THE EFFECTS OF SHAPE AND ORIENTATION ON THE STIMULUS VALUE OF LINES AS MEASURED BY THE SEMANTIC DIFFERENTIAL

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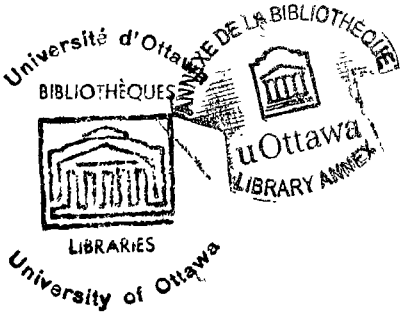
Thesis presented to the School of Psychology and Education of the University of Ottawa as partial fulfillment of the requirements for the degree of Doctor of Philosophy.



Ottawa, Canada, 1961.

ACKNOWLEDGEMENTS

This thesis was prepared under the supervision of Mr. J. Gilles Chagnon, Assistant Professor, of the School of Psychology and Education, University of Ottawa.

The author is indebted to numerous people for their permission and co-operation in undertaking this research. Dr. E.A. James gave his permission to carry-out the initial pilot studies with Patients and Aides and Attendants of the Ontario Hospital, Kingston. Rev. Sister Mary Andrew, s.g.c. and Dr. Raymond Vaillancourt of the School of Psychology and Education also allowed their students to participate as subjects. The programming and the computations of the Computing Centre, University of Ottawa, greatly facilitated the statistical analyses of the results.

CURRICULUM STUDIORUM

Jason Walker McCallum was born January 7, 1929, in Milden, Saskatchewan. He received a Bachelor of Arts degree in General Arts from the University of Western Ontario, London in 1950. He received a Master of Arts degree in Psychology from the University of Toronto, Toronto in 1954. The title of his thesis was The Effect of Activity Group Experience On The Social and Emotional Adjustment of Mentally Defective Boys.

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INTRODUCTION

The present study belongs within the broad area of research in visual perception. In a general sense, it is directed toward the investigation of stimulus variables in visual forms. Undoubtedly, a visual form can contain many variables, but possibly there are only a few which can be demonstrated to be effective in determining an individual's response. Boring states this problem very forcefully in the following way,

> ....the effective stimulus is not an object but the property of the stimulus object, some property that can not be altered without changing the response, some property that remains invariant, for a given response, in the face of transformations of other characteristics[1].

He further elaborates that the study of invariances should be considered central to the scientific study of perception. Following from these considerations, the contribution of the present study rests upon the determination of the invariances of simple lines. The stimulus variables of shape and orientation were selected for specific investigation.

An individual's response to visual stimuli can be made in various ways. It can be measured by a verbal response

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1 Edwin G. Boring, "Visual Perceptions as Invariance", Psychological Bulletin, Vol. 59, No. 2, March 1952, p.144.

such as naming, or matching or rating tasks, or it can be measured by non-verbal tasks such as pressing an assigned key, or moving a visual form within a field of presentation, or drawing what is presented. For this study, however, the response is measured by a rating task.

Undoubtedly, whatever task is selected to measure the effect of the stimulus variables will determine what aspect of effective stimulation in a line drawing is being investigated. Rating tasks can measure both the denotative and connotative stimulus value of a line. Since denotative tasks always describe what is given, the particular variables under consideration probably would be differentiated without gaining any new knowledge. The connotative aspects of simple lines are more complex and require verbal associations beyond the usual tasks of observation. For this study the, the stimulus value of a line is determined by its connotative associative value.

The first chapter is a review of the literature. It considers the general problems related to visual forms and perceptual tasks, the particular stimulus and procedural variables related to the phenomenon and the general hypothesis for this study.

The experimental design is detailed in the second chapter. It includes the formulation and definition of the variables of shape and orientation, and the statistical

procedures for the measurement of their effects. The description of the pilot studies and of the main research group with the specific hypotheses also are included in this chapter.

The experimental results are presented and discussed in the third chapter. This chapter is then followed by a summary of the experimental results and conclusions.

CHAPTER I

REVIEW OF THE LITERATURE

This chapter will first deal briefly with visual forms and some of the experimental tasks related to form perception. After delineation of the particular type of studies to be considered in this report, the variables in the stimulus and in the procedure, which might be related to the phenomenon to be investigated, will then be outlined in two separate sections. The last section will conclude from the review of the literature to a general hypothesis.

1. Visual Forms.

The present research belongs within the broad area of form perception. The word form can refer to many things and have various meanings for different people. The term can be applied to experimental stimuli in the sense modalities of vision, audition and touch. This study, however, will consider only visual form.

Gibson[1] points out that visual form can be classified into three main groups. These groups consist of solid or surface, pictorial and geometric forms. Pictorial forms can be further classified as either direct representations, or

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1 J.J. Gibson, "What is Form?", Psychological Review, Vol. 58, No. 6, November 1951, p. 403-412.

representational outlines, or draughted plan views, or draughted perspective views or as nonsense presentations. The geometric group consists of either plane, or solid, or projected geometrical forms.

In the same article, the author demonstrates how the classification changes when these forms are part of a complex phenomenon. He presented eight "outline" forms to subjects who were instructed to look at each card and say what they saw. The subjects showed little agreement in the names given to each drawing. Their responses varied from description of lines, to naming geometrical figures, to seeing solid objects which were either plan views or perspective views. The author concludes that the equivocal nature of such forms creates much confusion in classification.

From the demonstration, it is evident that simple line drawings readily can change categories within a classification of forms. It appears that their variability is dependent not only upon the stimulus variables in the form, but also upon the nature of the perceptual task.

In the following studies, the visual form is always a tracing made with ink or pencil on paper, sometimes having geometric qualities, but never drawn to represent a specific object. These forms have been called sign, non-representational, non-objective, non-specific, equivocal, ambiguous,

meaningless and nonsensical. Bartlett[2] points out that such forms are seldom meaningless, or nonsensical, since subjects often try to give them names or describe them verbally. He calls this type of drawing a sign; however, this is unsatisfactory as words also are signs. If these line drawings are non-representational, non-objective or non-specific, they are so because of the author's intention and not because of the perceiver's inability to make something out of them. The terms equivocal or ambiguous have some usefulness, since the subjects seldom agree in the spontaneous names given to the drawings. For this study, this type of line drawings will be called ambiguous.

2. Perceptual Tasks.

Perceptual tasks can be varied in several respects. Dember who primarily is interested in psychophysical methods and, in particular, thresholds, outlines the tasks of detection, discrimination, recognition and identification. He also remarks that recognition and identification have been used interchangeably by other researchers. He specifies that recognition is a task in which the subject matches "(a) a stimulus with one of a set of specified alternatives, or (b)

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2 F.C. Bartlett, Remembering, A Study in Experimental and Social Psychology, London, Cambridge, 1932, x-317 p.

a specified alternative with a set of stimuli."[3] His examples indicate that the measurement of recognition usually is a non-verbal task. Identification does require, however, a minnimal verbal response. In identification tasks, the subject is asked a question with the relevant categories supplied, and the subject must state verbally what is preceived either by pronouncing the word as presented, or giving the proper name to a figure.

On the other hand, Arnoult, who is interested in the variables affecting shape perception, is not so extensive in his classification. He states:

> It is also possible to make a rough classification of the possible perceptual tasks into discrimination, recognition, and identification depending upon whether S is expected to (a) detect a difference between two shapes, (b) point out a familiar shape, or (c) give the proper name to a shape.[4]

The approach of the two authors is slightly different, perhaps due to personal interests.

The foregoing classifications do not include some tasks of a broader verbal associative nature. There is a large group of studies in which subjects are presented with

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3 William N. Dember, The Psychology of Perception, New York, Holt, 1960, p. 60.

4 Malcolm D. Arnoult, "Shape Discrimination as a Function of the Angular Orientation of the Stimuli", Journal of Experimental Psychology, Vol. 47, No. 5, May 1954, p. 323.

an ambiguous line drawing to be matched with, or rated on a verbal response. Is this recognition because of matching,or is it some form of identification? Identification by assigning an agreed-upon name usually does not occur. Recognition, in so far as it is a matching task, combined with other verbal associations of a connotative nature, however, usually take place.

The phenomenon has been given different names by various researchers. It has been called expressive or physiognomic perception, fitness of sign to word and sexual and cultural symbolism. Expressive and physiognomic perception implies that the forms have qualities which express characteristics attributed to persons. This is demonstrated by matching ambiguous drawing to words, usually adjectives commonly assigned to people. Fitness occurs when one of two drawings of varying degrees of abstraction is paired with a word, usually a noun. Sexual and cultural symbolism has been demonstrated by matching a simple line drawing, of a particular shape, to either the words masculine or feminine, or to Christian names. The studies in each area are numerous, but often repetitious. Therefore, only those studies which specifically contribute to an understanding of the variables related to the stimulus value of the line drawings or procedure will be included in the following sections.

3. Stimulus Variables In Ambiguous Drawings.

It should be noted, that there is seldom an absolute relationship between a visual form, the formulated percept, and the related verbal associations. After an extensive review of form perception, Vernon states:

> The phenomenal percept, then, is never an accurate photographic reproduction of the external stimulus field. This is not to deny that the percept varies as a rule when the physical qualities of the stimulus vary, but it does so proportionately; there is no constancy of relationship between the variables.[5]

In discussing line drawings, Werner[6] more specifically concludes that the geometrical qualities of line drawings are usually very different from their physiognomic properties. These remarks point-up some of the difficulties in determining stimulus variables in ambiguous drawings which could be demonstratably relevant to matching or rating tasks.

Much of the early work on form perception is discussed in terms of gestaltqualität or form qualities. The word gestalt meant originally shape and later form. Köhler[7]

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5 M.D. Vernon, A Further Study of Perception, London, Cambridge, 1954, p. 46.

6 Heinz Werner, Comparative Psychology of Mental Development, Revised and Republished, New York, International Universities, 1948, xii-564 p.

7 Wolfgang Köhler, Gestalt Psychology, Republished New American Library, 1959, 222p.

remarks on the invariance of a visual shape when the gestalt-qualität of brightness, hue, size and location are varied. He also points out that the appearance of most objects change when they are placed in a new orientation, particularly when they are turned up-side down. It will become evident, that only a few of these qualities have been investigated in the studies under consideration.

Klüver's[8] work in the early 1920's is important. He demonstrated the equivalence of a wide variety of stimuli and responses by means of the matching technique. Graphic presentations, or vowel sounds, or complex verbal media, such as poems, or colours, or auditory rhythms of melodies were used as either the stimulus or response in sixteen experiments. Although the outline of his work is short, it does indicate that many widely differing forms can be matched in a consistent manner.

Poffenberger and Barrows[9] undertook a more specific study. Five hundred subjects matched drawings with words according to how the figures made them feel. There were eighteen rhythmic lines, consisting of nine curvilinear shapes

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8 Heinrich Klüver, "The Study of Personality and the Method of Equivalent and Non-equivalent Stimuli", Journal of Character and Personality, Vol. 5, No. 2, December 1936, p. 91-112.

9 A.T. Poffenberger and A.E. Barrows, "The Feeling Value of Lines", Journal of Applied Psychology, Vol. 8, No. 2, (June) 1924, p. 187-205.

and nine angular shapes. Direction and rhythm also were varied for the two main types of shape. Direction was varied by either a horizontal, or an up or down orientation, and rhythm was varied by the size of the waves or angles in a given drawing. Although certain drawings were matched at a high level of agreement, the significance for the effects of the stimulus variables is difficult to ascertain.

A renewed interest in expressive and physiognomic perception has been given by Scheerer and Lyons[10], who have undertaken a series of experiments. In the main study, they had subjects draw a line to represent a word and then rate the drawings on a scale. The authors carefully devised a rating scale which on the one hand was usable, but on the other hand, contained those categories which they considered would measure physiognomic qualities. They established the rating variables as design, shape, patterning, dominant drawing direction, pressure and closure. Each category was further specified by sub-sections. For each of the eight experimental words, the ratings of the drawings yielded at least three or more categories which were significant at better than the one per cent level of probability. Shape, pressure and drawing direction were the most frequently significant

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10 Martin Scheerer and Joseph Lyons, "Line Drawings and Matching Responses to Words", Journal of Personality, Vol. 25, No. 3, March 1957, p. 251-273.

variables. In terms of gestaltqualität, pressure can be equated with brightness, and drawing direction is possibly related to orientation. These results indicate that simple line drawings do have measurable stimulus variables which may measure the physiognomic qualities of lines.

The researchers in the area of fitness of sign to word have directed little of their attention to identifying stimulus variables. Hall and Oldfield[11] had subjects match one of two drawings with a word. They used six different sets of this type of presentation. For example, one set contained the word philosophy and two drawings, one of which was a curved concentric line, while the other drawing consisted of a crude X in which one bar was cross-thatched. They concluded that matching might have occurred due to some of the structural relevance in a drawing rather than from its specific associations. Using the same six sets and adding four more, McMurray[12] undertook two experiments. Although the first group of subjects matched one of two drawings to the presented word, the second group rated the twenty drawings and the ten words on fifteen scales of the Semantic

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11 K.R.L. Hall and R.C. Oldfield, "An Experimental Study on the Fitness of Signs to Words", Quarterly Journal of Experimental Psychology, Vol. 2, Part Two, (October) 1950, p. 60-70.

12 G.A. McMurray, "A Study of "Fittingness" of Signs to Words by Means of the Semantic Differential", Journal of Experimental Psychology, Vol. 56, No. 4, October 1958, p. 310-312.

Differential[13]. The first experiment again was highly successful in matching a particular drawing with the presented word, and the second study indicated the chosen drawing was closer to the word than the non-chosen drawing in nine out of the ten choice situations. He concludes that the connotations measured by a scale for a particular drawing result from formal qualities which are measurable by the scales, but which could not be readily verbalized by the subject. He also points out, that more abstract drawings might indicate the similarities and perhaps differences between a drawing and its matched word.

The studies on sexual and cultural symbolism have followed Freud's[14] hypothesis on dream symbols. The symbolic relationship depends upon certain structural or functional similarities between the dreamed object and the genital organ. This has been taken to mean that everyday objects in our culture may have certain sexual qualities. The structural qualities have been translated into ambiguous line drawings; so that straight, elongated, angular and pointed features are considered masculine, and curved, containing

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13 Charles E. Osgood, George J. Suci and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois, 1957, 342 p.

14 Sigmund Freud, The Interpretation of Dreams, Translated and Edited by James Strachey, New York, Basic Books, 1955, xxxii-692 p.

and enclosing qualities are considered feminine. The terms sexual and cultural symbolism have been used interchangeably by researchers in this field.

Although there have been many studies undertaken in this area, they are to some extent repetitious. There are, however, some marked differences between the drawings used by Starer[15] and those used by Glatter and Hauch[16]. Starer randomly presented ten cards containing an ambiguous drawing to 112 psychiatric patients and thirty nurses, who were seen individually. Five figures were elongated or pointed, and five were rounded and containing. The subjects matched the drawings with ten cards on each of which was printed a Christian name. There were an equal number of each gender. The subjects significantly matched the masculine names with the elongated or pointed figures and the feminine names with the rounded and containing figures. Glatter and Hauch used much less complex drawings, some of which were simple lines, or a collection of lines. They attempted to vary both shape and pressure in most of the forty drawings. These authors presented each figure on a separate card to seventy-two psychiatric hospital aides and attendants, who were seen

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15 Emannuel Starer, "Cultural Symbolism: A Validity Study", Journal of Consulting Psychology, Vol. 19, No. 6, December 1955, p. 453-455.

16 Andrew M. Glatter and Paul Hauch, "Sexual Symbolism in Line Qualities", Journal of Clinical Psychology, Vol. 14, No. 2, April 1958, p. 168-169.

individually. The subject was asked to state whether the drawing was masculine or feminine. There were only fourteen figures on which a significant level of agreement was obtained. The masculine matched drawings consisted of straight dark and angular lines portrayed in such figures as an arrow, a parallelogram, a cross, five parallel lines, an exclamation mark and four radiating straight lines. Drawings matched with the word feminine were curvilinear and usually drawn by light lines found in such figures as a circle, a curved line and four curved lines radiating from a common point.

From the studies in this section on stimulus variables, it is apparent that highly unusual and ambiguous drawings can be matched with or rated on a verbal response. The stimulus variables prompting concensus in matching appear to be primarily shape, followed by orientation and brightness as specified by lightness or darkness of line. The variables of design, pattern and closure also may be important effects in more complex drawings.

4. Procedural Variables.

This section will consider those variables which can be differentiated from the stimulus drawing. For this phenomenon, it will become evident that not only the figure, but the task and subjects have an important effect. The following sub-sections will consider the variables of sets, procedure, subjects and culture.

A. Set.- It has been demonstrated that verbal set affects how a visual form may be perceived. Using a broken letter B.under tachistoscopic presentation, Bruner and Minturn[17] found that when subjects were asked to see letters they saw a B, or a 13 when asked to see numbers. Werner and Wapner[18] presented an ambiguous figure which could be an aeroplane or a bird flying in opposite directions. They demonstrated that telling the subject whether it was a bird or an aeroplane determined whether he placed the picture to the left or right of the true centre of the frame of presentation.

From these considerations, there is some evidence to suggest that the response clues given to a subject may create a verbal set. Specifically, the studies on sexual and cultural symbolism which give only two types of words provide a narrow choice, possibly creating a set to think only in terms of sexuality.

The general set also is altered if the subject is allowed to be indecisive and not match a drawing with a word.

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17 Jerome S. Bruner and A. Leigh Minturn, "Perceptual Identification and Perceptual Organization" Journal of General Psychology, Vol. 53, First Half, July 1955,

18 Heinz Werner and Seymour Wapner, "Studies in Physiognomic Perception: I Effect of Configurational Dynamics and Meaning Induced Sets on the Position of the Apparent Median Plane", Journal of Psychology, Vol. 38, First Half, July 1954, p. 51-65.

Hall and Oldfield[19] provided this opportunity for subjects. There were some marked changes. One drawing and word which had been significantly matched in a forced choice procedure failed to reach significance, whereas another pair reached a level of significance. It is apparent then, that the opportunity to reject matching has an effect on a particular series.

B. Presentation.- In matching tasks, there is always a method and order of presentation for both the drawings and the words. Generally, there has been little investigation of whether these variables have an effect on the phenomenon. In the area of sexual and cultural symbolism, Stennett and Thurlow[20] presented drawings and words on a single mimeographed sheet to groups of subjects. Previously they had been administered on separate cards in random order to individuals. Both types of administration yielded highly significant results. Hall and Oldfield[21] also demonstrated that reversing the two drawings in a presentation does not affect which figure is most commonly chosen for the given word.

C. Subjects.- There are some indications that age,

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19 op. cit.

20 R.G. Stennett and H. Merle Thurlow, "Cultural Symbolism: The Age Variable", Journal of Consulting Psychology, Vol. 22, No. 4, August 1958, p. 496.

21 op. cit.

sex and level of mental health affect how a subject will match. Thurlow[22] presented ten drawings, previously used in other studies on sexual and cultural symbolism, to Public and High School students. Each drawing was to be matched with one of sixteen Christian names appearing on the same sheet. She found that significant agreement in matching did not occur before age thirteen for girls and age fifteen for boys.

Jones[23] has investigated the effects of sex and level of personality integration. He presented ten figures drawn on separate cards in accordance with the notions of sexual symbolism. The subjects were seen individually and asked to state for each drawing whether it had either a masculine or a feminine personality. He chose an equal number of men and women for the psychiatric and non-psychiatric groups. They were roughly similar in age and education background. The drawings were significantly matched in the predicted manner; however, some difference between the sexes and between the groups are evident. Generally, men and the normal group

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22 H. Merle Thurlow, Effect of Development on the Gender Assignment to Geometrical Figures, unpublished Master's thesis presented to the Department of Psychology, University of Western Ontario, London, 1959, vi-30p.

23 Austin Jones, "Sexual Symbolism and the Variables of Sex and Personality Integration", Journal of Abnormal and Social Psychology, Vol. 53, No. 2, September 1956, p.187-190.

matched more consistently in the predicted direction than women and the patient group respectively.

On the other hand, Hall and Oldfield[24] found no sex differences in graduate and undergraduate students who matched a word with one of two drawings. The main difference between the two studies is that Jones gave his subjects a set to consider sexuality which might have prompted the difference between men and women.

D. Culture.- The specific effects of widely differing cultures have not been considered. Scheerer and Lyons[25], however, redid in English some of the early work which had been undertaken in Germany and found the same results. It may be concluded that language differences within Western culture do not necessarily prevent matching in the predicted direction.

This section has outlined the procedural variables which might affect matching an ambiguous drawing with a word. In the area of set, it was found that the supplied verbal response and verbal clues affect a subject's response. This was taken to mean, that the words supplied for matching could create a particular set. Although presentation variables have not been thoroughly investigated, there is some

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24 op. cit.

25 op. cit.

indication that individual versus group administration is not an important factor, at least for the studies on sexual and cultural symbolism. For adults, level of mental health may be relevant, whereas, the relevance of the subject's sex possibly is dependent upon the task. Differences in language within Western culture also have not hindered matching in the predicted direction.

5. Conclusions and General Hypothesis.

It has been demonstrated that both stimulus and procedural variables can affect the verbal response attached to an ambiguous line drawing. The stimulus variables of shape, orientation and brightness appear to be the most important determinants in this phenomenon. The procedural variables of this kind of verbal response supplied, and the subject's sex and level of personality integration also may be relevant. Few of the variables, however, have received any thorough investigation.

For example, the effects of the specific kinds of shape have not been examined. Even in the studies on sexual and cultural symbolism which have controlled shape to some extent, straightness or angularity or curvilinearity occasionally appear in the same drawing. This results, in part, from the level of complexity in the drawings which these researchers have presented. If shape could be

controlled as in simpler drawings such as lines, the effects of specific shapes could be more readily explored.

The variables of orientation and brightness also could be investigated. In a graphic presentation, however, brightness is difficult to vary in a consistent manner. Orientation, on the other hand, can be manipulated with some degree of accuracy.

It was pointed out, that the relevance of procedural variables was primarily dependent upon the particular experimental design. If some of these variables could be controlled or randomized, their effects would be less prevalent.

In determining the effects of the particular stimulus variables in line drawing there is a problem in measurement. Most of the previous researchers have used frequency methods in determining the level of significance in matching a drawing with a word or type of words. Converting this method, however, is cumbersome when measuring specific effects. McMurray[26] has demonstrated that the scales of the Semantic Differential are sensitive to the connotative similarities between drawings and words. There is some indication then, that ratings on these scales could detect and discriminate amongst the particular stimulus variables in line drawings.

From these considerations, it is evident that the

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26 op. cit.

effects of the specific kinds of shape and of orientations have not been fully investigated. This led to formulating the following research hypothesis, which can be stated in the null form. Rating a simple line on the scales of the Semantic Differential is not affected by the shape and/or the orientation of a line.

CHAPTER II

THE EXPERIMENTAL DESIGN

The first section of this chapter will consider both the specific kinds of shape and the different orientations of the experimental lines. The second section will describe the Semantic Differential as a measuring technique, and the statistical procedures used in this study. The pilot studies then will be outlined, and their results will be considered in formulating the specific hypotheses and the procedure for the main research project.

1. Lines as Experimental Stimuli

The general hypothesis indicated that the shapes and orientations of lines would be investigated. It was suggested that lines could be more readily controlled or varied than complex drawings. For this study then, the variables of brightness, hue, size and location will be held constant, while shape and orientation will be varied.

There is some difficulty in defining the total population of lines. It is extensive and might even be indefinable. Nevertheless, plane geometry does limit the primary shapes of angularity and curvilinearity which change the appearance of a straight line. It also provides degree positions for changing the orientation of a shape. Upon these considerations, a limited sample of geometric lines was selected for exploring

the effects of shape and orientation.

The specific angular degrees and radial distances for the shapes were selected in the following manner. Although a random selection was possible, the required sample was small and the chances of obtaining angles and radii each of which would appear extremely different could not be guaranteed. The specific angular degrees and radial distances then, were obtained from structurally complex figures found in a drawing technique as developed by Breen[1] and North[2]. Card eight, a straight lined angular figure provided the specific shapes of a straight line, of an obtuse angle of 150° and of an acute angle of 60°. Card nine, a curved line figure, provided the curvilinear shapes determined by the radii of one inch and of one-half inch.

The five specific kinds of shape were then drawn. They are represented by a straight line, an obtuse angle, an acute angle, a curved line, and a curved line representing approximately two-thirds of a circle. In order to control the variables of size, brightness and hue, all of the lines

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1 Harold J. Breen, The Differential Diagnostic Technique as a Measure of Hostility, Unpublished doctoral thesis presented to Department of Psychology, University of Western Ontario, London, 1953, x-68 p.

2.Sidney L. North, The Diagnostic Efficiency of a Drawing Technique, Unpublished doctoral thesis presented to the Department of Psychology, University of Western Ontario, London, 1953, VIII-86 p.

are two inches long, drawn in black ink with a medium pressure. For consistency in presentation, the lines were printed by the photo-offset method.

The second independent variable, orientation, also has some peculiar characteristics. If orientation is the degree position of a fixed axis of each shape, the orientation varies as the axis is rotated for all of the five shapes except the straight line. The orientation is the same at either zero or 180 degrees of rotation, and the same again at ninety or 360 degrees. For a straight line, it appears horizontal in the former and vertical in the latter rotations. The angular and curvilinear shapes then were examined to determine if they had a vertical or horizontal orientation. The shapes were rotated until a line drawn across the ends of each shape would be horizontal when the open end was facing upwards. Each shape was tested on the following definitions of the two orientations. A horizontal orientation exists when the width of a shape is greater than its height. A vertical orientation exists when the width of a shape is less than its height. Measurements of each shape were taken at the greatest distance of extension in each plane. They were then assigned to the orientation which fitted the foregoing definitions. The five shapes in their horizontal and vertical orientations are drawn in half-size scale and appear in Figure I. A further examination of the two conditions of orientations will be undertaken in the analysis of the

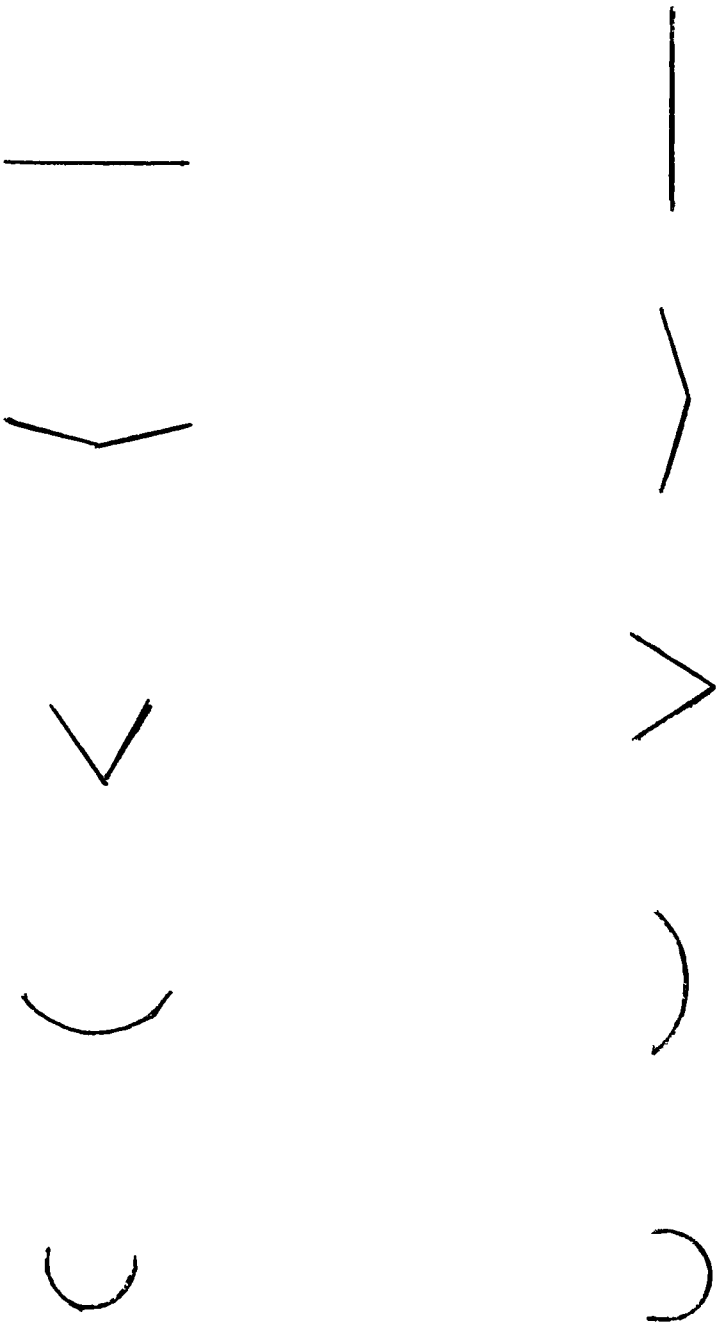

Figure 1.

Five Shapes in Two Orientations

results.

Once the variable of orientation had been established, location of the lines could be controlled. It is recognized that controlling the location of the line on a page does not control retinal position which may or may not be an important variable. It has not been considered relevant by previous researchers using a matching or rating task with ambiguous line drawings. In a rating task, it is possible that retinal position is determined by the individual's writing position. For this study, location was controlled by matching the centre of the frame of presentation to the centring point of each shape. The centring point of each shape was determined by dropping a perpendicular line from the mid-point between the ends of the line, and taking half the length of the perpendicular. The centring point of the frame of presentation was the centre of this area which was approximately five by eight inches. These proportions are similar to the usual field of vision.

2. Measurement by the Semantic Differential[3].

The authors of the Semantic Differential have been interested both in formulating a theory of psychological meaning and in developing a technique for its measurement. Scales have been developed which are useful in obtaining specific connotative meanings for a wide variety of concepts, sounds and pictures. McMurray[4] has demonstrated that some of the scales are sensitive to the formal qualities of ambiguous drawings which may not be readily verbalized by subjects. There is some suggestion then, that Semantic Differential scales could measure the effects of shape and orientation of lines.

The Semantic Differential, as a measuring technique, provides a structured association task. A typical scale contains two bipolar connotative adjectives separated by seven rating categories. Although different studies, such as the Thesaurus Study[5], have developed the usefulness and factorial loading of specific scales, it has been pointed out, that

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3 Charles E. Osgood, George J. Suci and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois, 1957, 342 p.

4 G.A. McMurray, "A Study of "Fittingness" of Signs to Words by Means of the Semantic Differential", Journal of Experimental Psychology, Vol. 56, No. 4, October 1958, p. 310-312.

5 op. cit p. 47-66.

there are no standard scales which must be administered. The authors suggest that the choice of scales should be directed by such criteria as factorial composition when known, relevance to the concept to be judged and semantic stability of the particular scales. For the latter criteria they remark, that some connotative scales become denotative depending upon what is being judged, and that some opposite adjectives are not strictly bipolar for some factors.

For the present research, scales were selected from the Thesaurus study. There was no evidence, however, that any particular scale would be better than another for rating simple lines. The choice of scales was determined therefore, by any indication given in the studies which have been reviewed and from the authors' suggestion that at least three closely related scales for each factor are usually included in a set. In the previous research on these scales, the Evaluative, Potency and Activity factors have accounted for about sixty-five percent of the total variance. Scales were then selected primarily from these main factors.

From the studies which were reviewed, there was some suggestion that eight scales might be relevant. From McMurray's selection of fifteen scales, the following appeared suitable; slow - fast, active - passive, hard - soft, good - bad and beautiful - ugly. The studies on sexual and cultural symbolism suggested masculine - feminine and the research on

expressive and physiognomic qualities suggested happy - sad. The other scales were selected either to fill-out the three main factors with closely related scales or to create different rating dimension.

Fifteen scales were selected for the pilot studies. In comparison with other studies, this selection is generally representative of those scales commonly used by other researchers. From the Evaluative factor, good - bad, safe - dangerous, pleasant - unpleasant, beautiful - ugly, affectionate - hateful, happy - sad and useful - useless were selected. The Potency factor was represented by hard - soft, strong - weak and masculine - feminine. The Activity factor was covered by active - passive, exciting - calming and fast - slow. The following scales of aggressive - defensive, which belongs to the Aggressive factor and competitive - co-operative which is unassigned were also included. For the main research study, however, the Evaluative scales of good - bad, useful - useless and beautiful - ugly were discarded, and aggressive - defensive was changed to aggressive - timid. The reason for these alterations will become apparent from the suggestions drawn from the Pilot Studies.

The reliability for the scales of the Semantic Differential has been fairly high. The authors report an overall coefficient of correlation of .85 on the retest of twenty concepts rated on fifty scales by one hundred subjects. The test-retest reliability for this investigation, however, will

be examined for both the Pilot Studies and the main Research Group.

3. Statistical Procedures.

The hypothesis indicated that the effects of shape and orientation would be investigated. The most suitable method of measuring the effects of variables and their interaction has been found by the method of analysis of variance. Under the circumstances of this study, for a single scale each individual rates ten different lines for which the variables of shape and orientation were systematically varied. There are then the following three main effects: individuals, shapes and orientations. A three dimensional analysis of variance for each scale is then necessary.

McMemar's "Case XIV"[6], a mixed model called aDG, was selected for the analyses of variance. In this present study for a given scale, each individual is assigned to a row while the ten columns represent his ratings for each line of a specific shape by orientation. Although no test of the effect of the individual is possible, it is not necessary as it would only be a test of the significance of individual differences.

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6 Quinn McNemar, Psychological Statistics, Second Edition, New York, Wiley, 1955, p. 330-331.

Some further elaboration of this model for the analyses of variance is necessary. The error term for each of the double interactions is the estimate of variance for the triple interaction. The error term for testing the main effects depends upon whether the F values of certain double interactions are found to be significant. Specifically, the error term for the effect of shape ordinarily would be the estimate of variance for shapes by orientations and for the effect of orientation it would be the estimate of variance for orientations by individuals. When the F value for the required double interaction is not found to be significant at the one per cent level, the error term is the sum of squares for the usual double interaction pooled with the sum of squares for the triple interaction and divided by the sum of their degrees of freedom.

Testing the level of significance for the simple effects was undertaken in the following manner. Since there are only two types of orientations, no further investigation is necessary if the F value is found to be significant. Since there are five kinds of shapes, however, a F value which was found to be significant was further investigated. This was determined by evaluating the differences between the means of the ratings for each shape. Following the formula for the

standard error of the difference as given by Dayhaw[7], the σ^2 is the error term which was previously taken as a separate or pooled term to test the main effect of shape, and n is the number of individuals rating the particular shapes. In order to determine if the differences between the means is significant, the σ diff. is multiplied by the critical ratio term of 2.58 to be significant at the one per cent level and by the CR of 1.92 for the five per cent level. The effect of the double interaction of shape by orientation also will be calculated in this manner. The error term is the estimate of variance of the triple interaction and the n is the 51 individuals rating a shape by orientation.

Most of the computations for the analyses of variances were done by the Computing Centre, University of Ottawa. The Centre programmed and computed the analyses of variance on an I.B.M. 650 to the point of deriving the estimates of variance. The evaluation of the main and simple effects were calculated by the researcher. Since each subject rated a scale ten times using single digit numbers, the data was very adaptable to the standard punch cards. In order to have an equal number of ratings for each individual, the number 4, which is the mid-point of a scale was inserted whenever a subject skipped a scale for a particular line.

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7 Lawrence T. Dayhaw, Manuel de Statistique, Ottawa, University of Ottawa, 1958, p. 416-417.

The test-retest reliability across the scales, for each scale and for each line was calculated by the product moment correlation coefficient. It is given as "Formula 30"[8] by McNemar. For this study, X is the initial rating and Y is the retest rating. The level of significance for each r will be calculated following the procedure outlined by McNemar[9]. It should be noted, that test-retest reliability will not be determined for each line in the pilot studies. The reliability, however, will be determined by the same procedure for each group. It will be established by assigning two randomly paired duplicate pages at the end of each task booklet which will provide a retest rating for two line drawings on each scale.

Each individual therefore, rated a particular scale for the ten experimental lines and for two duplicate lines. In other words, each individual's rating of a scale yielded twelve raw scores, ten of which are part of the analysis of variance and two are retest ratings on the experimental lines.

The accepted level of confidence for all statistical evaluations is the one percent level. Although this is a high standard, it will become evident that the proportion of error variance for the obtained results is large.

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8 op. cit. p. 118.

9 op. cit. p. 145-146.

4. Pilot Studies.

Four different groups of subjects were examined before the final research project was undertaken. The reasons for these investigations were to establish which groups could reliably rate the lines on the scales and to determine other factors which might be relevant. No attempt was made to equate the groups of individuals; so that no conclusive statements can be made regarding subject variables. The suggestions drawn from these studies then, depend as much upon the remarks made by the subjects, as upon the statistical analysis of their ratings.

A. Procedure.- The task was always administered to groups of individuals. For the study with patients, four or five subjects did the task at once, thus providing a group administration. All of their booklets were later pooled, in order to determine the reliability correlation coefficients.

Each subject was given a booklet. The first page was the same for both the Pilot Studies and the Research Group, and contains general information about the subject's age, sex, language, education and vocation. It appears as the first page in Appendix 3. The second page follows the usual instructions suggested by the authors of the Semantic Differential[10], with certain modifications directed by the specific subject matter

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10 op. cit. p. 82-84.

to be rated. It appears in Appendix 1. The instructions were read aloud to the subjects with some additional remarks on rating. The examiner wrote on a blackboard a sample scale with the numbers from one to seven under the respective rating spaces. Secondly, he wrote an explanation that the spaces one or seven meant very closely related to either the one end of the scale or the other, spaces two or six meant quite closely related, and space four meant neutral or undecided. For the patient groups, no blackboards were available; so that the above explanations were repeated several times. Since this graphic presentation decreased much turning of pages to re-read the instructions, it was done for each of the following groups in both the Pilot Studies and in the Main Research.

The next ten pages of the booklet each contained a different line to be rated on fifteen scales. A sample page appears in Appendix 2. The last two pages are a duplication of two main pages and serve the purpose of test-retest reliability. The sequence of the scales was the same on each page and was randomly ordered by using a table of random numbers[11] The sequence of the ten experimental pages varied for each booklet, and was randomly ordered by using the above tables. The last two pages were also randomly paired, and affixed to a given booklet so long as neither of them were the same as

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11 A.L. Edwards, Statistical Analysis, New York, Rinehart, 1946, Table G, p. 340-341.

the last two pages appearing in that specific booklet. This condition was applied to limit the effect of recent memory.

During the task, the examiner emphasized the use of imagination and not to skip any scales.

B. Psychiatric Patient Group. Thirty-three patients were selected from the current files of the Ontario Hospital, Kingston. They had been diagnosed, on admission, as either catatonic or paranoid schizophrenics. Their duration of hospitalization ranged from two weeks to ten years and some were receiving medication. All of the patients spoke only English. Their median age was 35 years 11 months, with a range from 21 years 3 months to 45 years in which the first quartile fell at 33 years and the third quartile at 43 years 4 months. The median of their educational achievement was grade 9, with a range of grade 8 to grade 13 in which the first quartile fell at grade 8.25 and the third quartile at grade 10.25.

The computation of the overall test-retest reliability yielded an r=.37. The accepted reliability for N=987 at the one per cent level of significance is r=.08. The reliability of the individual scales indicated that only eight of the fifteen scales were significant at r(p=.01)=.32. The patients needed much help in understanding the instructions, encouragement in doing the task, and even definition of particular words. Their perplexity and low level of test-retest reliability deterred further statiscal analysis.

C. Hospital Aides and Attendants.- Eleven aides and attendants were examined at The Ontario Hospital, Kingston. They were students for a diploma course given by the Nursing Department, and all spoke only English. Their median age was 33 years 11 months, with a range of 21 years 1 month to 53 years 8 months, for which the first quartile fell at age 21 years 11 months and the third quartile fell at 40 years 11 months. The median grade for their level of academic achievement was grade 10, with a range from grades 8 to 12, in which the first quartile was grade 9, and the third quartile was grade 11.

The computation of the overall test-retest reliability yielded an r=.46. To be significant at the one per cent level of confidence, the correlation coefficient for N=328 should be r=.14. There were, however, only two scales which met the accepted level of significance of r=.54. Although there was much less evidence of perplexity, the reliabilities were so low as to indicate the inadvisability of further analysis.

D. Seminarians.- Eighteen seminarians, who were in their second year of studies for the priesthood were examined. All of them spoke English primarily, except three who spoke best a language other than English. Their median age was 20 years 10 months, with a range of 19 years 10 months to 25 years 5 months, in which the first quartile fell at 20 years

10 months and the third quartile at 21 years 7 months.

The computation of the overall test-retest reliability was r=.35. The required reliability for N=535 at the one per cent level of confidence is r=.14. For the individual scales, only happy - sad, beautiful - ugly and aggressive - defensive failed to reach the accepted level of confidence. The approach of the seminarians also suggested much less confusion than the previous groups had experienced. An analysis of variance for each of the twelve reliable scales was then undertaken. The F value for the main effect of shape was significant at the one per cent level of confidence for the following seven scales: useful - useless, affectionate - hateful, strong - weak, masculine - feminine, hard - soft, exciting - calming and fast - slow. Neither the main effect of orientation nor the double interaction of shape by orientation were significant at the one per cent level of confidence for any of the scales.

E. Nurses.- The last group for the Pilot Studies consisted of sixty-two nurses who were enrolled in the School of Nursing, University of Ottawa. They were students in a course in general psychology. Forty-seven subjects spoke English primarily, nine spoke French best and six spoke either Italian, Chinese or Dutch most fluently. Their median age was 27 years 6 months with a range of 20 years 7 months to 52 years 4 months in which the first quartile fell at age 23 years and the third

quartile at 31 years 2 months.

The computation of the overall test-retest reliability yielded an r=.45. The accepted level at the one per cent level of confidence for N=1224 is r=.17. Only the scale aggressive - defensive failed to reach the required level of significance of r(p=.01)=.26. A few subjects experienced some degree of perplexity, did not complete their booklets, and were not included in the final group of 62 subjects. Analyses of variance for the fourteen reliable scales were undertaken. The main effect of shape was significant at the one per cent level of confidence for all of the fourteen scales. The main effect of orientation was significant at the accepted level of significance for the following scales: pleasant - unpleasant, beautiful - ugly, safe - dangerous, affectionate - hateful, happy - sad, hard - soft and fast - slow. None of the double interactions of shape by orientation for these scales reached the accepted level of confidence.

F. Suggestions Derived from the Pilot Studies.- It was apparent that the task could not be readily accomplished by everyone. The perplexity of the first two groups suggested that either level of mental health or level of academic achievement might be related to whether a subject could reliably rate the lines. The Seminarians and Nurses, however, produced results which indicated that some scales could be reliably rated and the analyses of variance demonstrated the effects of shape

and orientation. This suggested that a group of mixed subjects with a high level of academic achievement who were not hospitalized would be suitable for the main experimental research.

From the Pilot Studies, some doubt was created concerning the reliability of the scales. No single scale had been consistently reliable across the four groups. Their variability could depend upon either the nature of the task, or the particular samples of individuals, however, none of these aspects could be readily analyzed. From the comments of the subjects and from their general rating behavious, there was some suggestion that a few of the scales helped to create a 'halo' effect for the lines. A change in the format appeared necessary by decreasing the number of Evaluative scales; so that they would be more equal in number to the Potency and Activity scales. Good - bad, beautiful - ugly and useful - useless were therefore discarded. The direction of the remaining scales also was changed by randomly selecting half of the scales and reversing the position of their adjectives. The scale aggressive - defensive also was changed to aggressive - timid which might be more stable and appropriate for rating the lines.

From observing the subjects, it appeared that it took a few pages of rating to become acquainted with the task. Upon re-examination of the instructions, the opening paragraph was reformulated to emphasize the use of the subject's

imagination. An introductory page with a line of mixed shapes to be rated on the research scales also was inserted after the instructions. Both of these innovations were made to ease the subject's perplexity and thereby possibly increase the reliability of their ratings for the experimental lines and scales.

5. Specific Hypotheses.

Considerations which developed from the Pilot Studies indicated that twelve scales of the Semantic Differential would be used in the main research. Since the effects of shape and orientation of a line will be examined for each scale, an hypothesis for these scales is necessary. The specific hypotheses stated in the null form, are as follows.

1.-The rating of a line on the scale active - passive is independent of the shape and/or the orientation of the line.

2.-The rating of a line on the scale affectionate - hateful is independent of the shape and/or the orientation of the line.

3.-The rating of a line on the scale aggressive - defensive is independent of the shape and/or the orientation of the line.

4.-The rating of a line on the scale competitive - cooperative is independent of the shape and/or the orientation of the line.

5.-The rating of a line on the scale exciting - calming is independent of the shape and/or the orientation of the line.

6.-The rating of a line on the scale fast - slow is independent of the shape and/or the orientation of the line.

7.-The rating of a line on the scale happy-- sad is independent of the shape and/or the orientation of the line.

8.-The rating of a line on the scale hard - soft is independent of the shape and/or the orientation of the line.

9.-The rating of a line on the scale masculine - feminine is independent of the shape and/or the orientation of the line.

10.-The rating of a line on the scale pleasant - unpleasant is independent of the shape and/or the orientation of the line.

11.-The rating of a line on the scale safe - dangerous is independent of the shape and/or the orientation of the line.

12.-The rating of a line on the scale strong - weak is independent of the shape and/or the orientation of the line.

6. Experimental Procedure.

A. Subjects.- The fifty-five subjects, who took part in the main experiment, were students of the School of Psychology and Education, University of Ottawa. Forty-six subjects were members of a class in Measurement and nine other students were asked to sit-in and do the task with this class. Four booklets were discarded due to incompletion or upon the subject's statement of misunderstanding the task. For example, one person thought he was rating himself, two individuals misunderstood the technique of rating, and one person missed a complete page in the booklet. The total number of subjects who completed their booklets in the main study was then fifty-one, of which there were fifteen women and thirty-six men.

The native language spoken by the subjects was varied. Native language was defined as the language which the subject

spoke best. If a subject was bilingual, in other words, he spoke more than one language equally well, he was to list them on the front sheet. In the experimental group, eighteen subjects spoke English best, nine were bilingual, and twenty-four subjects spoke best a language other than English. More specifically, eighteen spoke French, three spoke Chinese and the remaining subjects spoke Spanish, German and Slovenian. All of the subjects, however, knew enough English to be enrolled in University courses given in English.

For the experimental subjects, the median age was 23 years 10 months, with a range of 19 years 1 month to 58 years 3 months in which the first quartile fell at 21 years 11 months, and the third quartile fell at 27 years 1 month.

B. Administration.- Each subject received a test booklet. A typical booklet appears in Appendix 3. It contains a face sheet for the subject's age, sex, language, education and vocation. The second page contains instructions similar to those given by the authors of the Semantic Differential. The examiner read them aloud to the subjects and then wrote on the blackboard the description of rating categories as outlined in the procedure for the Pilot Studies. The third page is an introduction to the experimental task. It contains a line to be rated on the twelve experimental scales. The introductory drawing has both straight and curvilinear shapes and an orientation not used for the experimental lines. The next ten pages each contains a different

line of specific shape and orientation to be rated on the twelve scales. The last two pages are a duplication of two of the main experimental pages, and serve the purpose of test-retest reliability. The sequence of the scales was the same on each page and was randomly ordered by using a table of random numbers given by Edwards[12]. The sequence of the experimental pages varied for each test booklet and was randomly ordered by using these tables. The last two pages also were randomly paired in the same manner. They were attached to a booklet under the conditions that neither of these duplicate lines should be the same as those appearing on the last two pages nor the first page of that specific booklet.

Subjects were given the opportunity to ask questions. They were answered by the examiner for each subject and were not given orally to the group. The subjects were also reminded to use their imagination and not to skip any scale.

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12 op. cit.

CHAPTER III

THE EXPERIMENTAL RESULTS

This chapter will consider the statistical findings of the main experiment. The section will cover the test-retest reliabilities, the analysis of variance for each of the twelve scales, followed by a discussion of the results.

1. Test-retest Reliability

The reliability for this study was established by the test-retest method. Each subject was presented with a booklet, the last two pages of which were duplicates. The subject's rerating of these two lines provided two pairs of retest ratings for each of the twelve scales. The fifty-one experimental subjects produced a total of 1224 test-retest rating pairs, which were made up of 102 pairs for each scale. Since the exact number of lines to be rerated could not be controlled, the number of test-retest ratings ranged from 120 to 132 pairs. The computation of the overall test-retest reliability yielded an $r=.52$, for which $r(p=.01)=.07$.

Each of the twelve scales reached the accepted level of significance of $r(p=.01)=.26$. The correlation coefficients ranged from $r=.32$ to $r=.69$. They will be given for each scale as it is discussed in the next section.

The reliability correlation coefficients for each of the ten lines also were greater than $r(p=.01)=.22$. Each of

the correlation coefficients is given in Table I. They range from r=.34 to r=.62.

The test-retest reliability coefficients across the scales, for each scale and for each line therefore, were beyond the accepted level of confidence.

2. The Stimulus Variables of Shape and Orientation.

This section will deal with the given scale for each of the specific hypotheses. The reliability correlation coefficients will be stated for each scale followed by a statement on the effects of shape and/or orientation. Since there are only two conditions of orientation, a F value which attains the accepted level of significance needs no further investigation. When the F value for shapes is significant, discussion of the significant differences between the mean ratings of the shapes will be included. For each scale, this aspect of the discussion will be limited to whichever shapes were found to be significantly different from each of the other shapes. Appendix 4 contains the Tables for each scale of the summary of the analysis of variance followed by an evaluation of the differences between the mean ratings for each shape. The Tables follow in a consecutive order. When evaluating the mean differences, the shapes were given the alphabetical letters A to C meaning straight line, obtuse angle, acute angle, curved line and two-thirds circle respectively.

Table I.-

Correlation Coefficients of the Test-retest Reliability for the Ten Experimental Lines

Shape	Orientation I	Orientation II
A.	.49	.49
B.	.48	.50
C.	.62	.59
D.	.49	.47
E.	.51	.34

Table II contains a summary of the estimates of variance for each scale.

1.-Active - passive.- The computation of the test-retest reliability yielded an r=.32. The F value for the main effect of shape is beyond the accepted level of confidence. The differences between the mean ratings for both the obtuse and acute angles were significantly different from each other and from the means of each of the other shapes.

2.-Affectionate - hateful.- The computation of the test-retest reliability yielded an r=.32. The F value for the main effect of shape is beyond the accepted level of confidence. Although some differences between the mean ratings of the shapes were found to be significant, no one shape was consistently different from each of the other shapes.

3.-Aggressive - timid.- The computation of the test-retest reliability yielded an r=.66. Both F values for the main effects of shape and orientation are beyond the accepted level of confidence. The mean rating of the straight line, the obtuse angle and the acute angle was found to be significantly different from the means of each other and from the mean ratings of the curvilinear shapes.

4.-Competitive - cooperative.- The computation of the test-retest reliability yielded an r=.48. The F value for the main effect of shape is beyond the accepted level of confidence. The differences between the mean rating for each shape was found to be significantly different from every other shape.

Table II.-

Estimates of Variance for the Ratings on Each of the Twelve Scales

Scale	Main Effects			Double Interactions			Triple Interaction
	Shape	Orientations	Individuals	S by O	S by I	O by I	S by O by I
1.	73.22[a]	8.54	4.37	.73	3.24[b]	2.59	2.47
2.	59.14	2.54	3.25	1.63	1.72	1.27	1.01
3.	92.12	16.24	5.03	2.05	2.30	2.06	1.77
4.	110.34	15.18	4.43	1.57	2.34	2.39	2.25
5.	54.29	36.80	4.46	1.61	2.94	2.17	1.86
6.	121.84	9.61	4.10	1.15	4.20	2.88	2.25
7.	6.84	1.13	4.27	2.87	2.69	2.20	1.25
8.	188.78	10.45	3.57	2.40	2.89	1.89	1.85
9.	158.03	2.68	2.15	1.83	2.40	1.62	1.43
10.	32.87	.95	3.17	3.87	2.80	2.21	1.84
11.	59.80	33.65	3.89	7.79	3.28	2.20	2.02
12.	99.99	4.71	5.15	.64	2.46	1.59	2.00

a Single underlining denotes a $p \leq .01$ for F.
b Double underlining denotes a $p \leq .05$ for F.

5.-Exciting - calming.- The computation of the test-retest reliability yielded an r=.36. Both F values for the main effects of shape and orientation are beyond the accepted level of confidence. The mean rating of the acute angle was found to be significantly different from each of the other means.

6.-Fast - slow.- The computation of the test-retest reliability yielded an r=.52. The F value for the main effect of shape is beyond the accepted level of confidence. The mean rating of the obtuse angle was found to be significantly different from each of the other means.

7.-Happy - sad.- The computation of the test-retest reliability yielded an r=.34. Neither of the F values for the main effects attained the accepted level of confidence. The table of differences between the mean ratings for each shape is included for casual examination. It is evident that the mean rating for any one shape is not consistently different from the means of other shapes.

8.-Hard - soft.- The computation of the test-retest reliability yielded an r=.69. The F value for the main effect of shape is beyond the accepted level of confidence. The mean ratings for both the obtuse angle and the acute angle were found to be significantly different from each other and from the means of the other shapes.

9.-Masculine - feminine.- The computation of the test-retest reliability yielded an r=.69. The F value for the main effect of shape is beyond the accepted level of confidence. The mean rating for the acute angle was found to be significantly different from the mean of every other shape.

10.-Pleasant - unpleasant.- The computation of the test-retest reliability yielded an r=.38. The F value for the main effect of shape is beyond the accepted level of confidence. No single mean rating for a shape was consistently significantly different from the means of the other shapes.

11.-Safe - dangerous.- The computation of the test-retest reliability yielded an r=.47. The F values for the main effects and the double interaction for shape by orientation are beyond the accepted level of confidence. The mean rating for the acute angle was found to be significantly different from the means for each of the other shapes.

12.-Strong - weak.- The computation of the test-retest reliability yielded an r=.60. The F value for the main effect of shape is beyond the accepted level of confidence. The mean rating of the obtuse angle was found to be significantly different from the means for each of the other shapes.

In summary then, the main effect of shape was found to be significant at the accepted level of confidence for all the scales except happy - sad. The effect of orientation was found to be significant for the scales aggressive - timid,

exciting - calming and safe - dangerous. Only the double interation of shape by orientation for the scale safe-dangerous reached the accepted level of confidence.

A further test of the effect of orientation was undertaken. The previous notions of horizontal and vertical orientation were discarded. For each of the five shapes the ratings were reordered; so that the first orientation contained the highest rating for each pair of ratings on a given shape. The analyses of variance were re-run and the following results were obtained. The effect of orientation was significant for the three scales which had previously yielded such results and for only one new scale hard - soft, which could have occurred by chance. This re-evaluation gives some support to the original assumptions concerning the horizontal and vertical orientations for the five experimental shapes.

Some consistency in the differences between the mean ratings were found for the shapes. Only on the scale competitive - cooperative was each mean rating found to be significantly different from the mean of every other shape. However, the mean rating was found to be significantly different from the means of every other shape on seven scales for the obtuse angle and on six scales for the acute angle.

3. Discussions.

From the statistical analyses, it is evident that the shape of a line has a major effect on rating scales of the Semantic Differential. The orientation of a line also appears to be an important effect but to a lesser extent than shape. The interaction between shape and orientation was significant at the accepted level for only one of the twelve scales and possibly could have occurred by chance. These trends also were evident in the pilot studies with the Seminarians and Nurses.

Examination of the significant differences among the mean ratings for the shapes indicates that each mean rating of the angular lines were more frequently different than the means of every other shape. By observation, however, the straight line and both curvilinear shapes appear equally different from each other but perhaps these visual differences did not significantly effect the rating of the scales. Either the selected scales were not sensitive to these difference,or else they measured other aspects of observation.

The authors of the Semantic Differential have formulated and to some extent demonstrated that the scales measure psychological meaning. They define this phenomenon from the following two approaches.

> In learning-theory terms, the meaning of a sign in a particular context and to a particular person has been defined as the representational mediation process which it elicits; in terms of our measurement operations the meaning of a sign has been defined as that point in the semantic space specified by a series of differentiating judgments.[1]

In the first definition, a representational mediation process occurs when a stimulus other than the significate is contiguous with a sign such as word. For this process both the stimulus and sign have acquired an increment of association with some degree of similarity. The semantic space is determined by the position checked on the scales which are analyzed by a generalized distance formual. Although the data in the present research could be analyzed to determine if a line had specific meanings, it would not serve the purpose of this study. In other words, the effects of shape and orientation of a line could not be determined from this approach. Whether the present ratings measure meaning within the definitions as given by the authors then has not been fully established by the statistical analysis. It is evident, however, that whatever connotative associations occurred between a line and an adjectival scale were enough to create some significant differences among the shapes and between the orientations.

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1 Charles E. Osgood, George J. Suci and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois, 1957, 342 p.

It should be noted that some researchers in the area of sexual and cultural symbolism have made fairly broad generalizations from their results. After demonstrating the matching of simple lines with the words masculine and feminine, Glatter and Hauch[2] conclude that the way in which a subject draws these kinds of lines is related to the individual's masculine or feminine identification. This type of statement may or may not be true, but it can not necessarily be concluded from this kind of research. The review of the literature and the present study indicate that lines can be matched with or rated on a wide variety of verbal responses.

An application of the present experimental results possibly could be made in the area of the graphic arts. When lines are accompanied with words, the shape and orientation of a line may influence the effect which an illustration has on an individual. For example, when a contrast effect is desired, presentations each containing the same kinds of line possibly would fall short of expressing opposite ideas. Of course, the most direct application can only be made to the present experimental design.

The statistical analyses of the experimental results indicate, that shape and orientation are measurable stimulus

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2 Andrew M. Glatter and Paul Hauch, "Sexual Symbolism in Line Qualities", Journal of Clinical Psychology, Vol. 14, No. 2, April 1958, p. 168-169.

variables of lines. These variables generally have been found to create significant effects on rating of the Semantic Differential scales. The general and the twelve specific hypotheses stated in the null form can be partially rejected, in that the rating of a line on a particular scale was not always found to be independent of the shape and/or orientation of the line. The analyses of variance indicated that primarily the shape and occasionally the orientation of a line do affect the rating of these scales. The interaction effect was found to be significant for only one scale which suggests that it could have occurred by chance. It is recognized that the generalizations cannot be made beyond the specific experimental group. Therefore, it can be stated that shape and orientation generally have a differential effect upon the rating of a line on scales selected from the Semantic Differential for a group of Psychology and Education students.

SUMMARY AND CONCLUSIONS

The purpose of the present research is to investigate the stimulus variables in simple lines. A sample of five geometric shapes was selected. It consisted of a straight line, an obtuse angle, an acute angle, a curved line and a two-thirds circle. These shapes were presented in two orientations defined as horizontal and vertical. In the experimental task, each subject rated each of the ten lines on a representative sample of Semantic Differential scales.

Four pilot studies were undertaken. The Psychiatric Hospital Patients and Aides and Attendants evidenced some degree of perplexity in doing the task and generally produced unreliable ratings. The Seminarians and Nurses however, appeared to understand the task and rated most of the scales reliably. Analyses of variances for the reliably rated scales of the last two groups were undertaken. The statistical results indicated that primarily the shape and to a lesser extent the orientation of a line affected the rating of these scales. The pilot studies also suggested some changes in the procedure and the necessity of selecting a group of subjects who were not hospitalized and had a high level of academic achievement.

The main experimental group consisted of fifty-one students of the School of Psychology and Education. Each line and each scale was reliably rated at the accepted level

of confidence. The analyses of variance for each scale indicated that primarily the shape and to a lesser extent the orientation affected the rating of Semantic Differential scales. Although the procedure was changed and the groups were different, these results are similar to those found in the pilot studies with Seminarians and Nurses.

Other stimulus variables could be investigated in future research. The variables of size, hue and line pressure could each play a part in rating these lines. Although line pressure is a difficult effect to control, the use of a light metre might provide some measurement of this variable when photo-offset printing is used.

The effect of the methods of presentation also could be investigated. It was pointed out that the words accompanying an ambiguous line drawing create a set. Although the scales are a representative sample of those used in studies with the Semantic Differential, they might have created an overall set. Also, when the rater has an opportunity to rate all of the lines, some degree of comparison and differentiation among the lines could occur. Although these effects were partially controlled by a random ordering of pages in each booklet, they still might have operated to create significant differences in the main effects. Further control of these effects could be achieved by presenting only one line to be rated on one scale by each subject in a group. To

attain an adequate sample of ratings of each line on each scale, a large number of subjects would be necessary.

The main conclusions from the present research indicate that simple lines do have some stimulus value. The differential effects of shape primarily and occasionally orientation of a line are evidenced in the rating of Semantic Differential scales. The mean ratings for the angular shapes were found most often to be consistently different from the means of the other shapes. Since all of the shapes appear different, it was suggested that the scales measured connotative associations which challenge casual observation.

BIBLIOGRAPHY

Glatter, Andrew M. and Paul Hauch, "Sexual Symbolism in Line Qualities", Journal of Clinical Psychology, Vol. 14, No. 2, April 1958, p. 168-169.

In some respects, this study is both different from and typical of many studies in the area of sexual and cultural symbolism. The authors have attempted to control both the shape and brightness of their line drawings. Like other authors in this field, they have based their rationale for undertaking the study in terms of projective drawing techniques. They also have generalized their results to support the hypothesis that the shape and brightness of a line as drawn by a subject indicates his kind and degree of sexual identification.

McMurray, G.A., "A Study of "Fittingness" of Signs to Words by Means of the Semantic Differential", Journal of Experimental Psychology, Vol. 56, No. 4, October 1958, p. 310-312.

This is the most recent research in the area of fitness of sign to word. In the first study, the earlier work on fitness is redone. In the second study, a comparison is undertaken between the mean ratings of the Semantic Differential scales for the signs and word of a given presentation. The results indicate that the Semantic Differential scales are sensitive to formal properties of ambiguous drawings which would be difficult for a subject to spontaneously verbalize.

Osgood, Charles E., George J. Suci and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois, 1957, 342 p.

The primary research and early studies on the Semantic Differential are contained in this book. The authors have formulated a theory of psychological meaning and undertaken extensive investigations within this area. Although the book is clearly written, the authors do not give an appendix which hinders easy access to particular topics of interest.

Scheerer, Martin and Joseph Lyongs, "Line Drawings and Matching Responses to Words', Journal of Personality, Vol. 25, No. 3, March 1957, p. 251-273.

The authors report three studies in this article. Two of their studies are modifications of those undertaken in Germany. The main research, however, is an attempt to establish rating categories of lines drawn for words which differentiate what the authors term the physiognomic properties of lines.

APPENDIX 1

INSTRUCTIONS FOR THE PILOT STUDY GROUPS

The purpose of this study is to measure what lines mean to various people. All of the lines in this booklet are parts of drawings. On each page, you will find a line to be judged and beneath it a set of seven-point scales. You are to rate each line on each scale in the order they are presented.

Here is how to use these scales:
If you feel the line at the top of the page is very closely related to one end of the scale, you should place your check-mark as follows:

emotional __X__:_____:_____:_____:_____:_____:_____ unemotional

OR

emotional _____:_____:_____:_____:_____:_____:__X__ unemotional

If you feel that the line is quite closely related to one or the other end of the scale (but not extremely so), you should place your check-mark as follows:

serious_____:__X__:_____:_____:_____:_____:_____ humorous

OR

serious_____:_____:_____:_____:_____:__X__:_____ humorous

If the line seems only slightly related to one side as opposed to the other side (but not really neutral), then you should check as follows:

unusual_____:_____:__X__:_____:_____:_____:_____ usual

OR

unusual_____:_____:_____:_____:__X__:_____:_____ usual

The direction toward which you check, of course, depends upon which end of the scale seems most characteristic of the line you are judging.

If you consider the line to be neutral on the scale, both sides of the scale equally associated with the line, or if the scale is completely irrevelant, unrelated to the line, then you should place your check-mark in the middle space:

near_____:_____:_____:__X__:_____:_____:_____ far

IMPORTANT:

1. - Place your check-marks in the middle of the spaces.

THIS NOT THIS

_____:__X__:_____:_____:_____X_____:_____

2. - Be sure to check every scale for every line. Do not omit any.

3. - Never put more than one check-mark on a single scale.

Do not look back and forth through the pages. Do not try to remember how you checked previous lines. Make each rating a separate and independent judgement. Work quickly and carefully. It is your first impressions, your immediate "feelings" about the lines, which we want.

APPENDIX 2

A SAMPLE PAGE OF A BOOKLET FOR THE PILOT STUDIES

strong	_____:_____:_____:_____:_____:_____:_____	weak
good	_____:_____:_____:_____:_____:_____:_____	bad
useful	_____:_____:_____:_____:_____:_____:_____	useless
competitive	_____:_____:_____:_____:_____:_____:_____	cooperative
beautiful	_____:_____:_____:_____:_____:_____:_____	ugly
pleasant	_____:_____:_____:_____:_____:_____:_____	unpleasant
happy	_____:_____:_____:_____:_____:_____:_____	sad
masculine	_____:_____:_____:_____:_____:_____:_____	feminine
hard	_____:_____:_____:_____:_____:_____:_____	soft
active	_____:_____:_____:_____:_____:_____:_____	passive
safe	_____:_____:_____:_____:_____:_____:_____	dangerous
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
exciting	_____:_____:_____:_____:_____:_____:_____	calming
fast	_____:_____:_____:_____:_____:_____:_____	slow
aggressive	_____:_____:_____:_____:_____:_____:_____	defensive

APPENDIX 3

A TYPICAL BOOKLET FOR THE EXPERIMENTAL GROUP

NAME _____ CIRCLE M or F
Surname Christian Names M or S

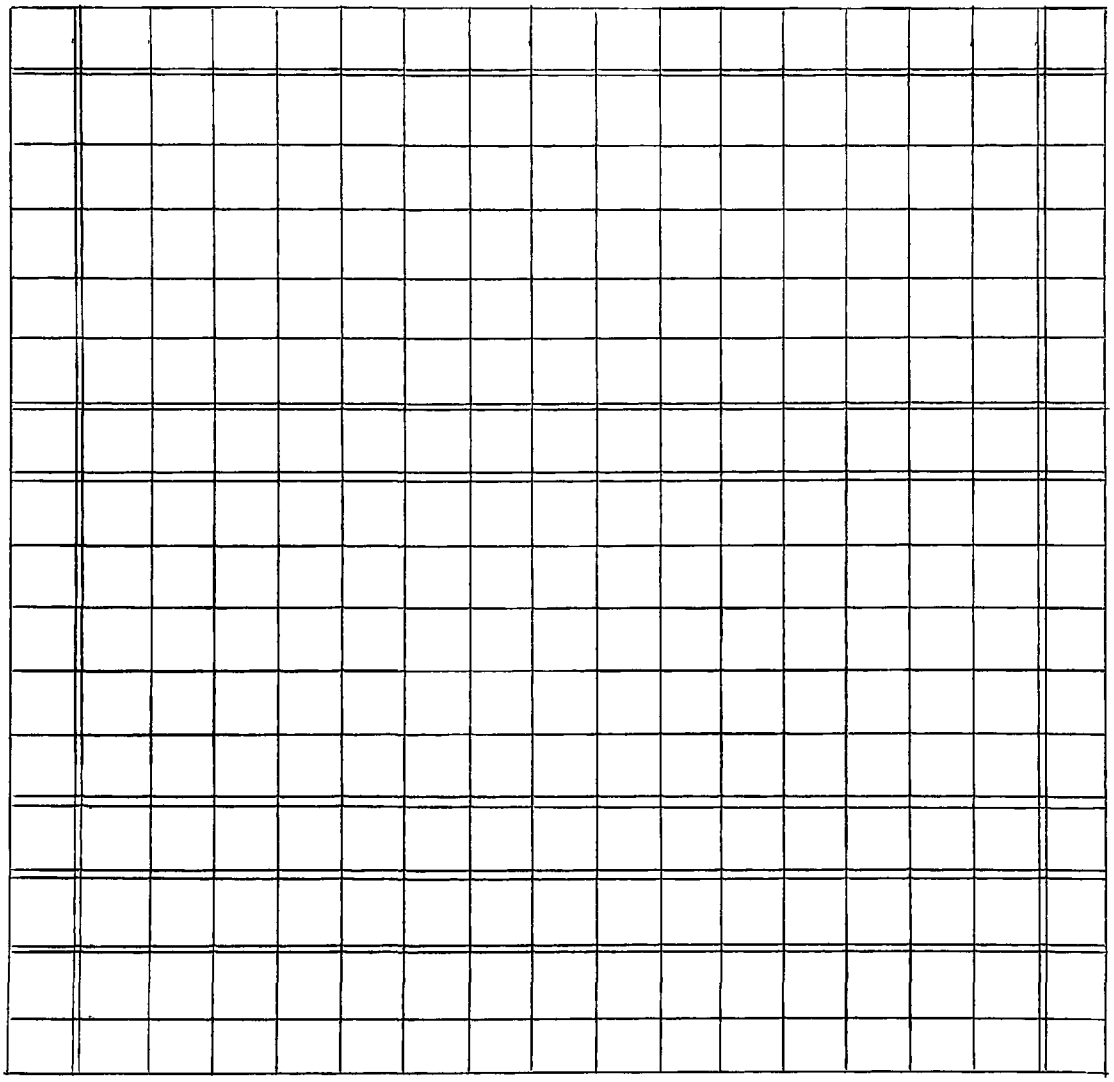
DATE OF BIRTH: _____ AGE: _____
Day Month Year Years Months

BIRTHPLACE: _____
Place Province or State Country

LANGUAGE: _____
Native Others you fluently use.

EDUCATION: _____
Grade or Degree Completed Institution Date

VOCATION: _____
Nature Where Employed?



The purpose of this study is to determine what simple line drawings mean to various people. On each page, you will find a line drawing to be judged and beneath it a series of descriptive scales. You are to rate each line on each scale in the order they are presented. Use your imagination to make each line meaningful.

Here is how to use these scales:
If you feel the line at the top of the page is very closely related to one end of the scale, you should place your check-mark as follows:

emotional __X__:____:____:____:____:____:____ unemotional

OR

emotional ____:____:____:____:____:____:__X__ unemotional

If you feel that the line is quite closely related to one or the other end of the scale (but not extremely so), you should place your check-mark as follows:

serious____:__X__:____:____:____:____:____ humorous

OR

serious____:____:____:____:____:__X__:____ humorous

If the line seems only slightly related to one side as opposed to the other side (but not really neutral), then you should check as follows:

unusual____:____:__X__:____:____:____:____ usual

OR

unusual____:____:____:____:__X__:____:____ usual

The direction toward which you check, of course, depends upon which end of the scale seems most characteristic of the line you are judging.

If you consider the line to be neutral on the scale, both sides of the scale equally associated with the line, or if the scale is completely irrevelant, unrelated to the line, then you should place your check-mark in the middle space:

near____:____:____:__X__:____:____:____ far

IMPORTANT:

1. - Place your check-marks in the middle of the spaces.

THIS	NOT THIS
____:__X__:____:____:____:____	____:____:____:____X____:____

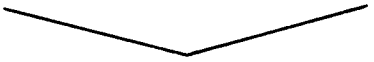
2. - Be sure to check every scale for every line. Do not omit any.

3. - Never put more than one check-mark on a single scale.

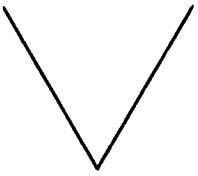
Do not look back and forth through the pages. Do not try to remember how you checked previous lines. Make each rating a separate and independent judgement. Work quickly and carefully. It is your first impressions, your immediate "feelings" about the lines, which we want.

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

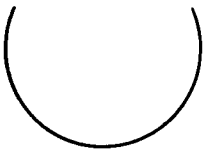


slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous



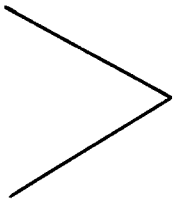
slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous



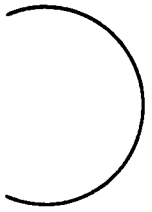
slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous



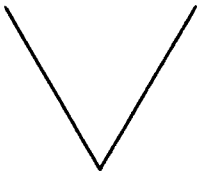
slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous



slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____	:	_____	:	_____	:	_____	fast
unpleasant	_____	:	_____	:	_____	:	_____	pleasant
active	_____	:	_____	:	_____	:	_____	passive
feminine	_____	:	_____	:	_____	:	_____	masculine
sad	_____	:	_____	:	_____	:	_____	happy
affectionate	_____	:	_____	:	_____	:	_____	hateful
strong	_____	:	_____	:	_____	:	_____	weak
exciting	_____	:	_____	:	_____	:	_____	calming
timid	_____	:	_____	:	_____	:	_____	aggressive
cooperative	_____	:	_____	:	_____	:	_____	competitive
hard	_____	:	_____	:	_____	:	_____	soft
safe	_____	:	_____	:	_____	:	_____	dangerous



slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

slow	_____:_____:_____:_____:_____:_____:_____	fast
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
active	_____:_____:_____:_____:_____:_____:_____	passive
feminine	_____:_____:_____:_____:_____:_____:_____	masculine
sad	_____:_____:_____:_____:_____:_____:_____	happy
affectionate	_____:_____:_____:_____:_____:_____:_____	hateful
strong	_____:_____:_____:_____:_____:_____:_____	weak
exciting	_____:_____:_____:_____:_____:_____:_____	calming
timid	_____:_____:_____:_____:_____:_____:_____	aggressive
cooperative	_____:_____:_____:_____:_____:_____:_____	competitive
hard	_____:_____:_____:_____:_____:_____:_____	soft
safe	_____:_____:_____:_____:_____:_____:_____	dangerous

APPENDIX 4

TABLES FOR EACH SCALE OF THE SUMMARY OF THE ANALYSIS OF VARIANCE AND THE EVALUATION OF THE DIFFERENCES BETWEEN THE MEAN RATINGS OF EACH SHAPE

Table III.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Active-passive

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	292.87	4	73.22	25.69	2.39	3.36
Orientations	8.54	I	8.54	3.43	3.88	6.75
Individuals	218.26	50	4.37			
Double Interactions						
S by O	2.91	4	.73	.30	2.41	3.41
S by I	648.13	200	3.24	1.31	1.26	1.39
O by I	129.26	50	2.59	1.05	1.42	1.62
Triple Interaction						
S by O by I	493.29	200	2.47			

Table IV.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Active-passive

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
		6.73	6.76	4.27	8.37	8.45
E	8.45	1.72[a]	1.69	4.18	.08	--
D	8.37	1.64	1.61	4.10	--	
C	4.27	2.46	2.49	--		
B	6.76	.03	- -			
A	6.73	--				

a Single underlining designates D($p \leq .01$)= .86

Table V.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Affectionate-hateful

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	236.57	4	59.14	34.38	2.41	3.41
Orientations	2.54	1	2.54	2.39	3.88	6.75
Individuals	162.47	50	3.25			
Double Interactions						
S by O	6.54	4	1.63	1.61	2.41	3.41
S by I	344.23	200	1.72	1.70	1.26	1.39
O by I	63.26	50	1.27	1.26	1.42	1.62
Triple Interaction						
S by O by I	202.66	200	1.01			

Table VI.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Affectionate-hateful

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
		8.37	7.76	8.43	5.27	5.65
E	5.65	2.72[a]	2.12	2.78	.38	- -
D	5.27	3.10	2.49	3.16	- -	
C	8.43	.06	.67	- -		
B	7.76	.61[b]	- -			
A	8.37	- -				

a Single underlining designates $D(p \leq .01) = .67$
b Double underlining designates $D(p \leq .05) = .51$

Table VII.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Aggressive-timid

Source of Variation	Sum of Squares	df	Estimate of Variance	F	$F_{.05}$	$F_{.01}$
Main Effects						
Shapes	368.47	4	92.12	45.16	2.39	3.36
Orientations	16.24	1	16.24	8.87	3.88	6.75
Individuals	251.74	50	5.03			
Double Interactions						
S by O	8.20	4	2.05	1.15	2.41	3.41
S by I	460.73	200	2.30	1.30	1.26	1.39
O by I	102.86	50	2.06	1.16	1.42	1.62
Triple Interaction						
S by O by I	354.20	200	1.77			

Table VIII.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Aggressive-timid

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
	Mean Rating	5.78	7.35	4.76	9.39	8.69
E	8.69	2.91[a]	1.34	3.93	.70[b]	- -
D	9.39	3.61	2.94	5.18	- -	
C	4.76	1.02	2.59	- -		
B	7.35	1.57	- -			
A	5.78	- -				

a Single underlining designates $D(p \leq .01) = .73$
b Double underlining designates $D(p \leq .05) = .55$

Table IX.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Competitive-cooperative

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	441.36	4	110.34	47.97	2.39	3.36
Orientations	15.18	1	15.18	6.66	3.88	6.75
Individuals	221.27	50	4.43			
Double Interactions						
S by O	6.27	4	1.57	.70	2.41	3.41
S by I	468.24	200	2.34	1.04	1.26	1.39
O by I	119.42	50	2.39	1.06	1.42	1.62
Triple Interaction						
S by O by I	450.13	200	2.25			

Table X.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Competetive-cooperative

Shape		Differences Between the Mean Ratings for Each Shape				
	Mean Rating	A	B	C	D	E
		6.82	7.59	5.35	10.53	9.67
E	9.67	2.85[a]	2.08	4.32	.86	- -
D	10.53	3.71	2.94	5.18	- -	
C	5.35	1.47	2.24	- -		
B	7.59	.77	- -			
A	6.82	- -				

a Single underlining designates $D(p \leq .01) = .77$

Table XI.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Exciting-calming

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	217.15	4	54.29	18.47	2.41	3.41
Orientations	36.80	1	36.80	19.17	3.88	6.75
Individuals	223.06	50	4.46			
Double Interactions						
S by O	6.42	4	1.61	.87	2.41	3.41
S by I	588.05	200	2.94	1.58	1.26	1.39
O by I	108.50	50	2.17	1.17	1.42	1.62
Triple Interaction						
S by O by I	372.78	200	1.86			

Table XII.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Exciting-calming

		Differences Between the Mean Ratings for Each Shape				
Shape		A	B	C	D	E
	Mean Rating	8.12	7.73	5.22	9.00	8.39
E	8.39	.27	.66	3.17	.61	- -
D	9.00	.88[a]	1.27	3.78	- -	
C	5.22	2.90[b]	2.51	- -		
B	7.73	.39	- -			
A	8.12	- -				

a Double underlining designates $D(p \leq .05) = .65$
b Single underlining designates $D(p \leq .01) = .87$

Table XIII.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Fast-slow

Source of Variation	Sum of Squares	df	Estimate of Variance	F	$F_{.05}$	$F_{.01}$
Main Effects						
Shapes	487.35	4	121.84	29.01	2.41	3.41
Orientations	9.61	1	9.61	4.11	3.88	6.75
Individuals	205.14	50	4.10			
Double Interactions						
S by O	4.61	4	1.15	.51	2.41	3.41
S by I	840.05	200	4.20	1.87	1.26	1.39
O by I	143.79	50	2.88	1.28	1.42	1.62
Triple Interaction						
S by O by I	449.99	200	2.25			

Table XIV.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Fast-slow

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
		5.63	7.73	4.65	9.73	8.90
E	8.90	2.27[a]	1.17	4.25	.83	- -
D	9.73	4.10	2.00	5.08	- -	
C	4.65	.98[b]	3.08	- -		
B	7.73	2.10	- -			
A	5.63	- -				

a Single underlining designates $D(p \leq .01) = 1.04$
b Double underlining designates $D(p \leq .05) = .79$

Table XV.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Happy-sad

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	27.35	4	6.84	2.54	2.44	3.41
Orientations	1.13	1	1.13	.51	4.03	7.17
Individuals	213.57	50	4.27			
Double Interactions						
S by O	11.48	4	2.87	2.30	2.41	3.41
S by I	538.25	200	2.69	2.15	1.26	1.39
O by I	110.07	50	2.20	1.76	1.42	1.62
Triple Interaction						
S by O by I	249.32	200	1.25			

Table XVI.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Happy-sad

Differences Between the Mean Ratings for Each Shape

Shape	Mean Rating	A	B	C	D	E
		7.61	7.24	7.29	6.25	6.86
E	6.86	.75[a]	.38	.43	.61	- -
D	6.25	1.36[b]	.99	1.04	- -	
C	7.29	.32	.05	- -		
B	7.24	.37	- -			
A	7.61	- -				

a Double underlining designates $D(p \leq .05) = .64$
b Single underlining designates $D(p \leq .01) = .84$

Table XVII.-

Summary of the Analysis of Variance of Rating on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Hard-soft

Source of Variation	Sum of Squares	df	Estimate of Variance	F	$F_{.05}$	$F_{.01}$
Main Effects						
Shapes	755.12	4	188.78	65.32	2.41	3.41
Orientations	10.45	1	10.45	5.65	3.88	6.75
Individuals	178.73	50	3.57			
Double Interactions						
S by O	9.58	4	2.40	1.30	2.41	3.41
S by I	577.68	200	2.89	1.56	1.26	1.39
O by I	94.25	50	1.89	1.02	1.42	1.62
Triple Interaction						
S by O by I	369.22	200	1.85			

Table XVIII.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Hard-soft

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
		5.35	7.69	4.94	10.80	10.33
E	10.33	4.98[a]	2.64	5.39	.47	- -
D	10.80	5.45	3.11	5.86	- -	
C	4.94	.41	2.75	- -		
B	7.69	2.34	- -			
A	5.35	- -				

a Single underlining designates $D(p \leq .01) = .86$

Table XIX.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Masculine-feminine

Source of Variation	Sum of Squares	df	Estimate of Variance	F	$F_{.05}$	$F_{.01}$
Main Effects						
Shapes	632.11	4	158.03	65.85	2.41	3.41
Orientations	2.68	1	2.68	1.82	3.88	6.75
Individuals	107.67	50	2.15			
Double Interactions						
S by O	7.33	4	1.83	1.28	2.41	3.41
S by I	480.29	200	2.40	1.68	1.26	1.39
O by I	81.22	50	1.62	1.13	1.42	1.62
Triple Interaction						
S by O by I	286.27	200	1.43			

Table XX.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Masculine-feminine

Shape		Differences Between the Mean Ratings for Each Shape				
	Mean Rating	A	B	C	D	E
		6.41	7.24	5.34	10.69	10.80
E	10.80	4.39[a]	3.56	5.46	.11	- -
D	10.69	4.28	3.45	5.26	- -	
C	5.34	.98	1.81	- -		
B	7.24	.83	- -			
A	6.41	- -				

a Single underlining designates $D(p \leq .01) = .79$

Table XXi.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Pleasant-unpleasant

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	131.48	4	32.87	11.74	2.41	3.41
Orientations	.95	1	.95	.52	3.88	6.75
Individuals	158.68	50	3.17			
Double Interactions						
S by O	15.46	4	3.87	2.10	2.41	3.41
S by I	560.12	200	2.80	1.52	1.26	1.39
O by I	110.65	50	2.21	1.20	1.42	1.62
Triple Interaction						
S by O by I	368.94	200	1.84			

Table XXII.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Pleasant-unpleasant

		Differences Between the Mean Ratings for Each Shape				
Shape		A	B	C	D	E
	Mean Rating	7.47	6.98	7.76	5.18	5.67
E	5.67	1.80[a]	1.31	1.09	.49	- -
D	5.18	2.29	1.80	2.58	- -	
C	7.76	.29	.98[b]	- -		
B	6.98	.49	- -			
A	7.47	- -				

a Single underlining designates $D(p \leq .01) = .85$
b Double underlining designates $D(p \leq .05) = .65$

Table XXIII.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals for the Scale Safe-dangerous

Source of Variation	Sum of Squares	df	Estimate of Variance	F	$F_{.05}$	$F_{.01}$
Main Effects						
Shapes	239.21	4	59.80	18.23	2.41	3.41
Orientations	33.65	1	33.65	16.33	3.88	6.75
Individuals	194.53	50	3.89			
Double Interactions						
S by O	31.15	4	7.79	3.86	2.41	3.41
S by I	655.39	200	3.28	1.62	1.26	1.39
O by I	110.05	50	2.20	1.09	1.42	1.62
Triple Interaction						
S by O by I	404.65	200	2.02			

Table XXIV.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Safe-dangerous

Shape		Differences Between the Mean Ratings for Each Shape				
	Mean Rating	A	B	C	D	E
		7.22	7.61	9.88	5.82	6.59
E	6.59	.63	1.02	3.39	.77[b]	- -
D	5.82	1.40[a]	1.79	4.06	- -	
C	9.88	2.66	2.27	- -		
B	7.61	.39	- -			
A	7.22	- -				

a Single underlining designates $D(p \leq .01) = .92$
b Double underlining designates $D(p \leq .01) = .70$

Table XXV.-

Summary of the Analysis of Variance of Ratings on 5 Shapes in 2 Orientations by 51 Individuals from the Scale Strong-weak

Source of Variation	Sum of Squares	df	Estimate of Variance	F	F.05	F.01
Main Effects						
Shapes	399.97	4	99.99	44.84	2.39	3.36
Orientations	4.71	1	4.71	2.45	3.88	6.75
Individuals	257.26	50	5.15			
Double Interactions						
S by O	2.56	4	.64	.32	2.41	3.41
S by I	492.03	200	2.46	1.22	1.26	1.37
O by I	79.59	50	1.59	.80	1.42	1.62
Triple Interaction						
S by O by I	400.64	200	2.00			

Table XXVI.-

Evaluation of the Differences Between the Mean Ratings of the 5 Shapes for the Scale Strong-weak

Shape	Mean Rating	Differences Between the Mean Ratings for Each Shape				
		A	B	C	D	E
		4.82	7.24	4.43	8.67	8.39
E	8.39	3.57[a]	1.15	3.96	.28	- -
D	8.67	3.85	1.43	4.24	- -	
C	4.43	.39	2.81	- -		
B	7.24	2.42	- -			
A	4.82	- -				

a Single underlining designates $D(p \leq .01) = .76$

APPENDIX 5

ABSTRACT OF

The Effects of Shape and Orientation on the Stimulus Value of Lines as Measured by the Semantic Differential

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The Effects of Shape and Orientation on the Stimulus Value of Lines as Measured by the Semantic Differential

The present research has been directed toward an investigation of the stimulus variables in simple lines. In the review of the literature, it was noted that ambiguous line drawings can be matched with or rated on a verbal response at a significant level of agreement. The particular stimulus variables of shape, orientation and brightness were suggested as being relevant to the connotative associations required for this phenomenon. Procedural variables, such as verbal set, method of presentation and subjects also were considered. There was no conclusive evidence however, to indicate which variables either in the stimulus or in the procedure were the most important.

From these considerations, the purpose of this study was formulated to examine the effects of the variables of shape and orientation on the stimulus value of lines. The past research also suggested that the stimulus value or more specifically the connotative associations of an ambiguous line drawing could be measured by the Semantic Differential scales.

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1 J.W. McCallum, Doctoral thesis presented to the School of Psychology and Education, University of Ottawa, October 1961, xi-106 p.

The experimental lines were drawn in five shapes and rotated in two orientations. The shapes consisted of a straight line, an obtuse angle, an acute angle, a curved line and a two-thirds circle. Each line was two inches long drawn in black ink with a medium pressure and reproduced by photo-offset printing. The orientations were defined as horizontal and vertical. Each line was presented on a page with a representative sample of Semantic Differential scales.

Four Pilot Studies were undertaken. It was found that the task created some perplexity, particularly for Psychiatric Patients, and Aides and Attendants; and that the computation of the test-retest reliability for each scale did not always reach the accepted level of significance. The effects of shape and orientation were further investigated for the reliable scales as rated by the Seminarians and the Nurses. The analyses of variance of their ratings indicated that the effects of shape and orientation could be differentiated by these scales. As a result of the Pilot Studies, some changes were made in the procedure for the experimental group.

The experimental group consisted of fifty-one Psychology - Education students. Each line and each scale was found to be reliably rated at the accepted level of confidence. From the analyses of variance, it was concluded that primarily shape and to a lesser extent orientation affected the stimulus value of lines as measured by the Semantic Differential.