THE RELATIONSHIP OF PERSONALITY
AND ACADEMIC APTITUDE TO PERCEPTUAL IMAGERY

by

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SIGNED: [Signature]

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This thesis has been approved on the date shown below:

[Signature] [Date]

Associate Professor of Psychology
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INTRODUCTION

One of the basic questions in psychology is what happens between the reception of a stimulus and the behavior following stimulation. One theory is that a perceptual process takes place in which the stimulus is symbolically represented, is interpreted by the individual, and an appropriate response is made. For example, when a person hears a word spoken, the sound of the word may evoke an inner symbolic representation of the word which is then interpreted in the light of the situation and an appropriate response is made.

There is little doubt that symbolic representations or images do occur in some individuals during cognition, but whether they always occur, and whether or not they are basic to cognition is not known. Wide variations in imagery exist and these variations may have a relationship to other individual differences. For instance, persons reporting imagery rich in color and motion may show a different personality organization than persons with imagery that lacks these characteristics.

The importance of imagery has been stressed by many writers including Schilder (17), Denbigh (6), and Bartlett (1). Schilder (17) feels that personality organization is
developed on a basis of a central integration of cues and traces from our sense organs into a schema or plastic model of ourselves. He refers to this schema as the "body image." According to Denbigh (6) the function of the image is to connect by analogy a thing which is understood with another thing which is not. He feels that imagery is as important for science as it is for poetry. Bartlett (1, p. 218) maintains that imagery precedes meaning. According to him, "There is an image, and meaning has to be tacked on to that, or, perhaps more accurately, has to flow out of it, or emerge from it, before words can carry the process further."

There was considerable interest in imagery and in its importance to cognition during the early part of the 20th century. Much discussion centered around the question of "imageless thought." The adherents to the idea of "imageless thought" maintained that imagery is not important to cognition and that awareness of meaning occurs without imagery. They recognized that imagery accompanies meaning in some people but felt that it is merely an auxiliary phenomenon (13, 14, 22). The opposite viewpoint held that imagery is basic to cognition in some if not all people and that imagery is part of meaning (20). Experiments were conducted by Moore (14), Tolman (20), and McDonough (13) with fairly common results but different interpretations. Moore (14) and McDonough (13) felt that imageless
thought is primary, while Tolman (20) maintained that, at least for some people, image and meaning are two aspects of the same thing.

Galton (7) was one of the first to investigate individual differences in imagery, which he did by sending large numbers of questionnaires to individuals and to educational institutions in England and abroad. He asked for introspective reports of the presence and quality of imagery. He was surprised to find that the majority of the scientific men who responded to the questionnaire maintained that they did not have images while the majority of nonscientific men reported definite imagery. His explanation was that the scientific men might have lost their imagery by disuse or subordination.

Early attempts to classify general types of imagery were made (2, 10) and although large individual differences were noted, no clear-cut types were found. Thorndike (19) insisted that it is useless to look for "types" of imagery since variations in imagery appear to be normally distributed. This would indicate that there exists either one general type of imagery or as many types as there are individuals.

Since 1920 very little work on imagery has been done. This is partly because of the difficulty in introspection and partly because behavioristic psychologists insist upon studying behavior that is directly observable and Gestalt
psychologists object to the analysis of mental activities into component parts.

Although there have been, so far as the writer knows, no experiments directly relating imagery to personality, Roe (16) has related individual differences in imagery to the occupation of the subject, and Brower (3) has attempted to relate differences in imagery to intelligence. Huxley (9) postulated a relationship between imagery and personality organization as a result of his experience after taking the peyote root. He said that he is unaware of any visual imagery in his normal state but that under the influence of peyote he experienced vivid visual imagery. He said that these images had an intensity of color and a quality of stimulation entirely different than his normal perceptions. This agrees with many descriptions of the drug (9, 23). The effects of peyote upon imagery may mean that imagery is related to chemical conditions of the organism which may underlie personality.

In Roe's experiment (16) the types of imagery reported by sixty-four eminent research scientists were classified. She found predominantly visual imagery in experimental physicists and biologists, and predominantly verbal imagery in psychologists, anthropologists, and theoretical physicists. She also found a relationship between the types of imagery reported by the subject and the occupation of the subject's father. For example, from the group of thirty
subjects whose fathers were professional men, ten of the twelve subjects reporting strong verbal imagery had fathers whose occupations were classified as "professional verbal." This classification included men whose occupations required facility in verbal manipulation, such as lawyers, teachers, clergymen and editors, as distinguished from physicians, engineers, etc.

Brower (3) asked ninety-three undergraduate psychology students at New York University to rate the intensity of their imagery in each of eight sense modalities. He found no relationship between imagery and mental ability as measured by the Otis Test of Mental Ability, Higher Form B.
STATEMENT OF PROBLEM

This study is an attempt to determine whether there is a relationship between imagery and personality and between imagery and academic aptitude.

Among the variations in imagery reported by individuals are the presence of accurate visual images in some people, while others have merely generalized motor or auditory impressions; the presence of highly colored imagery in some people, while others report merely black and white imagery; and the appearance of imagery in motion in some, while others seem to have stationary images. Some subjects deny having any imagery.

Although dividing individuals into imagery types is probably impossible, various characteristics of images can be analyzed and studied. Any relationship which can be determined between these various characteristics and personality or intelligence should prove of value in the study of human behavior.
APPARATUS

The apparatus used consisted of the list of eighteen stimulus words given in Table I. The stimulus words were nouns selected for their expected absence of any emotional content which might produce repression. Some of the stimulus words represented specific material objects, while others represented concepts that would vary more widely from subject to subject.

The words were also selected to allow the subject to exhibit all types of imagery that he might possess. For example, preliminary experimentation had shown that the words "dawn," "wagon," and "cow" tended to produce color imagery; while "churn," "accordion," and "swimming" tended to produce motion imagery.

Abstract words were spaced between words representing specific material objects so that subjects might not become discouraged if description of impressions to abstract words proved to be difficult.
Table I

Stimulus Words

<table>
<thead>
<tr>
<th>wagon</th>
<th>whale</th>
</tr>
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<tbody>
<tr>
<td>charcoal</td>
<td>8:30</td>
</tr>
<tr>
<td>fur</td>
<td>cow</td>
</tr>
<tr>
<td>window</td>
<td>accordion</td>
</tr>
<tr>
<td>knife and fork</td>
<td>sunshine</td>
</tr>
<tr>
<td>three</td>
<td>minute</td>
</tr>
<tr>
<td>churn</td>
<td>swimming</td>
</tr>
<tr>
<td>dawn</td>
<td>north</td>
</tr>
<tr>
<td>camera</td>
<td></td>
</tr>
</tbody>
</table>
PROCEDURE

The subjects for this experiment were thirty-seven male students from two recitation sections of the elementary psychology class at the University of Arizona. The subjects ranged in age from eighteen to twenty-four years.

Personality scores and descriptions of imagery were secured for each subject. Academic aptitude scores were obtained for thirty-three of the thirty-seven subjects. The group form of the Minnesota Multiphasic Personality Inventory was administered during a regular class period and the subjects' personality scores were obtained from the results. This test was selected because of the large amount of related work that has been conducted using it. Academic aptitude scores were obtained from the College Aptitude Test which is taken by all entering students at the University of Arizona. Descriptions of imagery were secured in individual interviews with each subject.

The interviews to determine the characteristics of each subject's imagery were conducted in a quiet room with only the experimenter and subject present. The subject was brought into the room and seated at the table. A tape recorder which was to be used during the experiment was located directly in front of him. He was told:

This is an attempt to surprise your perceptual processes at work. I'll say a word to you and when
I say this word will you describe the first thing that flashes through your mind; the first instantaneous impression you have. For example, if I say the word 'apple,' most people get an impression of a juicy red apple, or of an apple tree in an orchard, or they may see the word 'apple' written out. If you will describe this first quick impression as completely as you can, it will give us some idea of your perceptual processes in that instant before real thought begins.

Any questions pertaining to the purpose of the experiment were answered by a promise of a full explanation at the conclusion of the experiment. The entire interview was tape recorded.

After the instructions had been given to the subject, the stimulus words were read to him, with sufficient time between words for the subject to report his impressions. Questions such as, "Can you describe that more fully?" were asked occasionally when a reply appeared ambiguous and when it was felt that a question would not interfere with the subject's spontaneous descriptions of his impressions.

At the conclusion of the reading of the stimulus words, the experimenter said, "That is all the words we have. I would like to ask you some general questions, however." The subject was asked general questions about the responses he had given to the stimulus words; whether or not they appeared in color, whether the presence of motion had been noticed, and so on (see Appendix A). An effort was made to follow a consistent statement of questions and to keep supplementary questions at a minimum level. It was felt that anything beyond this might tend to reduce the validity of the subject's description.
When the general questioning was completed the subject was told the purpose of the experiment and was asked not to mention the experiment to anyone before a discussion of the experiment was given in the classroom.
METHODS OF ANALYSIS

Four measures were obtained for each subject; imagery ratings, personality scores from the Minnesota Multiphasic Personality Inventory (MMPI), general adjustment ratings, and academic aptitude scores from the College Aptitude Test. In the following sections detailed explanations are given of the methods of analysis used for each of these measures.

1. Imagery Analysis

The imagery descriptions obtained from this experiment were analyzed in terms of the level of motion, color, realism, cutaneous impressions, social situations, visual impressions, and time impressions reported. A rating was done by analysis of the transcriptions of the responses made by subjects to stimulus words and by analysis of their answers to the questions asked at the end of the interview. In all of these characteristics except one, color, threefold classifications were used. For color a twofold classification was employed. The following sections illustrate the bases for ratings on characteristics of imagery. In order to make it possible for the reader to understand fully what is meant by each term used, these descriptions will be presented in a detailed manner with quotations from the subjects.
Motion. Subjects were rated as having high motion imagery if they said that they had high motion imagery and if their responses to the stimulus words showed motion imagery.

An example of a subject rated as having high motion imagery is Subject 31. In response to the stimulus word "minute" he stated, "Minute, I think of a watch. I get the impression of the second hand going around." In answer to the general question about the presence of motion, he said, "Yes. Sure. I mean I could see those things moving in my imagination as you said the word."

Another example of a subject rated as having high motion imagery is Subject 17 whose response to the word "cow" was, "Well, I just get an image of a cow and some motion associated with it: the cow walking." When asked if he noticed motion in his impressions, he said, "Yes, in most of them. They were in motion; like in swimming, the porpoise was swimming. And the cows, and so on; they were in motion."

Subjects rated as having low motion imagery had no apparent motion in their responses to stimulus words and stated that their imagery did not contain motion. Subjects placed in the medium group did not belong clearly to either extreme.

Color. Only the subjects who appeared to have low color imagery clearly fell into a distinct group. Thus two rather than three groups were established.
An example of a subject with high color imagery is Subject 4 whose response to the stimulus word "accordion" was, "I see a picture of an accordion. I don't know why the color green should be associated with it. I think about it as green. That's about all." In answer to the general question about the presence of color in his impressions, he said, "Yes. I see things in color. No black and white. Technicolor or something. They are really quite vivid. Some perceptions are so real I could almost project myself right there and be there. Things are very clear and in color."

Subjects with low color imagery maintained that they were not aware of color in their imagery, and the responses they gave to the stimulus words contained no reference to color.

Realism. The realism of each subject's imagery was rated entirely on the basis of his answers to one of the general questions asked during the interview. This question was, "Some people say that their impressions seem just as real as if they were right there, while others say that their impressions seem more like turning the pages of a book and looking at a picture. What would you say about your impressions?"

The subjects rated as having a high degree of realism stated that their imagery appeared quite realistic. An example is Subject 1, who said, "Yes, they were real objects. Well, the clock: I could actually see the clock right there, and it was on my dresser. Well, I could barely see the
outline of the dresser in my room. It was a real clock. The February was on a real calendar just like the page had been torn out. The cow was real. The swimmer in the water was real. They were not pictures at all. They were real.”

An example of a subject who was rated as having low realism in his imagery was Subject 22, who said, "It would be more like looking back to me, through an old scrapbook or something." Subjects rated as having medium realism in their imagery did not belong clearly to either extreme.

Cutaneous. Subjects were rated as having high cutaneous imagery if their responses to stimulus words contained tactual or temperature references and if they also reported tactual impressions in the general questioning.

An example of a subject rated as having high cutaneous imagery is Subject 3. His response to the stimulus word "fur" was, "I think of fur right away as being able to feel it (gesturing as though fur were held between his finger tips). It's just soft; and then I think of a fur coat right away; anything soft." In response to the stimulus word "swimming" he said, "Well, I think of water. Just about feel the water as if I were going swimming. Feel myself in the water. During the summertime I can just feel it. It feels good because it is pretty hot and the water just cools you off." In the general questioning he stated that his impressions contained tactual imagery.
An additional example of a subject rated as having high cutaneous imagery is Subject 7. His response to the stimulus word "fur" was, "I think of skin, soft skin. The fur of an animal actually; soft feeling, a texture." In the general questioning he reported tactual impressions to the words "fur," "water," and "swimming."

Subjects were rated as having low cutaneous imagery if their responses to the stimulus words contained no cutaneous references and if they stated in the general questioning that they were not aware of tactual imagery. The medium group of subjects were those who did not clearly belong in either the high or low cutaneous imagery groups.

Visual. Subjects were rated as having high visual imagery if they both said that their imagery was visual and they had a large number of responses to stimulus words which indicated visual imagery. For example, subjects rated as having high visual imagery frequently began their responses with such comments as, "I see a picture," or "I just visualize the object." There was probably some degree of visualization in all subjects but those rated as having low visual imagery made little or no reference to visualization.

Time. Time imagery appeared to be a somewhat abstract concept for most subjects, even for those who maintained that they noticed this type of imagery. Those subjects who did not appear to have time imagery were at a loss when asked about the presence of an impression of "time passing."
Those subjects who said that they had had an impression of "time passing" found it difficult to describe their impressions but insisted that they had obtained the impression.

An example of a subject rated as having high time imagery is Subject 4. His response to the stimulus word "minute" was, "In minute, it's just time. How to describe it? It's kind of hard. It's kind of like being in a blank room with nothing there except just four blank walls and a little color; nothing to represent anything but time, I guess. Nothing to break the monotony of the color or time or space involved." This subject also said during the general questioning that he was aware of an impression of the passage of time.

Another example of a subject rated as having high time imagery is Subject 33. His response to the stimulus word "minute" contained a description of an underwater swim which had lasted one minute. His answer to the general question about an impression of the passage of time was, "In minute, yes. That was when I was swimming under water, and that was indeed a very timeful impression. I wouldn't know exactly how to describe it. It's like trying to describe a steak to someone; you couldn't do it if they've never had it. They have to have at least a facsimile. But it's just like if you were to close your eyes and close your nose off and not be able to hear anything. In the case of me I was moving. You might be just stationary up on land, but it would be to almost shut yourself off from everything and hold your breath."
Subjects rated as having low time imagery had no responses to the stimulus words that indicated an awareness of time, and stated in the general questions that they were not aware of this impression. Subjects rated as having medium time imagery did not show a complete absence of time awareness, but did not appear to have much of this impression.

**Social.** Subjects were rated as having a high degree of social imagery if their responses to stimulus words contained many references to people and social situations. No direct questions were asked about this type of imagery.

Responses to the stimulus words "charcoal," "fur," "accordion," and "swimming" are given below for a subject rated as having high social imagery and for a subject rated as having low social imagery.

Subject 36 was rated as having high social imagery. His response to the stimulus word "charcoal" was, "That I see as a party outside in the back yard, and roasting hamburgers or hot dogs on the charcoal broiler." In answer to the stimulus word "fur" he said, "Fur, I think of a mink and a young lady wearing it." In response to the stimulus word "accordion" he said, "I visualize a young gentleman playing an accordion. Very gay; squeezing it back and forth." His response to the stimulus word "swimming" was, "Swimming, I think of the ocean with a lot of people around on the beaches and in the water and some people riding the waves.
and other people swimming. Little kids playing ball on the beach."

Subject 9 was rated as having low social imagery. His response to the stimulus word "charcoal" was, "Black. I can see the charcoal." In answer to the stimulus word "fur," he said, "I don't know. I think when you say the word I just more or less see the object. It's just a general animal. I couldn't see whether it was a dog or a cat; just fur." His response to the stimulus word "accordion" was, "I see the object; an accordion." In answer to the stimulus word "swimming" he said, "I see the pool, I guess; that's the first thing."

Subjects rated as having medium social imagery did not belong clearly to either the high or the low extreme.

2. Analysis of MMPI Scores

MMPI scores were used as a basis for measurement of the personality of each subject. Scores from each subtest were divided as evenly as possible into three groups; the upper group containing the twelve highest scores, a medium group containing the thirteen next highest scores, and the lower group containing the twelve lowest scores. An individual referred to as having a high score on an MMPI subtest is one whose score fell in the high group of twelve, and so on.
3. General Adjustment Ratings

General adjustment ratings were made independently for each subject by three psychologists. Ratings were made solely on the basis of MMPI profiles, with each subject rated as having either good, average or poor adjustment. The ratings employed in this discussion represent the majority opinion of these psychologists. They rated seven subjects as well adjusted, twenty-four as of average adjustment, and six as poorly adjusted.

4. Analysis of College Aptitude Test Scores

College Aptitude Test scores were divided into three equal classes of eleven subjects each.\(^1\) Classifications were made of the total scores and of the scores on the Verbal and Quantitative subtests.

\(^1\) College Aptitude Test scores were available for only thirty-three of the thirty-seven subjects used in the experiment.
RESULTS

The procedure employed in the present study made possible a number of comparisons. The scores on the MMPI were divided into a number of subgroups and correlated with the characteristics of the imagery predominant in each individual. The profiles obtained from the MMPI were classified according to level of adjustment and correlated with the characteristics of the subjects' images. Intelligence correlates of imagery were determined using the results from the College Aptitude Test.

1. Relationships between Scores on the MMPI and Characteristics of the Subject's Images

As can be seen in Table II subjects with high motion imagery tended to obtain high scores in Pd (2.76% level of

2. Cottle (5) presents the following description of the MMPI scales:

"Hs (Hypochondriasiasis): Amount of abnormal concern about bodily functions.
D (Depression): Depth of clinically recognized symptoms complex, depression.
Hy (Hysteria): Conversion-type hysteria symptoms.
Pd (Psychopathic Deviate): Absence of deep emotional response, inability to profit from experience, disregard of social mores.
Mf (Masculinity-Femininity): Tendency toward masculine or feminine interests.
Pa (Paranoia): Suspiciousness, over-sensitivity, delusions of persecution.
Pt (Psychasthenia): Phobias or compulsive behavior.
Sc (Schizophrenia): Bizarre and unusual thoughts or behavior.
Ma (Hypomania): Marked overproductivity in thought, action.
Si (Social Introversion): High score indicates social introversion."
Table II
Relationships between High MMPI Scores and Characteristics of Imagery

<table>
<thead>
<tr>
<th>High MMPI SCORES:</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Realism</td>
<td>Motion</td>
<td>Cutaneous</td>
<td>Social</td>
<td>Visual</td>
<td>Time</td>
<td>Color</td>
</tr>
<tr>
<td>Hs</td>
<td>6.552</td>
<td></td>
<td></td>
<td>7.209</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>4.510</td>
<td></td>
<td></td>
<td>6.307</td>
<td>5.426</td>
<td>5.363</td>
<td></td>
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<tr>
<td>Hy</td>
<td>10.69%</td>
<td>11.113</td>
<td></td>
<td>4.48%</td>
<td>7.04%</td>
<td>7.27%</td>
<td></td>
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<tr>
<td>Pd</td>
<td>3.153</td>
<td>11.13</td>
<td></td>
<td>3.624</td>
<td></td>
<td>5.250*</td>
<td></td>
</tr>
<tr>
<td>Mf</td>
<td>4.210</td>
<td></td>
<td></td>
<td>17.08%</td>
<td></td>
<td>7.68%</td>
<td></td>
</tr>
<tr>
<td>Pa</td>
<td>8.570</td>
<td></td>
<td></td>
<td>6.241</td>
<td>3.295**</td>
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<td></td>
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<tr>
<td>Pt</td>
<td>8.156</td>
<td></td>
<td></td>
<td>9.78%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sc</td>
<td>7.934</td>
<td></td>
<td></td>
<td>7.629</td>
<td>5.967</td>
<td>5.702</td>
<td></td>
</tr>
<tr>
<td>Si</td>
<td>1.92%</td>
<td>10.84%</td>
<td></td>
<td>5.09%</td>
<td></td>
<td>6.04%</td>
<td></td>
</tr>
<tr>
<td>Ma</td>
<td>10.051**</td>
<td></td>
<td></td>
<td>above 1%</td>
<td>7.849</td>
<td>2.00%</td>
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</tr>
</tbody>
</table>

Note.—Chi-square values are listed in each cell entry, followed by the level of significance for this value. These are chi-square values for sixfold tables with two degrees of freedom, except in the case of motion imagery where ninefold tables with four degrees of freedom were used.

* High color imagery was related to medium scores on Pd.

** Reversals of imagery trends occurred with three relationships. Pa was related to high visual imagery, Ma was related to low social imagery, and Si was related to high cutaneous imagery.
Significance), Pa (9.54%), and Sc (10.84%). Subjects with low cutaneous imagery tended to have high scores on Hy (4.48%), Pa (4.59%), and Sc (5.09%). Those subjects who were rated as having imagery of low realism were found to have high scores on Hs (4.88%), Hy (10.69%), Pd (14.70%), Mf (12.85%), and Sc (1.92%).

Subjects rated as having low visual imagery appeared to have high scores on Sc (6.04%) and Si (2.00%). Those subjects who were rated as having high social imagery tended to have high scores on D (3.01%) and Hy (7.04%), while those rated as having low social imagery tended to have high scores on Ma (9.19%). Color imagery was found to be related to only one score on the MMPI. High color imagery tended to be found in those subjects who fell into the medium group on Pd (7.68%). Subjects reporting low time imagery tended to secure low scores on Hy (7.27%) and Ma (4.40%).

2. Relationships between General Adjustment Level of Subjects and Characteristics of Imagery

The ratings of subjects according to general adjustment yielded only a trend toward a relationship between high adjustment and low motion imagery (16.31%). It might be noted,

3. Although it is realized that levels of significance that do not attain the 5 or 10% level are of questionable value, relationships to the 15% level of significance are included in this discussion as possibly showing trends. Values between 15% and 20% are listed in Table II but are not included in the statement of results.
however, that twenty-four of the thirty-seven subjects were placed in the medium adjustment group, with seven rated as well adjusted and six as poorly adjusted. This uneven distribution may have tended to make it difficult to reveal a possible relationship.

3. Relationships between Scores on the College Aptitude Test and Characteristics of the Subject's Images

Very few relationships were found between characteristics of imagery and scores received on the College Aptitude Test. These are shown in Table III. Subjects who were rated as having low social imagery tended to receive high and medium total scores on the College Aptitude Test (4.62%). Subjects with medium cutaneous imagery secured high scores on the Quantitative subtest (3.46%), while subjects rated as having a high and medium sense of time imagery tended to obtain low scores on the Verbal subtest (4.48%).
Table III

Relationships between College Aptitude Test Scores and Characteristics of Imagery

<table>
<thead>
<tr>
<th>Characteristics of Imagery:</th>
<th>Low Social</th>
<th>Medium Cutaneous</th>
<th>High &amp; Medium Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>High &amp; Medium Total Scores</td>
<td>6.228</td>
<td>4.62%</td>
<td></td>
</tr>
<tr>
<td>Low Verbal Subtest Scores</td>
<td></td>
<td>6.307</td>
<td>4.48%</td>
</tr>
<tr>
<td>High Quantitative Subtest Scores</td>
<td>6.931</td>
<td>3.46%</td>
<td></td>
</tr>
</tbody>
</table>

Note.—Chi-square values are listed in each cell entry, followed by the level of significance for this value. These are chi-square values for sixfold tables with two degrees of freedom.
DISCUSSION AND CONCLUSIONS

1. Relationships of Imagery to Scores on the "Neurotic Triad" Group of MMPI Scales

Subjects scoring high in what is usually considered the "neurotic triad" of MMPI scales tended to have low realism and high social references in their imagery. The "neurotic triad" of MMPI subtests is fairly generally agreed upon by various authorities. Hathaway and McKinley in the manual for the MMPI (8) discuss the triad as including individuals with high neurotic tendencies. They include Hs, D, and Hy in the triad and say that high scores in Pt are also an indicator of neuroticism.

Cottle (4) has obtained a factor with high loadings on Hs, D, and Hy; that is, in the subtests generally assumed to constitute the neurotic triad. He interprets this factor as concern with health and personal matters. In another factor analysis of MMPI scores, Wheeler, Little, and Lehner (21) obtained a factor with high loadings on the same three subtests. This factor was interpreted as ego defense. On this basis, grouping the subjects in terms of their scores on the "neurotic triad" subtests seems to be justified.

Subjects with low realism in their imagery showed a tendency to obtain high scores on Hs (4.08%) and Hy (10.69%), and subjects with high social imagery tended to have high
scores on D (3.01%) and Hy (7.04%). A possible explanation for subjects with low realism in their imagery tending to obtain high scores on subtests from the "neurotic triad" is that they are concerned with health and personal matters; their interest is focused on inner problems. These subjects may be concerned with the outer world but since they can not cope adequately with it, may tend to withdraw defensively. In directing their attention to inner problems, the outer world may appear less real than it does to subjects whose attention is more outwardly directed.

Another possible explanation is that subjects whose inner symbolic representations of the outer world are less realistic than those of others may be handicapped through limited representation or imagery. This limitation may create anxiety or concern over inability to cope with the outside world as successfully as others appear to, and may cause worry and anxiety over personal inadequacies.

High social imagery was found to be related beyond the 10% level of significance to high scores on Hy and on D.

4. The Rorschach test is scored for H or human responses. These responses imply interest in and sensitivity to others (15) but do not necessarily imply involvement with others. H responses on the Rorschach are found more frequently in the records of well adjusted than of poorly adjusted subjects. This is not in line with the results obtained in the present study, and probably indicates that the H response may not be equivalent to social responses in an imagery situation.
This relationship may be explained in terms of the high level of concern over personal relationships which is often found in the neurotic. Karen Machover (12) has pointed out that people with problems tend to draw more human figures than do well adjusted people thus indicating their concern with personal relationships. High social imagery in subjects with high scores on subtests from the "neurotic triad" may be the result of a concern over the lack of ability to relate adequately to other people. This would tend to focus the subject's attention upon social situations.

2. Relationships between Imagery and Scores on the "Psychotic" Group of MMPI Subtests

The MMPI subtests Pa, Sc, Pt, Ma, and D are generally considered to constitute the "psychotic" group for normal individuals as well as for seriously disturbed people. Hathaway and McKinley in the manual for the MMPI (8) maintain that in psychotic profiles, for normal as well as for abnormal persons, Sc and Pa are of primary importance, with D and Ma also expressing the pattern. In a factor analysis of the scores of 400 normal adult males, Gottle (4) obtained a factor which he interprets as indicating serious areas of emotional upset and maladjustment. This factor has high loadings on Sc and Pt and a somewhat lower loading on Ma. Wheeler, Lehner and Little (21) have obtained a similar factor with high loadings on Sc and Pt in a factor analysis of MMPI scores of 112 college students. This is interpreted as concern with one's self without the
operation of the usual ego defenses which are seen in the neurotic pattern. The "psychotic" group will be used as a general basis for comparison with characteristics of imagery reported by subjects in the present experiment.

High motion imagery and low cutaneous imagery tended to be present in those subjects who obtained high scores in the "psychotic" group of MMPI subtests. Subjects reporting high motion imagery obtained high scores in Pa (9.54%), Sc (10.84%), and Pt (9.78%). Subjects reporting low cutaneous imagery tended to obtain high scores in Pa (4.59%) and Sc (5.09%). Motion and cutaneous imagery will be discussed under separate sections below. Other diversified relationships between imagery and scores on the "psychotic" group subtests will be discussed under a miscellaneous section.

Motion imagery. The visualization of movement in the Rorschach test is generally considered to be one of the most significant of the various types of responses (11). Movement responses on the Rorschach are classified broadly as M or human movement, FM or animal movement, and m or inanimate movement. None of these types of motion appears to be directly comparable to the general active motion used as a basis for rating subject's imagery in the present experiment.

5. Subjects reporting high motion imagery tended to obtain high scores in Pd (2.76%), and subjects with low cutaneous imagery secured high Hy scores (4.48%).

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On the Rorschach any description of posture is scored as a movement response (11). Only active motion was rated as motion in the present experiment.

There seems to be general agreement that motion response to the Rorschach is the result of activity in the inner ideational life, whether a function of superior intelligence or disturbed mental processes.6

Thompson (18) found that college students who reported an unusual amount of M (human movement) and EM (animal movement) on Rorschach cards showed consistently higher scores on the MMPI than did subjects who reported little movement response.

Although motion responses on the Rorschach and in the present experiment do not appear strictly comparable, there was a trend in the present experiment for high motion imagery to be found with high scores on all MMPI subtests. Results were thus similar to those obtained by Thompson although several of the relationships were not significant.

6. M or motion responses to the Rorschach are assumed to be the capacity for fantasy life, productive creativity, and original ability. The kind of motion response appears to be as important as the amount of motion reported (11, 15). Klopfer (11) maintains that a large number of movement responses in a normal pattern are associated with superior intelligence and normality, but adds that a large number of movement responses are found in the over-ideational schizophrenic and in the encapsulated paranoid schizophrenic. Phillips and Smith (15) say that people of superior intelligence tend to report more movement responses than people of lower intelligence, but also state that an unusual amount of movement response is characteristic of the obsessive-compulsive, as well as the paranoid and paranoid schizophrenic.
Whether individuals with problems tend to report motion in their inner ideational life as a result of these problems, or whether a lack of stability in ideational life tends to create problems which are reflected in high scores on the MMPI remains an interesting point for investigation.

**Cutaneous imagery.** Subjects reporting low cutaneous imagery tended to obtain high scores in Pa (4.59%) and Se (5.09%). Subjects who were rated as having low cutaneous imagery had no references in their descriptions of imagery to the quality of touch or temperature, and stated that they were not aware of any such impressions.

The Rorschach test scores for texture responses (15), but these do not appear to be comparable to reports of cutaneous imagery. Texture responses on the Rorschach are determined primarily by shading and form, while in the present experiment an important part of cutaneous imagery is the report of a feeling of warmth or coolness, or of an object actually touching the body.

Low cutaneous imagery in individuals scoring high in the "psychotic" group is not readily explainable. One possible explanation may be that a loss of contact with the outside world causes the subject to have imagery that is not particularly related to his body. This explanation, however, appears to be more readily applicable to the schizophrenic

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7. Subjects reporting low cutaneous imagery also received high scores in Hy (4.48%). However, subjects rated as having high cutaneous imagery received high scores in Si (above 1%).
than to the paranoid characteristics. The paranoid individual would be expected to be very much concerned with the effects of his environment upon him.

A second possible explanation is that a tendency to be withdrawn and suspicious may result from a lack of adequate imagery.

**Miscellaneous relationships.** Subjects reporting low visual imagery and imagery of low realism tended to obtain high scores on Sc (6.04%, and 1.92%). This tendency may provide some support for the second explanation offered above. Subjects scoring high in the schizophrenic scale would appear to have generally poorer imagery than the other subjects in this experiment.

Subjects rated as having high social imagery tended to have high scores on D (3.01%) while subjects rated as having low social imagery tended to have high scores on Ma (9.19%). This relationship is somewhat complex since it includes the high scores on D, and interpretation of a high score on D depends to some extent upon whether it is found in conjunction with neurotic or psychotic tendencies. It is considered quite important in both cases (5). An attempt was made above (p. 27-28) to explain high social imagery in the depressed individual as a part of the neurotic triad. No separate discussion will be entered into here since high depressed scores were not divided into these two subgroups. The number of cases employed was too small to make such an analysis desirable. The depressed individual is probably more concerned with other people than is the hypomanic individual.
3. Relationships between Imagery and Scores on the "Behavior Problem" Group of MMPI Subtests

According to Hathaway and McKinley in the manual of the MMPI (8) behavior problem profiles are those clearly dominated by the scales Pd, Mf, and Ma. Cottle (5) refers to this group as the "conduct disorders" and says that it is composed of the Pd scale in combination either with Mf, Ma, and Pa, or with the neurotic triad.

Since Pd is generally considered to be the dominant scale in the "behavior problem" group of MMPI subtests, it will be discussed in this section. Ma and Pa scores and their relationship to imagery has already been discussed in other sections and will be omitted here. Mf showed only one relationship to imagery; subjects who obtained high scores in Mf tended to be rated as having imagery of low realism (12.85%). This tendency might result from an interest on the part of these subjects in intellectual pursuits.

Subjects scoring high on Pd tended to have high motion imagery (2.76%) and low realism in their imagery (14.70%). These tendencies may reflect a lack of concern for others except in instances when the activity of other people directly affects them.
SUMMARY

This experiment represents an attempt to determine whether any relationships exist between characteristics of imagery and personality, and between imagery and academic aptitude.

Thirty-seven elementary psychology students were used as subjects. Scores on the MMPI were used to determine personality ratings, and level of adjustment was secured from independent ratings of MMPI profiles made by three psychologists. Scores from the College Aptitude Test were used to determine academic aptitude. Imagery characteristics were rated from the results of individual tape recorded interviews with subjects. Seven characteristics of imagery were used for comparison. These were motion imagery, visual imagery, cutaneous imagery, time imagery, color imagery, realism of imagery, and number of social situations contained in imagery.

Relationships beyond the 10% level of significance were found to exist between high motion imagery and high scores on Pd, Pa, and Pt, and between low cutaneous imagery and high scores on Hy, Pa, and Sc. Other relationships at this level of significance were found between low realism in imagery and high scores on Hs and Sc, and between low visual imagery and high scores.
on Si and Sc. Relationships beyond the 10% level of significance were also found between low time imagery and high scores on Hy and Ma, and between high social imagery and high scores on Hy and D.

Low social imagery appeared to be related to high scores on Ma and high cutaneous imagery showed a relationship to high Si scores. Color imagery appeared to be related only to medium scores on Pd.

No significant relationships were found between characteristics of imagery and general adjustment ratings. Three significant relationships were found between College Aptitude Test scores and characteristics of imagery. These were between low social imagery and high and medium total scores, between medium cutaneous imagery and high quantitative scores, and between high and medium time imagery and low verbal scores.

Attempts were made to explain these relationships in terms of Rorschach scoring methods and in terms of expectations based upon the characteristics of various types of maladjustment. This was done by dividing MMPI scores into three groups; the "neurotic triad," the "psychotic" group, and the "behavior problem" group.
REFERENCES


APPENDIX A

FORM OF GENERAL QUESTIONS

ASKED SUBJECTS ABOUT THE NATURE OF THEIR IMAGERY

1. Motion: Were you aware of movement or the presence of motion in any of your impressions?

2. Color: Were you aware of color in your impressions? Did you notice any color?

3. Visual: Would you say that your impressions seemed to be mostly visual impressions?

4. Auditory: Were you aware of the presence of sound or lack of sound in any of your impressions?

5. Cutaneous: Were you aware of an impression of touch or texture or the quality of feeling in any of your impressions?

6. Time: Were you aware of the passage of time in any of your impressions? Did you notice an impression of time passing?

7. Realism: Some people say that their impressions seem just as real as if they were right there while others say that their impressions seem more like turning the pages of a book and looking at a picture. What would you say about your impressions?

8. General: Would you give a somewhat general description of what your impressions seemed to be like to you?