y'}{N}\right)^2 = (.07)^2 = .00$$

$$\frac{\sum Y'^2}{N} = \frac{808}{109} = 7.41$$

$$\frac{\sum X'Y'}{N} = \frac{452}{109} = 4.15$$

$$\sigma_X = \sqrt{\frac{\sum X'^2}{N} - \left(\frac{\sum X'}{N}\right)^2} = \sqrt{7.30 - .00} = 2.70$$

$$\sigma_Y = \sqrt{\frac{\sum Y'^2}{N} - \left(\frac{\sum Y'}{N}\right)^2} = \sqrt{7.41 - .00} = 2.72$$

$$r = \frac{\frac{\sum X'Y'}{N} - \left(\frac{\sum X'}{N}\right)\left(\frac{\sum Y'}{N}\right)}{\sigma_X \cdot \sigma_Y} = \frac{4.15 - (-.07)(.07)}{2.70 \times 2.72} = \frac{4.15}{7.34} = .57$$

$$\sigma_r = \frac{1-r^2}{\sqrt{N}} = \frac{1-.57^2}{10.44} = \frac{1-.32}{10.44} = \frac{.68}{10.44} = .07$$

PLATE 17

LETTER TO DEPARTMENT OF ART FACULTY EXPLAINING  
THE NATURE OF THE VALIDATION STUDY

Mar. 1, 1948

Mr. A. Caponi  
Art Department  
Jones Hall

Dear Mr. Caponi:

I would be deeply appreciative of your help in aiding me in fulfilling a requirement for the Ph.D.

The job on which I am working at the present time, consists of the constructing of a test in art aptitude which will indicate the degree to which an art student tends to work and think, either:

1. Visually (preferring representational drawing) or
2. Haptically (preferring highly emotional types of art expression) or
3. Capable of doing both types and reacting both ways.

However, in order to validate the test, I would like to enlist the aid of all the art faculty individually to judge the students who have already taken the test and to render a judgment as to which type they consider each of the students to be. Then, if each of the faculty members is in general agreement as to the "type" each of the art students is, this judgment will be correlated with the student's score on the test in order to determine the test's validity.

If you could help me with this task, you need only do the following:

1. Read the description of the three types, (description enclosed)
2. Read through the list of names (score sheet also enclosed) and put a check mark in the column corresponding to the "type" to which you feel the student belongs.
3. Return the list of names to me in the envelope enclosed for that purpose.

In order to make the judgment as accurate as possible, I would suggest you mark only those students whom you recall clearly from recent contact with them. If you cannot reach any of those whom you had previous to this quarter, then you might prefer to observe those from the list whom you have in your classes this quarter, and then turn in the judgment at the end of the winter quarter.

If you can help me with this task, I would indeed be grateful.

Thank you.

Sincerely,

Richard G. Wiggin

PLATE 18

DESCRIPTION OF THE THREE TYPES

Description of the "visual", "haptic", and "indefinite" types  
sent to the 16 faculty members of the Department of Art at the  
University of Minnesota



## DESCRIPTION OF THE THREE TYPES

## No.1 (Visual)

1. In reacting to art products, he shows little ability to project himself into the work and actively "feel" the tensions created by line, color, textural and form relationships. Rather, he prefers to "look" at these relationships as though he were apart from them.
2. In reacting to art products, he prefers to act as "observer", looking at them as an objective observer looks at a distant scene in order accurately to describe and record events taking place there.
3. In producing, he shows a marked tendency to prefer representational means. (The visually photographic as opposed to the non-representational)
4. If he occasionally produces work using non-representational means, he shows little ability to express a personal feeling or emotional intent through the means used.
5. His choices indicate a marked preference for work which describes or records incidents through representational means, and without a marked emotional flavor.
6. In perceiving any art product, he shows a marked ability to act as a "recorder" of sense impressions from the outside, but does not actively experience these impressions within himself.

## No.3 (Both visual and haptic)

The "visual-haptic" or "strong in both" category includes all those who evidence a marked ability to react and produce either "visually" or "haptically", depending upon the demands of the art product or the wishes of the subject at the moment.

## No.2 (Haptic)

1. In reacting to art products, he evidences a marked ability to project himself into the work and actively "feel" the tensions created by line, color, textural and form relationships.
2. In reacting to art products, he prefers to act as "participator", becoming completely involved in interaction of tensions created by the idea or the feeling implied.
3. In producing, he shows a marked tendency to prefer non-representational means. (As opposed to the visually photographic)
4. If he occasionally produces work using representational or visually photographic forms, he markedly "distorts" or modifies the photographic appearance in order to express a personal feeling about the form or idea represented.
5. His choices indicate a marked preference for work which includes a strong emotional flavor or intent.
6. In perceiving any art product, he shows a marked ability to act as a "receiver" of sense impressions from the outside, actively experiencing those impressions within himself.

PLATE 19

SCORE SHEET

---

To be used by each Department of Art faculty member to record his judgment as to a student's aptitude

## SCORE SHEET

Directions: Place a check (✓) in columns 1, 2 or 3, beside the name of each student whom you recall well enough to feel safe in making a judgment. To illustrate, if you feel the student is highly visual, place a (✓) in column 1; if highly haptic (or emotional), put a (✓) in column 2; if he is strong in both forms of expression and appreciation, then place a (✓) in column 3.

Name	1. Visual	2. Haptic	3. Strong in both
1. Names here			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

To number 62.

PLATE 20

"REMINDER" LETTER

Sent to all Department of Art faculty members who did not  
return their SCORE SHEETS within the specified time

To: A. Caponi  
From: R. G. Wiggin  
Subject:

Just a reminder to you that if you have found any time to observe any of the students whose names appear on the "Score Sheet" I sent you, I would appreciate your returning the form in the next two weeks with your judgments noted.

Thank you.

PAGE 01

VISUAL, PARTIC, OF INDEFINITE CLASSIFICATION OF 27 UNIVERSITY  
OF MINNESOTA STUDENTS BY FACULTY MEMBERS OF THE DEPARTMENT OF  
ART AT THE UNIVERSITY OF MINNESOTA

---

Number	Score - Test 1-A	No. of judgments	V	H	I	Classification*
1	8	5	2	1	2	Indefinite
2	7	3	1	0	2	Indefinite
3	7	3	2	1	0	Visual
4	6	4	2	1	1	Indefinite
5	6	4	3	1	0	Visual
6	4	4	1	0	3	Indefinite
7	7	3	0	0	3	Indefinite
8	6	7	0	1	6	Indefinite
9	6	7	0	5	2	Haptic
10	6	3	2	0	1	Visual
11	6	3	1	1	1	Indefinite
12	7	4	1	1	2	Indefinite
13	8	5	1	1	3	Indefinite
14	6	4	2	0	2	Indefinite
15	8	3	2	0	1	Visual
16	7	5	5	0	0	Visual
17	0	4	3	1	0	Visual
18	2	5	0	5	0	Haptic
19	5	5	0	3	2	Haptic
20	6	4	4	0	0	Visual
21	7	5	5	0	0	Visual
22	7	3	0	1	2	Indefinite
23	7	3	2	0	1	Visual
24	4	5	1	1	3	Indefinite
25	6	6	2	0	4	Indefinite
26	5	3	1	0	2	Indefinite
27	6	6	5	0	1	Visual
Number of students taking test						
Raw score each student made on Test 1-A						
Number of faculty members who judged student						
Number of faculty judging student "visual"						
Number of faculty judging student "haptic"						
Number of faculty judging student "indefinite"						

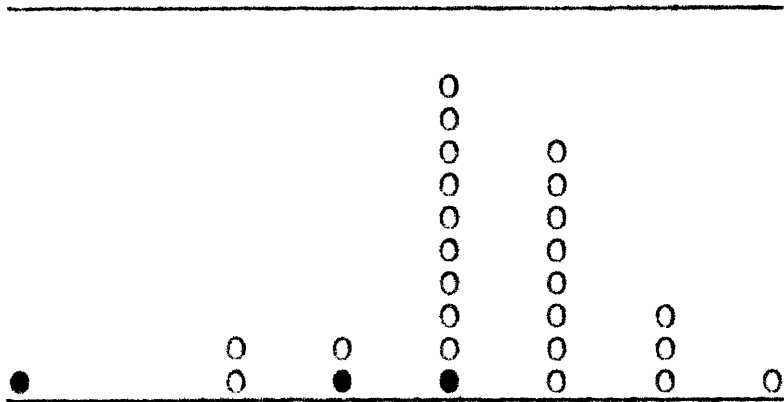
\*If either the "visual" or "haptic" category received a majority of the votes, the subject was so classified. If neither category received a majority, the subject was classified "indefinite".

-157- 22

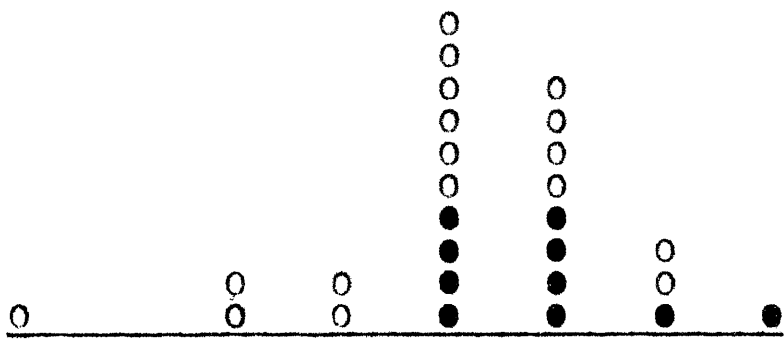
SCORES ON TEST 1-3 OF 27 ART STUDENTS JUDGED "VISUAL", "HAPIC",  
OR "INDIFFERENT" BY 16 FACULTY MEMBERS OF THE UNIVERSITY OF  
MINNESOTA

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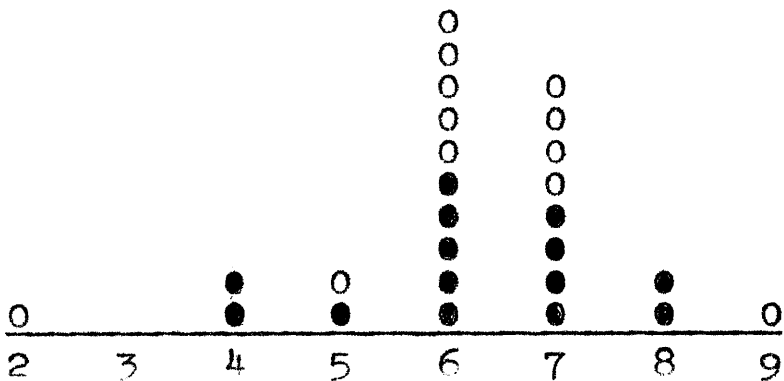




Haptics (3)



Visuals (10)



Indefinites (14)

Scores - Test 1-A

● Represents the scoring positions, in the total distribution, of the category in question. Thus, in the first graph showing the scores of the three "haptics", one scored 2, one scored 5, one scored 6.

○ Represents the total distribution of scores.

PLATE 23

A DESCRIPTION OF N. J. CARR'S TWENTY FORSCHACH FACTORS USED  
TO DERIVE A QUANTITATIVE PERSONALITY SUMMARY

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1. M is the symbol for figures in human-like action. All such responses have one characteristic in common; viz., the subject sees some creature performing human-like action in all or part of the card. M seems to indicate richness of inner life, the creative powers, and the acceptance of one's inner promptings. A normal, intelligent adult is expected to give at least three M responses.
2. W% refers to the number of responses using the blot as a whole. As such, it is generally regarded as an index of present-functioning intelligence. Although qualitative aspects of W produced are most important, the working hypothesis will be that W% should be at least 15 per cent of the total number of responses.
3. F% refers to the percentage of responses which are determined exclusively or primarily by form. Excessive use of this factor indicates constricted control which usually results in lack of personal spontaneity. Normal records will be assumed to have a F% of less than 60.
4. F+% refers to the percentage of accurate or good form responses. As such it demonstrates the subject's ability to direct his thinking with conscious attention and discriminating judgment. For this study, the critical minimum will be set at 60 per cent.
5. H-Hd is the difference between the number of responses which represent the entire human form and the responses to a part of the human figure. The H represents interest in human beings and human problems as opposed to anxiety trends, depressive tendencies, etc. The number of H responses is expected to be greater than those of Hd.
6. (FY+YF+Y)wt is the weighted sum of the number of responses of which flat gray (Y) plays part of the determinant and in excess suggests a dysphoric mood characterized by passivity and absence of activity. Since the degree varies in the order named, a weighted value is given to each of these determinants: .5 for FY, 1.0 for YF and 1.5 for Y. A weighted score of 1.5 or over will be considered as evidence of a possible trend toward the described condition.
7. (FV+VF+V)wt is the weighted sum of the number of responses on which vista (V) plays a part of the determinant and in excess suggests what is commonly called inferiority feelings. Since the degree varies in the order named, a weighted value is given to each of these determinants: .5 for FV, 1.0 for VF, and 1.5 for V. A weighted score of 1.5 or over will be considered as evidence of a possible trend toward the described condition.

8. %A represents the percentage of animal responses regardless of whether they refer to whole animals or parts of them. %A is usually considered to indicate degree of stereotypy and conformity as opposed to adaptivity. It is expected that %A should not be greater than 50 per cent.
9. An and Sex refers to anatomy and sex responses. An overpreponderance of such responses indicates an overconcern with these two areas. Quantitatively, three or more such responses will be considered significant.
10. Adx and Hdx are indicated when the subject sees only part of a figure usually seen as a whole. This response indicates inhibition of the thought processes or mental arrest. No Adx or Hdx is expected in a normal record.
11. P represents the number of popular or common responses. It would seem that the use of seven or more popular concepts is assurance that the subject possesses capacity and interest in thinking along normal lines.
12. R represents the number of responses. Normal, intelligent individuals are usually expected to give at least 20 responses to the total set of cards.
13. FC is the symbol used to indicate responses determined by both form and color, with form playing the predominate role. This factor seems to represent degree of emotional adjustment and control to outer reality. A normal individual is expected to give at least two FC responses.
14. FC-(FC+C)wt indicates the difference between the FC responses (form with bright color) and the number of CF responses (bright color with indefinite form) and C responses (bright color with no form). The FC has a weighted score value of .5, CF of 1.0, and C of 1.5. A well adjusted individual usually has more FC than CF+C responses, the excess being indicative of emotional stability.
15. C is the symbol for a response determined by color only. Such responses seem indicative of a lack of emotional control and are usually not found in the record of a normal adjusted individual.
16. %VIII-X indicates the percentage of responses which are given to the last three cards and seems to indicate a responsiveness to stimuli from without. Approximately 40-60 per cent of all responses are expected to be to these cards.

17. Rejection is a failure to give a response to one or more of the cards. Normal individuals are expected to see something in each of the ten cards.
18.  $M+FC-(C+CF)$  is an indication of the maturity of emotional adjustment and stability.  $M+FC$  is always expected to be greater than  $C+CF$  in the normal adult.
19.  $A+H/(Hd+Ad)$  is the proportion of whole animal and human form responses to part animal and human form responses. A preponderance of the latter indicates a tendency to move more critically toward the given form qualities than the average subject. If the number of  $Hd+Ad$  exceeds one-half the number of  $A+H$ , the threshold for such a critical attitude will be assumed to have been reached.
20.  $S$  indicates a reversal of figure and ground and suggests an oppositional tendency, particularly when there are three or more such responses present.

**PLATE 24**

**SATISFACTORY OR UNSATISFACTORY PERFORMANCE ON 20 RORSCHACH  
FACTORS TAKEN FROM RORSCHACH TESTS GIVEN TO 9 HIGH SCORERS  
AND 9 LOW SCORERS ON TEST 2-A**

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"Satisfactory" or "unsatisfactory" performance in each of the  
20 factors is based upon N. J. Carr's criteria from his article  
entitled "Evaluation of Nine Psychotherapy Cases by the Rorschach",  
Journal of Consulting Psychology, vol. 13, June, 1949, pp. 196-  
205.

High scorers on Test 2-A

1.	1	s	1	u	16	u	0	s	0	s	100	s	1.5	s	0	s	7/2	s
2.	0	s	0	s	16	u	0	s	0	s	50	u	1.	s	2	s	10/0	s
3.	5	u	1	u	48	s	0	s	0	s	94	s	4.	u	4	u	16/8	s
4.	5	u	2	u	131	s	0	s	0	s	89	s	14.5	u	6	u	24/44	u
5.	7	u	1	u	51	s	0	s	0	s	97	s	5.5	u	2	s	9/23	u
6.	1	s	0	s	28	s	0	s	0	s	87	s	5.5	u	0	s	12/7	u
7.	2	s	0	s	37	s	0	s	0	s	88	s	5.5	u	1	s	16/11	u
8.	1	s	0	s	20	s	0	s	0	s	83	s	3.5	u	3	s	8/2	s
9.	4	u	2	u	76	s	0	s	0	s	94	s	10.	u	5	u	22/26	u

SCORES OF NORMAL ADJUSTMENT

Number	S	Rating	C=0	Rating	R= 20	Rating	Adx+Hdx=0	Rating	Rejections=0	Rating	F+%= 60	Rating	FY+YF+Y(wt.)= 1.5	Rating	An+Sex= 3	Rating	H+A/Hd+Ad= 2:1	Rating
--------	---	--------	-----	--------	-------	--------	-----------	--------	--------------	--------	---------	--------	-------------------	--------	-----------	--------	----------------	--------

Low scorers on Test 2-A

1.	2	s	0	s	36	s	0	s	0	s	88	s	10.5	u	1	s	11/10	u
2.	2	s	5	u	86	s	0	s	0	s	88	u	10.5	u	4	u	27/26	u
3.	3	s	0	s	34	s	0	s	0	s	86	u	11.	u	5	u	14/5	s
4.	5	u	2	u	75	s	0	s	0	s	82	s	14.5	u	11	s	34/23	u
5.	0	s	0	s	42	s	0	s	0	s	79	s	2.5	u	0	s	14/4	s
6.	10	u	0	s	102	s	0	s	0	s	76	s	15.	u	1	s	39/28	u
7.	3	s	3	u	33	s	0	s	0	s	85	s	1.5	u	3	u	14/8	u
8.	0	s	1	u	41	s	0	s	0	s	81	s	15.	u	6	u	9/15	u
9.	1	s	0	s	12	u	0	s	0	s	87	s	2.	u	0	s	7/0	s

High scorers on Test 2-A

1.	8	s	50	s	43	s	1.5	s	1.5	s	3	s	-1.5	u	2	s
2.	8	s	44	s	37	s	0.	s	4.	s	4	s	4.	s	4	s
3.	6	u	42	s	42	s	0.	s	8.	s	5	s	3.	s	-2	u
4.	9	s	63	u	40	s	2.5	u	12.	s	16	s	-4.	u	-6	u
5.	6	u	67	u	61	u	0.	s	0.	s	2	u	-2.	u	-13	u
6.	10	s	36	s	46	s	0.	s	6.5	s	4	s	2.5	s	0	u
7.	9	s	51	s	30	s	0.	s	9.	s	8	s	1.	s	2	s
8.	4	u	45	s	35	s	0.	s	1.5	s	3	s	-1.5	u	1	s
9.	12	s	66	u	42	s	.5	s	5.	s	7	s	-2.	u	-4	u

Number	P	Rating	F%	Rating	A%	Rating	FV+VF+V(wt.)	Rating	M+FC-(C+CF)	Rating	M	Rating	FC-(CF+C)	Rating	H-Hd	Rating
	7		60		50		1.5		0		3		0		1	

Low scorers on Test 2-A

1.	7	s	67	u	47	s	0.	s	-2.	u	0	u	-2.	u	-2	u
2.	10	s	53	s	41	s	25.	u	-11.	u	1	u	-12.	u	0	u
3.	6	u	62	u	38	s	0.	s	5.	s	5	s	-4.5	u	0	u
4.	6	u	55	s	51	u	2.	u	5.5	s	00	s	-2.5	u	-7	u
5.	7	s	57	s	33	s	5.	u	3.5	s	5	s	-.5	u	2	s
6.	10	s	68	u	35	s	0.	s	11.5	s	12	s	.5	s	-15	u
7.	7	s	64	u	48	s	0.	s	-1.	u	4	s	-3.5	u	-2	u
8.	4	u	51	s	51	u	0.	s	.5	s	2	u	-1.5	u	-1	u
9.	3	u	25	s	50	s	0.	s	0.	s	2	u	-2.5	u	1	s



High scorers on Test 2-A

1.	69	s	31	u	0	u	15	5
2.	56	s	50	s	2	s	18	22
3.	48	s	50	s	12	s	14	6
4.	3	u	50	s	8	s	10	10
5.	8	u	33	u	3	s	8	12
6.	21	s	54	s	7	s	17	3
7.	16	s	38	u	2	s	17	3
8.	15	s	55	s	1	u	16	4
9.	11	u	33	u	4	s	10	10

Number	W%	Rating	Total R's to (VIII-x) 40%	Rating	FC	Rating	Sum of satis- factory scores	Sum of unsatis- factory scores
	15				2			

Low scorers on Test 2-A

1.	14	u	28	u	2	s	11	9
2.	10	u	38	u	1	u	7	13
3.	35	s	35	u	1	u	13	7
4.	8	u	40	s	1	u	9	11
5.	52	s	31	u	5	s	16	4
6.	8	u	33	u	1	u	12	8
7.	9	u	33	u	1	u	11	9
8.	10	u	29	u	0	u	8	12
9.	67	s	25	u	1	u	13	7

PLATE 25

PERCENTAGE OF 9 HIGH SCORERS AND 9 LOW SCORERS ON TEST 2-A  
WHO WERE JUDGED UNSATISFACTORY ON EACH OF 20 FOREIGNAGE FACTORS

1.	S	24	45	22	-22
2.	C	4	56	44	-12
3.	Total R's	1	22	0	-11
4.	Adx HdX	0	0	0	0
5.	Rejections	0	0	0	0
6.	F+%	11	11	0	0
7.	FY+YF+Y (wt.)	78	78	0	0
8.	An Sex	33	33	0	0
9.	H+A/Hd+Ad	66	56	10	11
10.	P	44	33	11	11
11.	F%	44	33	11	11
12.	A%	22	11	11	11
13.	FV+VF+V (wt.)	33	11	22	22
14.	H-Hd	78	56	22	22
15.	M+FC- (CF+C)	33	0	33	33
16.	M	44	11	33	33
17.	FC- (CF+C)	89	56	33	33
18.	W%	66	33	33	33
19.	Total R's to VIII - X	89	44	45	45
20.	FC	78	22	56	56

Number

Rorschach factors

LOW SCORERS

Number graded "unsatisfactory" on Rorschach factors

HIGH SCORERS

Number graded "unsatisfactory" on Rorschach factors

A. LOW SCORERS (on Test 2-A)  
Percentage graded "unsatisfactory" on Rorschach factors

B. HIGH SCORERS (on Test 2-A)  
Percentage graded "unsatisfactory" on Rorschach factors

C. DIFFERENCE

Difference between column A and column B

**PLATE 26**

**NUMBER OF "VISUAL" AND "HAPTICAL" WORDS ON TEST 1-B USED  
BY 25 SUBJECTS JUDGED "VISUAL", "HAPTIC", OR "INDIFFERENT"  
BY FACULTY MEMBERS OF THE DEPARTMENT OF ART AT THE UNIVERSITY  
OF MINNESOTA**

---

Number	No. of visual words	No. of haptic words	No. of judgments				Classification
				V	H	I	
1	14	0	4	3	1	0	Visual
2	7	0	4	1	1	2	Indefinite
3	3	1	3	2	1	0	Visual
4	0	8	4	2	1	1	Indefinite
5	3	0	4	2	0	2	Indefinite
6	6	9	6	2	0	4	Indefinite
7	1	10	4	1	0	3	Indefinite
8	9	9	3	1	0	2	Indefinite
9	13	2	3	1	0	2	Indefinite
10	1	10	5	2	1	2	Indefinite
11	8	7	3	0	0	3	Indefinite
12	4	1	3	1	1	1	Indefinite
13	6	7	5	1	1	3	Indefinite
14	4	6	5	1	1	3	Indefinite
15	17	0	7	0	1	6	Indefinite
16	3	2	4	3	1	0	Visual
17	10	1	5	2	0	1	Visual
18	1	1	5	0	3	2	Haptic
19	2	2	3	2	0	1	Visual
20	5	11	5	0	5	0	Haptic
21	14	1	5	5	0	0	Visual
22	13	1	6	5	0	1	Visual
23	17	0	7	0	5	2	Haptic

Number of students taking test 1-B

Number of visual words used

Number of haptical words used

Number of faculty members who judged student

Visual classification

Haptic classification

Indefinite classification

\*If either the "visual" or "haptic" category received a majority of the votes, the subject was so classified. If neither category received a majority, the subject was classified "indefinite". No subjects were used who were not judged by at least three faculty members.

PLATE 27

NUMBER OF VISUAL WORDS USED ON TEST 1-3 BY 23 STUDENTS JUDGED  
"VISUAL," "HAPTIC," OR "INDIFFERENT" BY FACULTY MEMBERS OF THE  
DEPARTMENT OF ART AT THE UNIVERSITY OF MINNESOTA

---

Number	No. of visual words	No. of haptic words	No. of judgments	Classification			Classification
				V	H	I	
1	14	0	4	3	1	0	Visual
2	7	0	4	1	1	2	Indefinite
3	5	1	3	2	1	0	Visual
4	0	8	4	2	1	1	Indefinite
5	5	0	4	2	0	2	Indefinite
6	6	9	6	2	0	4	Indefinite
7	1	10	4	1	0	3	Indefinite
8	9	9	3	1	0	2	Indefinite
9	13	2	3	1	0	2	Indefinite
10	1	10	5	2	1	2	Indefinite
11	8	7	3	0	0	3	Indefinite
12	4	1	3	1	1	1	Indefinite
13	6	7	5	1	1	3	Indefinite
14	4	6	5	1	1	3	Indefinite
15	17	0	7	0	1	6	Indefinite
16	3	2	4	3	1	0	Visual
17	10	1	3	2	0	1	Visual
18	1	1	5	0	3	2	Haptic
19	2	2	3	2	0	1	Visual
20	5	11	5	0	5	0	Haptic
21	14	1	5	5	0	0	Visual
22	13	1	6	5	0	1	Visual
23	17	0	7	0	5	2	Haptic

Number of students taking test 1-B

Number of visual words used

Number of haptical words used

Number of faculty members who judged student

Visual classification

Haptic classification

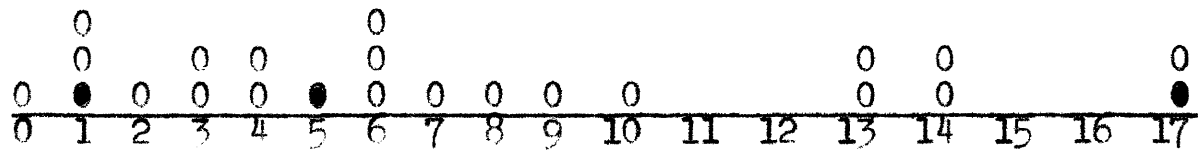
Indefinite classification

\*If either the "visual" or "haptic" category received a majority of the votes, the subject was so classified. If neither category received a majority, the subject was classified "indefinite". No subjects were used who were not judged by at least three faculty members.

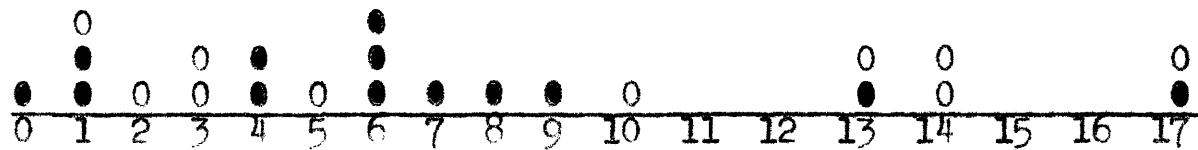
PLATE 27

NUMBER OF VISUAL WORDS USED ON TEST 1-B BY 25 STUDENTS JUDGED  
"VISUAL", "HAPTIC", OR "INDIFFERENT" BY FACULTY MEMBERS OF THE  
DEPARTMENT OF ART AT THE UNIVERSITY OF MINNESOTA

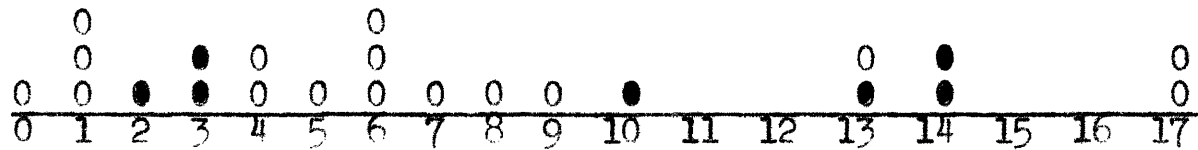




Haptics (3)



Indefinites (13)



Visuals (7)

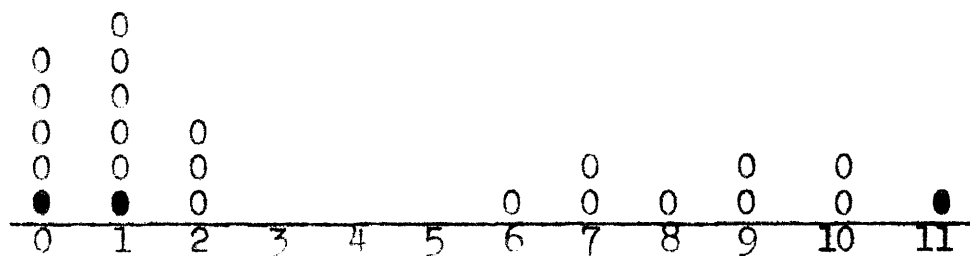
Number of visual words used in Test 1-B

- Represents the scoring position of each of the students contained in the classification to the right. Thus, among the three haptics, one used 1 visual word, one used 5, and the third one used 17 visual words.
- Represents the total distribution of scores, each white circle standing for the scoring position of a specific student.

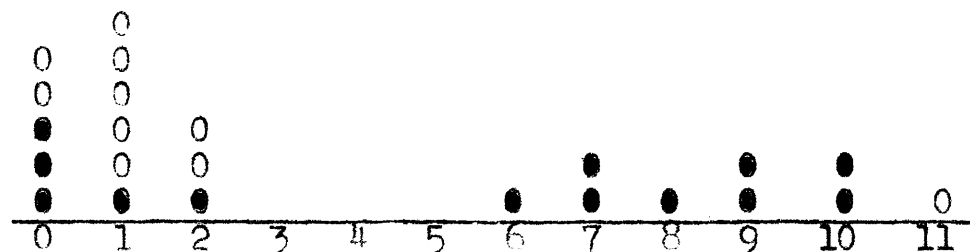
PLATE 28

NUMBER OF HAPTICAL WORDS USED ON TEST 1-B BY 23 STUDENTS JUDGED  
"VISUAL", "HAPTIC", OR "INTERMEDIATE" BY FACULTY MEMBERS OF THE  
DEPARTMENT OF ART AT THE UNIVERSITY OF MINNESOTA

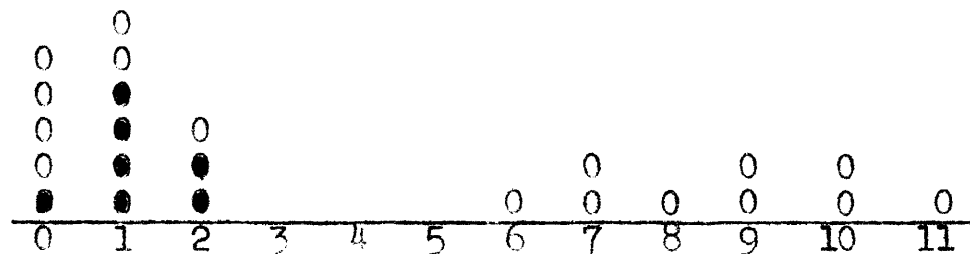
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Haptics (3)



Indefinites (13)



Visuals (7)

Number of haptical words used in Test 1-B

- Represents the scoring position of each of the students contained in the classification to the right. Thus, among the three haptics, one used no haptical words, one used 1, and the third used 11 haptical words.
- Represents the total distribution of scores, each white circle standing for the scoring position of a specific student.

PLATE 29

RANK ORDER OF 117 UNIVERSITY OF MARYLAND STUDENTS ACCORDING  
TO THE NUMBER OF "VISUAL" WORDS USED ON TEST 1-B AND SHOWING  
THE SCORES EACH MADE ON TEST 2-A

---

Number	Number of Visual Words	Score - Test 2-A
1.	17	14
2.	16	14
3.	16	14
4.	15	18
5.	15	14
6.	15	9
7.	14	17
8.	14	15
9.	14	15
10.	14	15
11.	14	11
12.	13	16
13.	13	15
14.	13	12
15.	13	11
16.	12	15
17.	12	14
18.	12	14
19.	12	13
20.	12	13
21.	12	12
22.	11	18
23.	11	17
24.	11	14
25.	11	12
26.	11	12
27.	11	12
28.	11	10
29.	11	10
30.	11	8
31.	10	18
32.	10	12
33.	10	10
34.	9	16
35.	9	16
36.	9	16
37.	9	13
38.	8	11
39.	8	19

Number	Number of Visual Words	Score - Test 2-A
40.	40	17
41.	41	17
42.	42	17
43.	43	15
44.	44	15
45.	45	15
46.	46	15
47.	47	14
48.	48	14
49.	49	12
50.	50	12
51.	51	11
52.	52	10
53.	53	16
54.	54	16
55.	55	16
56.	56	14
57.	57	14
58.	58	13
59.	59	13
60.	60	13
61.	61	12
62.	62	16
63.	63	16
64.	64	14
65.	65	13
66.	66	11
67.	67	10
68.	68	18
69.	69	18
70.	70	17
71.	71	15
72.	72	15
73.	73	14
74.	74	11
75.	75	16
76.	76	15
77.	77	17
78.	78	15

Number	Number of Visual Words	Score - Test 2-A
79.	79	14
80.	80	12
81.	81	10
82.	82	10
83.	83	7
84.	84	18
85.	85	17
86.	86	15
87.	87	7
88.	88	4
89.	89	18
90.	90	18
91.	91	17
92.	92	15
93.	93	15
94.	94	15
95.	95	15
96.	96	15
97.	97	13
98.	98	16
99.	99	16
100.	100	16
101.	101	16
102.	102	16
103.	103	16
104.	104	15
105.	105	15
106.	106	15
107.	107	15
108.	108	14
109.	109	14
110.	110	14
111.	111	13
112.	112	12
113.	113	12
114.	114	11
115.	115	10
116.	116	8
117.	117	4

PLATE 30

COMPUTATION OF THE MEAN AND STANDARD DEVIATION OF THE SCORES  
OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A

Score	f	f x score	d	fd	fd <sup>2</sup>
19	1	19	5	5	25
18	8	144	4	32	128
17	9	153	3	27	81
16	16	256	2	32	64
15	23	345	1	23	23
14	17	238	0	0	0
13	9	117	-1	-9	9
12	11	132	-2	-22	44
11	7	77	-3	-21	63
10	8	80	-4	-32	128
9	2	18	-5	-10	50
8	2	16	-6	-12	72
7	2	14	-7	-14	98
6	0	0	-8	0	0
5	0	0	-9	0	0
4	2	8	-10	-20	200
N	117	1617		-21	985

Computation of Mean:

$$M = \frac{f \times \text{score}}{N} = \frac{1617}{117} = 13.82$$

Computation of Standard Deviation:

$$1. \quad \sum \frac{fd}{N} = \frac{-21}{117} = -.179$$

$$2. \quad \left( \frac{fd}{N} \right)^2 = (-.179)^2 = .032$$

$$3. \quad \sum \frac{fd^2}{N} = \frac{985}{117} = 8.419$$

$$4. \quad \text{S.D.} = \sqrt{\sum \frac{fd^2}{N} - \left( \sum \frac{fd}{N} \right)^2} = \sqrt{8.419 - .032} = \sqrt{8.387} = 2.90$$

PLATE 31

COMPUTATION OF THE MEAN AND STANDARD DEVIATION OF THE SCORES  
MADE ON TEST 2-A BY 21 UNIVERSITY OF MARYLAND STUDENTS WHO  
WERE CLASSIFIED AS "VISUAL" ON TEST 1-B

---



Score Test 2-A	f	f x score	d	fd	fd <sup>2</sup>
18	1	18	5	5	25
17	1	17	4	4	16
16	1	16	3	3	9
15	5	75	2	10	20
14	6	64	1	6	6
13	2	26	0	0	0
12	1	12	-1	-1	1
11	2	22	-2	-4	8
10	0	0	-3	0	0
9	2	18	-4	-8	32
N = 21		268		15	117

Computation of Mean:

$$M = \frac{268}{21} = 12.76$$

Computation of Standard Deviation:

$$1. \quad \frac{fd}{N} = \frac{15}{21} = .714$$

$$2. \quad \left(\frac{fd}{N}\right)^2 = .714^2 = .510$$

$$3. \quad \sum \frac{fd^2}{N} = \frac{117}{21} = 5.095$$

$$4. \quad \text{S.D.} = \sqrt{\sum \frac{fd^2}{N} - \left(\sum \frac{fd}{N}\right)^2} = \sqrt{5.095 - .510} = \sqrt{4.585} = 2.14$$

PLATE 32

COMPUTATION OF THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEAN SCORES OF 117 STUDENTS ON TEST 2-A AND THE MEAN SCORES OF 21 STUDENTS FROM THIS GROUP WHO WERE CLASSED AS "VISUAL" ON TEST 1-B

---

\*A "visual" score on this test was determined by applying Lowenfeld's stipulation that the subject must respond with 12 or more "visual" words on the "Test of Visual vs. Haptical Word Association"

- 
1. Standard error of the Mean of 117 students:

$$G M = \frac{G}{\sqrt{N-1}} = \frac{2.90}{\sqrt{117-1}} = \frac{2.90}{\sqrt{116}} = \frac{2.90}{10.77} = .27$$

2. Standard error of the Mean of 21 "visuals":\*

$$G M = \frac{G}{\sqrt{N-1}} = \frac{2.14}{\sqrt{21-1}} = \frac{2.14}{\sqrt{20}} = \frac{2.14}{4.47} = .48$$

3. Standard error of the difference:

$$G M_{117} - G M_{21} = \sqrt{G M_{117}^2 + G M_{21}^2} = \sqrt{.27^2 + .48^2} =$$

$$\sqrt{.07 + .23} = \sqrt{.30} = .55$$

4. Significance ratio:

$$M_{117} - M_{21} = 13.82 - 12.76 = 1.06$$

$$\text{The significance ratio} = \frac{1.06}{.55} = 1.93$$

5. Significance of the difference:

Assume that a significant difference must be significant at the 2% level.\*\* Then the significance ratio must exceed 2.33.\*\*\* Therefore, the difference between the two means is not significant, since the significance ratio is 1.93.

---

\*This sampling is composed of 21 students who responded with 12 or more "visual" words on Test 1-B.

\*\*Everet F. Lindquist, A First Course in Statistics, Boston: Houghton Mifflin Co., p. 132, 1942.

\*\*\*Ibid., p. 132.

PLATE 33

**RANK ORDER OF 117 UNIVERSITY OF MARYLAND STUDENTS ACCORDING  
TO THE NUMBER OF "HAPTICAL" WORDS USED ON TEST 1-B AND  
SHOWING THE SCORES EACH MADE ON TEST 2-A**

---

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.		

42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.		

83.	84.	85.	86.	87.	88.	89.	90.	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.							

COMPARISON OF THE MEAN AND STANDARD DEVIATION OF THE SCORES  
 MADE ON TEST 2-A BY 21 MALE STUDENTS OF HARVARD UNIVERSITY WHO  
 WERE CLASSIFIED AS "NATIVE" ON TEST 1-B

---

From the total sampling of 17 students who took Test 1-B and  
 2-A, those 21 who responded with the highest number of "native"  
 words on Test 1-B were chosen and designated as "native".  
 The range of the number of "native" words used by this group  
 was from 4 to 12. Refer to Plate 33 for a ranking of the 17  
 students according to the number of "native" words used on  
 Test 1-B.

Score Test 2-A	f	f x score	d	fd	fd <sup>2</sup>
19	1	19	4	4	16
18	1	18	3	3	9
17	3	51	2	6	12
16	4	64	1	4	4
15	2	30	0	0	0
14	3	42	-1	-3	3
13	3	39	-2	-6	12
12	3	36	-3	-9	27
11	0	0	-4	0	0
10	1	10	-5	-5	25
N	21	309		-6	108

Computation of Mean:

$$M = \frac{309}{21} = 14.71$$

Computation of Standard Deviation

$$1. \sum \frac{fd}{N} = \frac{-6}{21} = -.286$$

$$2. \left( \sum \frac{fd}{N} \right)^2 = -.286^2 = .081$$

$$3. \sum \frac{fd^2}{N} = \frac{108}{21} = 5.143$$

$$4. \text{S.D.} = \sqrt{\sum \frac{fd^2}{N} - \left( \frac{fd}{N} \right)^2} = \sqrt{5.143 - .081} = \sqrt{5.062} = 2.25$$

From the total sampling of 117 students who took Tests 1-B and 2-A, those 21 who responded with the highest number of "haptic" words on Test 1-B were chosen and designated as "haptic". The range of the number of haptical words used by this group was from 4 to 12. Refer to Table 33 for a ranking of the 117 students according to the number of haptical words used on Test 1-B.

**PLATE 35**

**COMPUTATION OF THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE  
MEAN SCORES OF 117 STUDENTS ON TEST 2-A AND THE MEAN SCORES  
OF 21 STUDENTS FROM THIS GROUP WHO WERE CLASSIFIED AS "HAPTIC"  
ON TEST 1-B.**

---



- 
1. Standard error of the Mean of the scores of 117 students on Test 2-A:

$$M = .27^*$$

2. Standard error of the Mean of the scores of 21 "haptics" on Test 2-A:

$$\sigma_M = \sqrt{\frac{S}{N-1}} = \sqrt{\frac{2.25}{21-1}} = \sqrt{\frac{2.25}{20}} = \frac{2.25}{4.47} = .50$$

3. Standard error of the difference between the two means:

$$\begin{aligned} \sigma_{M_{117} - M_{21}} &= \sqrt{\sigma_{M_{117}}^2 + \sigma_{M_{21}}^2} = \sqrt{.27^2 + .50^2} = \\ &= \sqrt{.07 + .25} = \sqrt{.32} = .57 \end{aligned}$$

4. Significance ratio:

$$M_{117} - M_{21} = 13.82^{**} - 14.71^{***} = -.89$$

$$\text{The significance ratio is } \frac{-.89}{.57} = -1.56$$

5. Significance of the difference:

Assume that a significant difference must be significant at the 2% level. Then the significance ratio must exceed 2.33. Therefore, the difference between the two means is not significant, since the significance ratio is 1.56.

---

\*Refer to Plate 32 for the computations.

\*\*Refer to Plate 30 for the derivation of this mean.

\*\*\*Refer to Plate 31 for the derivation of this mean.

PLATE 36

COMPUTATION OF THE PEARSON PRODUCT-MOMENT COEFFICIENT OF  
CORRELATION BETWEEN THE SCORES OF 117 UNIVERSITY OF MARYLAND  
STUDENTS ON TEST 2-A AND THE NUMBER OF VISUAL WORDS WITH WHICH  
EACH RESPONDED ON TEST 1-B

---

$$\frac{\sum X'}{N} = \frac{-63}{117} = -.54$$

$$\left(\frac{\sum X'}{N}\right)^2 = (-.54)^2 = .29$$

$$\frac{\sum X'^2}{N} = \frac{2791}{117} = 23.85$$

$$\frac{\sum Y'}{N} = \frac{-23}{117} = -.20$$

$$\left(\frac{\sum Y'}{N}\right)^2 = (-.20)^2 = .04$$

$$\frac{\sum Y'^2}{N} = \frac{989}{117} = 8.45$$

$$\frac{\sum X'Y'}{N} = \frac{-56}{117} = -.48$$

$$C_X = \sqrt{\frac{\sum X'^2}{N} - \left(\frac{\sum X'}{N}\right)^2} = \sqrt{23.85 - .29} = \sqrt{23.56} = 4.85$$

$$C_Y = \sqrt{\frac{\sum Y'^2}{N} - \left(\frac{\sum Y'}{N}\right)^2} = \sqrt{8.45 - .04} = \sqrt{8.41} = 2.90$$

$$r = \frac{\frac{\sum X'Y'}{N} - \left(\frac{\sum X'}{N}\right)\left(\frac{\sum Y'}{N}\right)}{C_X \cdot C_Y} = \frac{-.48 - (.54 \times -.20)}{4.85 \times 2.90} = \frac{-.59}{14.06} = -.04$$

$$C_r = \frac{1 - r^2}{\sqrt{N}} = \frac{1 - .04^2}{\sqrt{117}} = \frac{.9984}{10.82} = .09$$

PLATE 37

CORRELATION CHART FOR COMPUTATION OF THE PEARSON PRODUCT-MOMENT COEFFICIENT OF CORRELATION BETWEEN THE SCORES OF 117 UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-A AND THE NUMBER OF VISUAL WORDS WITH WHICH EACH RESPONDED ON TEST 1-B

		Number of Visual Words																								
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	f	d	Y'	Y' <sup>2</sup>	+ X'Y'		
Scores - Test 2-A	19								5											1	5	5	25	5		
	18		-48	-20			-16					12	16				32			8	4	32	128	60	84	
	17		-18	-15	-12		-6			9			12			21				9	3	27	81	42	51	
	16	-84				-6	-4				12				12					16	2	32	64	24	94	
	15	-28	-30	-5	-4	-3	-4			4					5	6	21			23	1	23	23	36	74	
	14																			16						
	13	7	6					1			-2			-10						9	-1	-9	9	14	12	
	12	28			8					-4			-6	-24	-10	-12				12	-2	-24	48	36	56	
	11	21					6	3		-3	-6					-18	-21			7	-3	-21	63	30	48	
	10	28			16			4		-4			-12	-32						8	-4	-32	128	48	48	
	9																-40	-45		2	-5	-10	50		85	
	8	42												-24						2	-6	-12	72	42	24	
	7			35	28															2	-7	-14	98	63		
	6																						-8			
	5																						-9			
	4	70		50																2	-10	-20	200	120		
	f	20	9	5	7	2	7	6	9	14	5	3	9	6	4	5	3	2	1	117			$\Sigma Y'$	$\Sigma Y'^2$	$\Sigma X'Y'$	$\Sigma X'^2$
	d	-7	-6	-5	-4	-3	-2	-1		1	2	3	4	5	6	7	8	9	10				23	95	205	76
	X'	-140	-54	-25	-28	-6	-14	-6		14	10	9	36	30	24	35	24	18	10				$\Sigma X'$			-63
X' <sup>2</sup>	980	324	125	112	18	28	6		14	20	27	144	150	144	245	192	162	100				$\Sigma X'^2$			2791	

**PLATE 38**

**COMPUTATION OF THE PEARSON PRODUCT-MOMENT COEFFICIENT OF  
CORRELATION BETWEEN THE SCORES OF 117 UNIVERSITY OF  
MARYLAND STUDENTS ON TEST 2-A AND THE NUMBER OF HAPTICAL  
WORDS WITH WHICH EACH RESPONDED ON TEST 1-B**

---

$$\frac{\sum X'}{N} = \frac{-29}{117} = -.25$$

$$\left(\frac{\sum X'}{N}\right)^2 = (-.25)^2 = .06$$

$$\frac{\sum X'^2}{N} = \frac{829}{117} = 7.09$$

$$\frac{\sum Y'}{N} = \frac{-23}{117} = -.19$$

$$\left(\frac{\sum Y'}{N}\right)^2 = (-.19)^2 = .04$$

$$\frac{\sum Y'^2}{N} = \frac{789}{117} = 6.74$$

$$\frac{\sum X'Y'}{N} = \frac{37}{117} = .32$$

$$\sigma_X = \sqrt{\frac{\sum X'^2}{N} - \left(\frac{\sum X'}{N}\right)^2} = \sqrt{7.09 - .06} = \sqrt{7.03} = 2.65$$

$$\sigma_Y = \sqrt{\frac{\sum Y'^2}{N} - \left(\frac{\sum Y'}{N}\right)^2} = \sqrt{6.74 - .04} = \sqrt{6.70} = 2.59$$

$$r = \frac{\frac{\sum X'Y'}{N} - \left(\frac{\sum X'}{N}\right)\left(\frac{\sum Y'}{N}\right)}{\sigma_X \cdot \sigma_Y} = \frac{.32 - (-.25 \times -.19)}{2.65 \times 2.59} = \frac{.27}{6.86} = .04$$

$$\sigma_r = \frac{1-r^2}{\sqrt{N}} = \frac{1-.04^2}{\sqrt{117}} = \frac{.9984}{10.82} = .09$$

CONFESSION CHART FOR COMPARISON OF THE PHASOR PHOTODUPLICATION  
MORSELL CORRECTION OF COMPARISON BETWEEN THE BOOKS OF 117  
UNIVERSITY OF MARYLAND STUDENTS ON TEST 2-V AND THE NUMBER  
OF HAPPIER WORDS WITH EACH RECORDED ON TEST 1-B

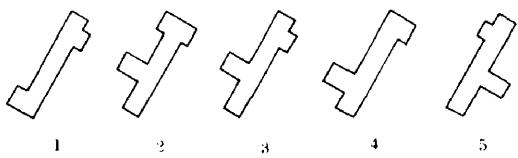


		Number of Haptical Words																			
		0	1	2	3	4	5	6	7	8	9	10	11	12	f	d	$\Sigma Y^2$	$\Sigma Y^2$	$\Sigma X^2$	$\Sigma X^2$	
Scores - Test 2-A	19					10									1	5	5	25	10		
	18	-60	-16					16							8	4	32	128	16	76	
	17	-36			3		9			18		24			9	3	27	81	54	36	
	16	-36	-12				12	8				16			16	2	32	64	36	48	
	15	-45	-4		2								9	10	23	1	23	23	21	49	
	14														16						
	13	8	1			-2	-6								9	-1	-9	9	9	8	
	12	20	2		-4	-4	-6		-10						12	-2	-24	48	22	24	
	11	30	3												7	-3	-21	63	33	40	
	10	24	4		-12						-28				8	-4	-32	128	28		
	9	10	5												2	-5	-10	50	15		
	8		6												2	-6	-12	72	6		
	7	28													2	-7	-14	98	28		
	6																				
	5																				
	4	40													2	-10	-20	200	40		
	f	59	17	11	9	3	7	3	2	1	1	2	1	1	117						
	d	-2	-1		1	2	3	4	5	6	7	8	9	10							
	$\Sigma X^2$	-118	-17		9	6	21	12	10	6	7	16	9	10		$\Sigma X^2 =$	-29				
$\Sigma X^2$	236	17		9	12	63	48	50	36	49	128	81	100		$\Sigma X^2 =$	829					

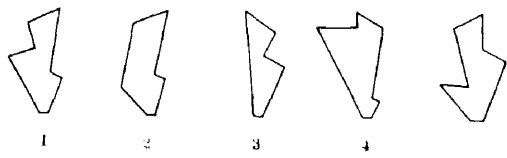
PLATE 40

ANSWER CARDS - TEST 2-A. FOR SYMBOLS 11-20

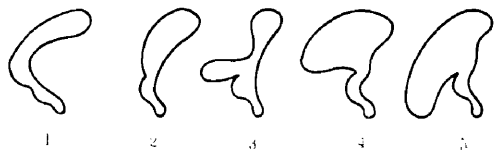
Answer cards for expanded and modified version of Lowenfeld's  
"Test of Integration of Successive Impressions".



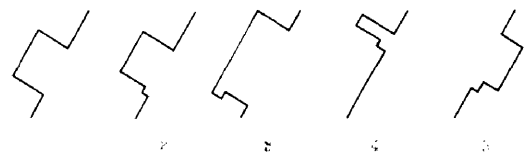
13



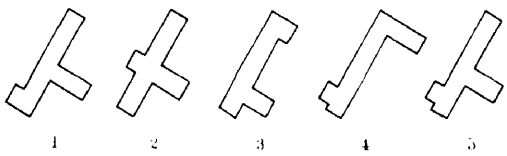
14



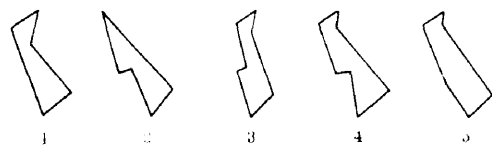
15



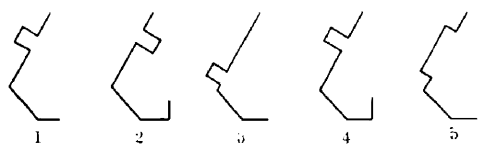
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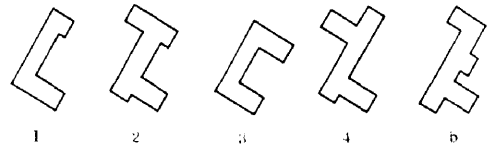
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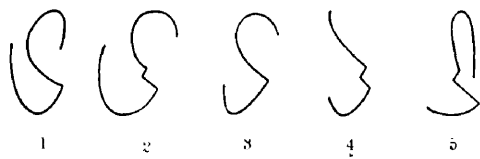
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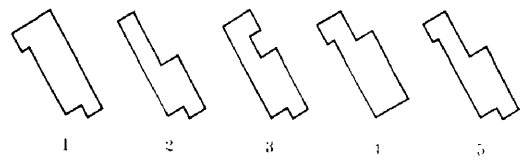
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