LUCE, Nancy Carol, 1940-
REPORTED IMAGERY AND ITS RELATIONSHIP TO PERTINENT PERSONALITY FACTORS.
The University of Arizona, Ph.D., 1971
Psychology, clinical

University Microfilms, A XEROX Company, Ann Arbor, Michigan

© COPYRIGHTED
BY
NANCY CAROL LUCE
1971

THIS DISSERTATION HAS BEEN MICROFILMED EXACTLY AS RECEIVED
REPORTED IMAGERY AND ITS RELATIONSHIP TO PERTINENT PERSONALITY FACTORS

by

Nancy Carol Luce

A Dissertation Submitted to the Faculty of the DEPARTMENT OF PSYCHOLOGY In Partial Fulfillment of the Requirements For the Degree of DOCTOR OF PHILOSOPHY In the Graduate College THE UNIVERSITY OF ARIZONA 1971
THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

I hereby recommend that this dissertation prepared under my
direction by Nancy Carol Luce
entitled REPORTED IMAGERY AND ITS RELATIONSHIP
TO PERTINENT PERSONALITY FACTORS
be accepted as fulfilling the dissertation requirement of the
degree of Doctor of Philosophy

[Signature]
Disertation Director Date

After inspection of the final copy of the dissertation, the
following members of the Final Examination Committee concur in
its approval and recommend its acceptance:*

[Signatures]

*This approval and acceptance is contingent on the candidate's adequate performance and defense of this dissertation at the final oral examination. The inclusion of this sheet bound into the library copy of the dissertation is evidence of satisfactory performance at the final examination.
STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgment of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the copyright holder.

SIGNED: Nancy Carol Luce
TABLE OF CONTENTS

LIST OF TABLES ........................................... vii
ABSTRACT .................................................... viii
INTRODUCTION ............................................... 1

Evoked and Spontaneous Imagery:
  Galton's Study ........................................ 2
  The Betts Questionnaire .............................. 3
  Evoked Imagery in the Betts Questionnaire ........ 4

STATEMENT OF THE PROBLEM AND GENERAL DESCRIPTION
OF THE STUDY ............................................. 8

  Openness to Experience ................................ 9
  The Experience of Control ........................... 14
  Imagery and the Experience of Control ............. 16
  Early Memories ......................................... 17
  The Cube Problem ...................................... 17
  General Expectations of the Present Study ........ 18

METHODOLOGY ............................................... 20

  Subjects ............................................... 20
  Measuring Instruments ................................ 20
    The Experience Inventory .......................... 21
    The Personal Opinion Survey ....................... 23
    The Early Memories Scale ......................... 26
    The Cube Problem .................................... 27
    The Shortened Form of the Betts Questionnaire upon Mental Imagery .... 28
  Procedure ................................................ 29

RESULTS .................................................... 30

  Evoked Imagery and Openness to Experience ........ 31
  Evoked Imagery and the Experience of Control ..... 33
  Early Memories Scale .................................. 35
  Early Memory and Evoked Imagery ................... 35

iv
TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Memory and Openness to Experience</td>
<td>35</td>
</tr>
<tr>
<td>Early Memory and Experience of Control</td>
<td>39</td>
</tr>
<tr>
<td>The Cube Problem</td>
<td>39</td>
</tr>
<tr>
<td>Sex Differences</td>
<td>42</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>48</td>
</tr>
<tr>
<td>Betts Imagery Scores and Experience Inventory</td>
<td></td>
</tr>
<tr>
<td>Factors: the General Picture of Relationships</td>
<td>48</td>
</tr>
<tr>
<td>Evoked Imagery and Openness to Theoretical and Hypothetical Ideas</td>
<td>49</td>
</tr>
<tr>
<td>Imagery and Thinking</td>
<td>49</td>
</tr>
<tr>
<td>Vivid and Persistent Imagery and Mental Flexibility</td>
<td>50</td>
</tr>
<tr>
<td>Evoked Imagery and the Experience of Control</td>
<td>52</td>
</tr>
<tr>
<td>Evoked Imagery and Effort</td>
<td>52</td>
</tr>
<tr>
<td>Incidental Imagery</td>
<td>53</td>
</tr>
<tr>
<td>Evoked Imagery and Control in Immediate Social Interaction</td>
<td>54</td>
</tr>
<tr>
<td>Lack of Relationship between Imagery Scores and Control over Internal Processes</td>
<td>56</td>
</tr>
<tr>
<td>Evoked Imagery and Beliefs about What Will Happen to Man :&quot;</td>
<td>57</td>
</tr>
<tr>
<td>Evoked Imagery and the Cube Problem</td>
<td>58</td>
</tr>
<tr>
<td>Evoked Imagery and Early Memories</td>
<td>59</td>
</tr>
<tr>
<td>Age of Earliest Memory</td>
<td>60</td>
</tr>
<tr>
<td>Number of Revived Impressions</td>
<td>60</td>
</tr>
<tr>
<td>Number of Specific Memories</td>
<td>60</td>
</tr>
<tr>
<td>Sex Differences</td>
<td>62</td>
</tr>
<tr>
<td>SUMMARY AND CONCLUSIONS</td>
<td>64</td>
</tr>
<tr>
<td>APPENDIX A: MEASURING INSTRUMENTS</td>
<td>67</td>
</tr>
<tr>
<td>The Betts QMI Vividness Imagery Scale</td>
<td>68</td>
</tr>
<tr>
<td>Experience Inventory</td>
<td>76</td>
</tr>
<tr>
<td>Early Memories</td>
<td>90</td>
</tr>
<tr>
<td>Cube Problem</td>
<td>92</td>
</tr>
<tr>
<td>Personal Opinion Survey</td>
<td>94</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPENDIX B: EXPERIENCE INVENTORY FACTORS</td>
<td>103</td>
</tr>
<tr>
<td>Experience Inventory</td>
<td>104</td>
</tr>
<tr>
<td>APPENDIX C: PERSONAL OPINION SURVEY FACTORS</td>
<td>113</td>
</tr>
<tr>
<td>Personal Opinion Survey</td>
<td>114</td>
</tr>
<tr>
<td>APPENDIX D: CORRECT SOLUTION OF THE CUBE PROBLEM</td>
<td>123</td>
</tr>
<tr>
<td>Cube Problem</td>
<td>124</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>125</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Correlations between Betts Imagery Scores and Experience Inventory Factor Scores</td>
<td>32</td>
</tr>
<tr>
<td>2.</td>
<td>Correlations between Betts Imagery Scores and Personal Opinion Survey Factor Scores</td>
<td>34</td>
</tr>
<tr>
<td>3.</td>
<td>Correlations of Early Memories Scores with Betts Imagery Scores</td>
<td>36</td>
</tr>
<tr>
<td>4.</td>
<td>Correlations of Early Memory Scores with Experience Inventory Factor Scores</td>
<td>37</td>
</tr>
<tr>
<td>5.</td>
<td>Correlations of Early Memories Scores with Personal Opinion Survey Factor Scores</td>
<td>38</td>
</tr>
<tr>
<td>6.</td>
<td>Intercorrelation of Cube Problem Scores</td>
<td>40</td>
</tr>
<tr>
<td>7.</td>
<td>Correlations of Cube Problem Scores with Imagery Scores</td>
<td>41</td>
</tr>
<tr>
<td>8.</td>
<td>Correlations of Cube Problem Scores with Experience Inventory Factor Scores</td>
<td>43</td>
</tr>
<tr>
<td>9.</td>
<td>Correlations of Cube Problem Scores with Personal Opinion Survey Factor Scores</td>
<td>44</td>
</tr>
<tr>
<td>10.</td>
<td>T Scores for Differences between Means for Males and Females for All Variables</td>
<td>45</td>
</tr>
</tbody>
</table>
ABSTRACT

The present study investigated the relationship between evoked imagery as measured by the Short Form of the Betts Questionnaire upon Mental Imagery, a number of personality variables measured by three personality questionnaires, and the use of imagery in thinking measured by a mathematical abstract reasoning problem.

A description of some of the processes involved in evoked imagery was made possible by the interrelationships observed. In general, variables dealing with abstract processes and issues or with private, internal experience did not correlate positively with evoked imagery scores; while variables dealing with personal action, interpersonal relationships and concrete issues were positively related to evoked imagery scores.
INTRODUCTION

In very early studies of imagery (Galton, 1883; Pear, 1927; Binet, 1966), imagery was treated as a single "faculty" or "element" which could be isolated and commented upon by the person experiencing it. In other words, it could be "introspected." For imagery, more than for any other "faculty," attempts were made to obtain introspective reports in response to questionnaires.

The choice of this particular "faculty" as a suitable questionnaire subject is not without foundation. Certain essential dimensions of imagery, namely, vividness, frequency, and modality, lend themselves to the questionnaire format. They can be counted, scaled, etc. Ideally, these dimensions serve to help focus the subject's attention upon aspects of pictures, sounds, or whatever experiences he considers his imagery, and help him discriminate and isolate them. Two of the dimensions actually seem to characterize different "types" of imagery. For example, eidetic imagery is distinguished from other types of imagery partially by its vividness and the rarity of its occurrence in adult experience.
Beyond these considerations, the meaningfulness of such dimensions lies in their interpretation in relation to the general context of the subject's experience.

Two classic imagery questionnaires have dominated this method of imagery assessment for many decades. These are Galton's famous "breakfast" questionnaire and its elaborations (1883), and the Betts Questionnaire upon Mental Imagery (1909). These questionnaires emphasized the traditional imagery dimensions, but they yielded some important information within the limitations of these dimensions.

**Evoked and Spontaneous Imagery: Galton's Study**

Galton's (1883) questionnaire study of the distribution of various kinds of imagery experience provided a description of such experience ranging from eidetic imagery to more common types of voluntarily evoked imagery. Generally, Galton's subjects reported two kinds of imagery experience, "visions" and voluntary imagery or visualization. Galton claimed that "all that precedes and follows (visions) lies outside of (consciousness) and can only be inferred." Thus, it is not without reason that visualizations rather than visions have constituted the more popular, although perhaps the less interesting,
subject of much subsequent imagery research. One can ask people to remember, imagine, or picture a thing; and people can respond in some way. But the atmosphere conducive to visions is obscure. It has just recently begun to be manipulated and studied by researchers in the areas of electroencephalography, drugs, sleep, and hypnosis.

The Betts Questionnaire

In 1909, or shortly before, George H. Betts developed a questionnaire which he felt would correct some of the failings of earlier questionnaires, such as Galton's (1883), and would avoid the ostensible pitfall of experimenter pressure, if not actual bias, inherent in interview and introspective methods used alone.

Betts felt that Galton's questionnaire did not adequately assess types of imagery which were not visual and that it permitted answers which were too general and too loose. The Betts questionnaire required subjects to give categorical answers and allowed the selection of definite alternatives.

Limited as they are, the imagery dimensions, modality and vividness could easily be adapted to the requirements of categorical response and presentation of alternatives. Betts's questionnaire required subjects to
rate imagery in a number of modalities for vividness. A scale of seven was used, since it admitted more alternatives.

The principle of requiring categorical responses using imagery dimensions which could be adapted to this, and an additional requirement that the subjects used should "have a reasonable amount of training in introspection" contributed to the accuracy which Betts was seeking. However, he sacrificed variety in his subject sample and spontaneity in his subjects' responses. Galton obtained a great deal more varied, although less detailed, information from his subjects, who were not required to confine their answers to a single dimension and who were not, except for schoolboys, tested in a formal classroom situation. It is interesting that Betts himself could not ignore the feasibility of interviewing subjects to obtain additional information that he could not obtain with his questionnaire alone.

**Evoked Imagery in the Betts Questionnaire**

With his questionnaire, Betts obtained information regarding a certain kind of imagery. He measured imagery which could be reported in a classroom situation in response to a brief, written, verbal description and evaluated for vividness in terms of a seven-point scale.
It is difficult to say just what kind of imagery or imagery process this is. It is certainly not an experience similar to the visions of Galton's subjects; nor is it like spontaneous imagery of dreams, hallucinations, hypnogogic or drug states, or eidetic imagery.

Evoked imagery, as Betts measured it, has little to do with the use of imagery in thinking. This was demonstrated by studies by Betts in which subjects were requested to report on imagery used in the course of various activities requiring thinking and imagining. People who reported a good amount of vivid, evoked imagery in response to the questionnaire did not necessarily report using imagery in the various problem-solving and thinking activities of later studies. Galton (1883) found the same phenomenon. So did Pear (1927), and Binet (1966). Certain kinds of thinking simply seem to be carried on more efficiently without imagery or with imagery which has little to do with that reported on the Betts.

Other kinds of activity do involve voluntary imagery. Jung (1958) described a kind of imagery activity, "active fantasy," which he described as dependent on intuition and direct attention to unconscious content. He distinguished this from "passive
fantasy," which is a kind of spontaneous process appearing (much as visions) "without any antecedent and . . . dependent on a passive attitude of the subject."

Coleridge (1939) described imagination as a process which "builds a new edifice" and is distinct from "fancy," which merely "assembles and accumulates." Furlong (1961) spoke of activity occurring "with imagination" which could be distinguished from activity occurring "in imagination."

Any possible similarity between these types of active processes and processes involved in answering the Betts questions is worth investigation.

Among other processes, the Betts questionnaire seems to stimulate memory images, and it is possible that some of the reported differences in vividness on the Betts actually reflect differences in clarity and other dimensions of memory. However, a study by Sheehan (1969) implies that whatever memory processes are involved in answering the Betts questionnaire are not related to direct recall of specific material even if imagery accompanies recall of the material. Sheehan found that vividness of imagery, reported on a shortened form of the Betts questionnaire, was unrelated to accuracy of recall of block designs, although the better recalled designs were accompanied by more vivid imagery.
Betts wanted his subjects to produce an immediate image, albeit a memory image, and to observe it carefully enough to evaluate its vividness and clarity. This meant, considering the possibility that the subjects were making an effort to do what Betts wanted them to, that the images produced had to be maintained. This was essentially an exercise in concentration and attention, as well as memory. But the various factors involved have not really been delineated.
STATEMENT OF THE PROBLEM AND GENERAL
DESCRIPTION OF THE STUDY

The primary value of the Betts questionnaire lies in its capacity to differentiate between people who are able to evoke vivid images and people who are not. It is thus potentially a good selective instrument for studies where imagery is to be used in some way or where imagery is otherwise an important component of some other aspect of the experiment or study.

So far, various studies indicate that high and low imagery as measured by the Betts is not clearly related to anything (Sheehan, 1969; Betts, 1909). This could mean that high and low imagery is a meaningless dimension, or it could mean that the Betts questionnaire involves imagery processes that are simply unlike the other imagery processes which people usually want to measure, e.g., those used in thinking and recall.

It is important, if we are to continue to use such measures as the Betts to assess imagery and select subjects, that we clarify as much as possible the types of imagery or imagery-related processes it involves.

We have attempted to do this by relating scores obtained on Sheehan's shortened version of Betts
questionnaire (1909) to scores obtained on several paper and pencil personality tests—all administered under the same conditions and all requiring similar processes, i.e., thinking and remembering, and evaluating feelings, thoughts, and images as they occur at the time of answering the questions. We thought that some of the processes involved in all measures used would be clarified by their relationship or lack of relationship with each other.

**Openness to Experience**

One of the personality measures used in the present study, the Experience Inventory, developed by Coan (n.d.) contains factors bearing on a dimension which Coan has called "openness to experience."

Coan has pointed out that the concept of openness to experience has its definition and its strongest supporters among humanistic, phenomenological, and existentialist psychologists. Such people express the belief that "an individual's potentiality for various kinds of experience and expression and his encounters with ever-new situations" contribute to his personal growth, while a tendency to cling to rudimentary forms of experience or escape from individual expression through adjusive conformity causes a failure of growth.
Potentiality for (openness to) various experiences and individual expression are involved in creativity, spontaneity, and independence—all of which are crucial facets of maturity. It is within this framework of development of optimal personality that the concept of openness to experience has the most meaning.

The earliest attempt to measure openness to experience as a dimension was a questionnaire devised by Fitzgerald (1966) called the Experience Inquiry. Coan (n.d., p.4) claims that "Fitzgerald set out to assess empirically Schactel's concept of world-openness, which he regarded as a modification of Kris's [1952] concept of regression in the service of the ego." Essentially, regression in the service of the ego refers to a process of voluntarily relaxing certain mental controls in order to gain access to the rich material of less controlled mental activities. People are presently more personally acquainted with this process than may have been the case several decades ago. Hallucinogenic drugs might be expected to facilitate the process and to speed it up and intensify it considerably. Sensitivity training seems to encourage creative regression. Kris's (1952) concept was used to account for creativity, which seemed to be left out of the Freudian paradigm.
Fitzgerald's questionnaire contained many items designed to tap the capacity for regressive experience and tolerance for the irrational. Items of the Inquiry borrowed from Ås, O'Hara, and Munger (1962) tapped five major things: tolerance for regressive experiences, tolerance for logical inconsistencies, constructive use of regression, altered states, and peak experience.

Coan feels that Fitzgerald's questionnaire was "limited by its heavy (and, of course, deliberate) emphasis on phenomena of a regressive nature [n.d., p. 5]." With his own questionnaire, Coan sought to measure capacity for nonregressive as well as regressive experience. With this approach, he developed the concept of openness to experience to include a wide variety of experiences, including experiences with the external environment and cognitive activity as well as noncognitive inner states. Specifically, items of Coan's questionnaire were designed to measure access to experiences suggested by the Jungian attitude-function system, i.e., experiences related to introversion, extroversion, feeling, thinking, sensing, and intuiting. (Jung [1958] expressed the view that a fully developed person is familiar with and has access to all of these attitudes and functions.) Also, Coan's questionnaire taps an assortment of associations,
memories, ideas, impulses, feeling states, and fantasy and dream phenomena.

Openness to a variety of experiences theoretically means many things. Coan has rather thoroughly described some of the difficulties involved in operationalizing such a concept. His comments on the subject are worth quoting at length (n.d., pp. 7-8).

It is conceivable that much of the variance in the general population is governed by a general factor of openness to experience. On the other hand, there can be little doubt that some people are selectively open. They may welcome one type of experience while avoiding or suppressing another. The first type may even serve as a defense against the second type. Thus, one may welcome experiences of a masculine nature while avoiding those of a feminine nature. One may deal in a detached, analytical, or rational way with a wide range of events and phenomena while denying that questions of worth or value are applicable or meaningful. One may seek an endless series of sensual experiences while avoiding any consideration of their personal meaning or broader implications. One may stay in noisy crowded places to avoid experiences that arise in a solitary setting, or one may indulge in fantasy rather than face the threat of real social interaction.

The problem is actually a bit more complicated than it might seem at first glance, since there are various levels on which any given stimulus or situation might be experienced . . . . There seem to be vast individual differences in sensitivity. One individual may seek large amounts of stimulation of any kind that occurs to him and appear unable to obtain enough. On closer examination, we may find that much of the stimulation has little effect on him. He is relatively unreactive to stimuli that others find quite disturbing, basically perhaps because of the
way his nervous system is constructed. Another individual, who is constitutionally more prone to autonomic upsets, may have to ration his stimulation to avoid an excess. We might be tempted to regard the former individual as more open to experience were it not for the fact the more sensitive person readily experiences very intense sensations that his insensitive counterpart may never encounter.

A further complication that any large-scale investigation must take into account is that a given situation may have basically different meanings for different people and thus provide an occasion for different kinds of experience.

In view of all the above considerations, we cannot realistically regard the thorough assessment of openness as an easy task.

In spite of the difficulties involved, Coan regards openness to experience as relevant to the concept of optimal development of personality, or the optimal personality, and worthy of investigation. The Experience Inventory, with its items related to internal and external, private and public, personal and social, mundane and fantastic, waking and dream experiences, is the result of this opinion.

Imagery fits in because it is undoubtedly a part of many of the experiences tapped by the Experience Inventory. The similarity or dissimilarity of these experiences to those of the Betts is not clear.
The Experience of Control

The second personality questionnaire, the Personal Opinion Survey, deals with the experience of control. The Personal Opinion Survey was developed by Coan (n.d.). The concept of experience of control has met with more positive interest than has openness to experience. Coan mentions as a lineage for the concept concepts of will treated by Hume, Kant, Schopenhauer, and Nietzsche, and Adler's treatment of striving for mastery. However, Coan cautions that "an interest in the experience (of active control) presupposes no particular position with respect to related philosophical issues (e.g., the existence of free will) [n.d., p. 3]."

A number of scales have been developed by psychologists to treat expectancy of control as a dimension. One of the better known scales is the I-E scale of Julian Rotter (1966). Rotter conceived of a generalized expectancy for internal or external control, which he called locus of control. He defined locus of control in terms of the person's expectancy regarding the effects of his own behavior. A person is said to display internal control if he perceives events as being a consequence of his own actions and under his own personal control. He is
said to manifest external control if he regards events as being unrelated to his own efforts.

Rotter's concept of locus of control places particular emphasis on social reinforcement as an important determinant of expectancy. Coan (n.d.) has attempted to move away from this emphasis and focus on the experience of control. He has gathered data which justify this shift in emphasis: among the results of a battery of personality tests administered to first and second grade children was the finding that internal scores on two tests converging in a factor called Wary Realism reflected "a need to maintain some kind of control, more than an expectancy that control will be maintained."

Coan's Personal Opinion Survey is an attempt to measure a wide range of phenomena having to do with the experience of control that has not been measured by other instruments. The areas of control which he expects to cover with the Personal Opinion Survey include external events, personal characteristics, and the body. External events include the actions of people with whom one interacts, the immediate physical world (including mechanical objects, other human products, natural objects, and surroundings, the weather, etc.), intellectual problems, and broad-scale human events. Personal characteristics
include relatively persistent features (habits, traits, status, goals, life style, etc.) and more immediate, transitory events (emotional states, moods, thoughts, actions, etc.). Aspects of the body relevant to experienced control include processes subject to physiological fluctuation (heart rate, respiration, gastrointestinal processes, sensory functions, the operation of the skeletal musculature, etc.). They also include features subject to long-term growth and development (strength, coordination, weight, physical skills, attractiveness, physique, etc.).

**Imagery and the Experience of Control**

The experience of control is a very important aspect of imagery experience. It is one of the essential factors distinguishing voluntary imagery from spontaneous imagery. The actual control of imagery has been found to be related to mental flexibility of various kinds: ability to shift alternatives when solving problems (Bartlett, 1921), ability to experience perceptual shift (Gordon, 1951), lack of stereotypy in making statements about other persons (Gordon, 1949).

The Betts questionnaire itself (if it is answered seriously by the subjects) requires a certain amount of control of imagery. The subject must produce imagery
and maintain it long enough to evaluate its vividness. Vividness reported on the Betts might even be partially a reflection of the control (or its lack) which people experience with respect to their imagery.

It seemed of interest to discover what areas of the experience of control were related to imagery as measured by the Betts questionnaire.

**Early Memories**

An Early Memories scale developed by Coan (n.d.) measures immediate recall of early impressions, sensations, events, and images. This test was considered an appropriate measure for comparison with the Betts. It actually contains many items which are similar to Betts questionnaire items. We thought that relation of the Betts questionnaire with this scale, of all the personality scales used, would reveal and clarify some of the memory factors, if any, involved in reported vividness of voluntary imagery.

**The Cube Problem**

One of the measures that Betts (1909) used to assess the spontaneous use of imagery in thought was the Cube Problem. Essentially, the Cube Problem is an exercise in abstract reasoning, mathematical computation,
and (if the subject does use imagery), visualization. Betts found that the use of imagery to solve this problem, as well as various other problems, had no particular relation to imagery reported in response to his questionnaire. People who reported a good amount of vivid imagery did not significantly tend to report using imagery in thinking. In addition, imagery reported occurring in the course of solving the problem seemed to be incidental to the correct solution of the problem.

Pear (1927) has commented that problems such as the Cube Problem do not really tap imagery since they involve processes already halfway to abstraction. However, we thought the processes actually involved in the solution of the Cube Problem and their relation to voluntary imagery could bear some clarification.

Furthermore, since we wanted to know all we could about the processes involved in voluntary imagery of the Betts questionnaire, we thought that even a lack of relationship between the two measures might give us some information.

**General Expectations of the Present Study**

With the above battery of tests, we hoped to relate imagery processes and personality factors.
While a number of specific predictions of relationship were possible, we thought it wiser to treat the present study as primarily exploratory and simply observe and attempt to make sense of whatever relationships were found among the various tests.
METHODOLOGY

Subjects

The subjects in this study were all undergraduate students at The University of Arizona, enrolled in psychology classes.

When Betts developed his questionnaire in the early 1900's, there was some reason to assume that students had at least heard of introspection even if they had not had some formal training in it. Furthermore, at that time, those processes which were popular subjects for introspection were probably better defined than they are now, and they were frequently discussed at length in classes. This is not the case with these particular "elements" and with the process of introspection in 1970; we could assume no familiarity with formal introspective training or with formal, circumscribed definitions of imagery on the part of our subjects.

Our sample consisted of 124 volunteers. There were 74 female and 50 male subjects.

Measuring Instruments

Five instruments were used for the present study. These were: the Experience Inventory, the Personal
Opinion Survey, and the Early Memories Scale—all developed by Coan (n.d.); and the Cube Problem and the Shortened Form of the Betts Questionnaire upon Mental Imagery, the latter developed by Sheehan (1967). Samples of all tests are included in Appendix A.

The Experience Inventory

The version of the Experience Inventory used in the present study is a 181-item questionnaire developed by Coan (n.d.). A factor analysis of Coan's original 114-item test administered to 383 subjects yielded 16 factors; however, only nine of these were considered clearly interpretable.

The test used in the present study consists of those items of Coan's original test which were most heavily loaded by the first seven factors of that test, with additional items designed to attract loadings by these same factors. The use of the Experience Inventory in the battery of tests used in the present study served two purposes: refinement of the Experience Inventory itself, and possible elucidation of its factors and those of the other measures by relationship with the other tests in the battery.

Some of the new items turned out to be unusable. However, we used the old items and a number of the new
ones, and the original seven factors accounted for the greatest variance in our sample. These factors were:

1. **Aesthetic Sensitivity.** This factor measures the reported capacity to be affected by art, music, dance, poetry, natural beauty, etc.

2. **Unusual Perceptions and Associations.** This factor measures an inclination to perceive things in various odd and novel ways and to entertain unusual associations to all objects of perceptions. People who score high on this factor report being able to see faces and forms in cloud formations and rocks, to hear voices in the sound of machinery, to perceive people as animals, to think of plants as having feelings, etc.

3. **Openness to Theoretical or Hypothetical Ideas.** This factor indicates freedom in the realm of abstraction and thought. It deals with a willingness to entertain novel and unusual ideas and a capacity to allow spontaneous insights to occur. Avid readers of fantasy and science fiction are likely to show these qualities.

4. **Constructive Utilization of Fantasy and Dreams.** This factor suggests access to unconscious processes that favors their use for creative or constructive purposes. It involves creation and problem-solving in dreams, reception of telepathic communications, and the experience of "inspiration."
5. **Openness to Unconventional Views of Reality.**
This factor is related to Openness to Theoretical or Hypothetical Ideas. It has to do with openness to specific kinds of unconventional ideas, e.g., of life on other planets, the possibility of extrasensory perception, etc.

6. **Indulgence in Fantasy.** The high scorer on this factor dreams in color, daydreams, experiences painful loneliness, tends to be absent-minded, and reports some experiences like those who report unusual perceptions and associations.

7. **Need for Deliberate and Systematic Thought.**
This factor is scored low for openness to experience. Its title describes it.

A copy of the Experience Inventory appears in Appendix A. Items used for factor scores for this test are contained in Appendix B.

The Personal Opinion Survey

The measure of control used in the present study was a 122-item version of the Personal Opinion Survey, a questionnaire developed by Coan (n.d.). Coan's original test was administered to 525 subjects and the results yielded 18 factors. The first seven of these were represented by the greatest number of items and proved the most
reliable. A general factor for control was not strongly justified in Coan's original testing, and attention to individual factors seems more meaningful than searching for generalized control.

The version of the Personal Opinion Survey used in the present study contained some new items which proved to be loaded by seven factors of the original test. These factors were:

1. **Achievement through Conscientious Effort.** This factor attempts to assess the view that one can accomplish many things if one tries hard enough. Areas of success defined by the questions are academic, social, and physical. High scorers on this factor express belief that one can overcome all obstacles in the path of academic success, that anyone who is willing to devote enough time can attain a position of leadership and authority, that people can stay healthy all the time by getting the right food, etc.

2. **Personal Confidence in Ability to Achieve Mastery.** The high scorer on this factor expresses confidence that he has the capacity for accomplishment in various realms--mathematical, mechanical, scientific, athletic, linguistic. The areas of success measured tend to be intellectual in character. The high scorer claims
to be good at chess and card games, solving puzzles, arithmetic and math, figuring out scientific theories and ideas, getting high grades, learning how to do new things, etc.

3. **Belief in Capacity of Mankind to Control Its Destiny vs. Belief in Supernatural Power or Fate.** This factor deals with beliefs about man's ability to build a just society, to control both his own evolution and natural physical phenomena, and the possibility of acting to eliminate war.

4. **Successful Planning and Organization.** This factor refers to the planning, organization, and completion of tasks, or, generally, successful self-control in the realm of work.

5. **Control over Internal Processes.** This factor indicates control of somatic, affective, and cognitive reactions and processes. It deals with the ability to control anxiety, mood swings, bodily reactions, etc.

6. **Control over Large-scale Human Events.** The subject who scores high on this factor tends to see himself and people in general as capable of doing something about major societal processes and events (elections, poverty, pollution, etc.).
7. **Control in Immediate Social Interaction.**
This factor has to do with whether the subject is able to secure desired reactions from other people. High scorers on this factor report that they are at ease in social and interpersonal situations, that they are not shy, can usually think of something to say to people, have friends who confide in them, are concerned about other people, etc.

A copy of the Personal Opinion Survey appears in Appendix A.

Items used for factor scores for this test are contained in Appendix C.

The Early Memories Scale

The Early Memories Scale is a very brief questionnaire developed by Coan. It is designed to assess the recall of childhood events and is thought by Coan to have some bearing on openness to experience as measured by the Experience Inventory.

The scale yields three scores: age of earliest memory, number of specific early memories, and variety of revived impressions. Revived impressions are early sensations and images which the subject ostensibly re-experiences and which he reports. The three scores have
been found to be rather highly intercorrelated. They do not constitute factors in the strictest sense, since no formal factor analysis was done for this test.

The Cube Problem

For the Cube Problem, as used in the present study, subjects were asked to imagine a solid wooden cube which was painted red on all sides. They were instructed to cut this imaginary cube into smaller, equal sections by making a series of slices, thereby dividing it into quarters each time. Subjects were then asked to answer a series of questions requiring them to determine how many small cubes there were altogether and how many of these small cubes were painted red on three, two, one, and zero sides.

A second section of the problem required subjects to do some introspection and determine what processes they used to solve the problem.

The Cube Problem yielded three scores: correct solution of the problem, reported use of imagery to solve the problem, and reported use of imagery to deal with each aspect of the problem. These scores are not factors.
A copy of the Cube Problem as presented in this study appears in Appendix A. The correct solution of the Cube Problem constitutes Appendix D.

The Shortened Form of the Betts Questionnaire upon Mental Imagery

This questionnaire was developed by Peter Sheehan (1967), and is a very condensed version of the questionnaire developed and used by Betts (1909) to assess the imagery of college students.

Like its predecessor, the short form of the Betts requires subjects to rate imagery on a scale of seven. In the present study, seven represented the greatest degree of vividness and one, the least. Subjects rated five images for each of seven modalities: visual, auditory, tactile, kinesthetic, gustatory, olfactory, and somesthetic. Items used to arouse imagery were brief descriptions or single words. By rating five images for each modality, subjects could obtain a possible maximum score of 35 for any one modality. The scores of this test do not constitute factors such as those obtained by a formal factor analysis.

A copy of the Short Form of the Betts questionnaire appears in Appendix A.
Procedure

Subjects volunteered for one of 12, three-hour testing sessions. They had been told that they would be taking personality tests and were further instructed to bring a stamped, self-addressed envelope to the testing session if they wanted individual results mailed to them. Tests were arranged in a packet in a prescribed order. All subjects took all the tests in the same order.

A code number had been previously printed on each test in place of the subject's name to insure confidentiality. Those who brought envelopes were instructed to print this number on their envelopes. A letter was then sent to these subjects explaining the nature of the study and giving individual feedback on the general openness score of the Experience Inventory.

Individual instructions went with each test. These are contained, with the tests, in Appendix A.
RESULTS

The scores of the Early Memories Scale, the Cube Problem, and the Betts questionnaire are not factors such as those obtained by factor analysis for the Experience Inventory and the Personal Opinion Survey. They are scores. In the present study, scores for factors of the Experience Inventory and the Personal Opinion Survey and for sections of the other three tests were all treated as single variables. Thus, 27 variables were intercorrelated. These were: scores for seven Experience Inventory factors, scores for seven Personal Opinion Survey factors, three Early Memories scores, three Cube Problem scores, and seven Betts imagery scores—one for each imagery modality.

The intercorrelations were derived by squared multiple correlation. With this technique, it is possible to determine the extent to which each variable contributes to the total variance observed. When two variables show correlation with each other, it means that each contributes to variance observed in the other, or that they share common variance. The higher the correlation between two variables, the greater amount of variance they share.
Squared multiple correlation takes into account scores in the middle ranges. For this reason, it is an appropriate method where the whole range of individual differences is of interest. In the present study, the high-low imagery paradigm was sacrificed to attention to the relationship of variance in different imagery modalities to variance in the other variables of the study.

The results of the intercorrelations of all 27 variables of the present study are presented in this section in nine tables. An additional table shows the contribution of sex differences to observed variance. In all tables, correlations which are significant at the .05 and at the .01 level are indicated by underlining.

**Evoked Imagery and Openness to Experience**

Table 1 shows correlations between imagery scores of the Betts questionnaire and Experience Inventory factor scores.

Most of the imagery scores failed to correlate significantly with Experience Inventory factor scores. The general trend was toward statistically insignificant negative correlation.
Table 1

Correlations between Betts Imagery Scores and Experience Inventory Factor Scores

<table>
<thead>
<tr>
<th>Experience Inventory Factors</th>
<th>Imagery Modality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Auditory</td>
</tr>
<tr>
<td>Aesthetic Sensitivity</td>
<td>-.032</td>
</tr>
<tr>
<td>Unusual Perceptions and Associations</td>
<td>-.077</td>
</tr>
<tr>
<td>Openness to Theoretical and Hypothetical Ideas</td>
<td>-.229</td>
</tr>
<tr>
<td>Constructive Utilization of Fantasy and Dreams</td>
<td>-.006</td>
</tr>
<tr>
<td>Openness to Unconventional Views of Reality</td>
<td>-.086</td>
</tr>
<tr>
<td>Indulgence in Fantasy</td>
<td>.046</td>
</tr>
<tr>
<td>Need for Deliberate and Systematic Thought</td>
<td>.011</td>
</tr>
</tbody>
</table>

$P .05 \ r = .177$
$P .01 \ r = .231$
The only significant correlation was a negative one between visual imagery and openness to theoretical and hypothetical ideas.

**Evoked Imagery and the Experience of Control**

Table 2 shows relationships between Betts imagery scores and scores of factors of the Personal Opinion Survey.

The reported capacity to evoke images in six modalities showed significant, positive correlations with three areas of the experience of control: Tactile, kinesthetic, and gustatory imagery were positively correlated with achievement through conscientious effort; tactile and kinesthetic imagery showed positive correlation with the reported experience of control over large-scale human events; and visual, auditory, tactile, kinesthetic, gustatory, and olfactory imagery showed positive correlation with the reported experience of control in immediate social interaction.

There was a tendency toward negative correlation between imagery scores and all Personal Opinion Survey factors except successful planning and organization. This factor showed low positive correlation with most of the imagery scores.
<table>
<thead>
<tr>
<th>Personal Opinion Survey Factors</th>
<th>Imagery Modality</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Auditory</td>
<td>Visual</td>
<td>Tactile</td>
<td>Kinesletic</td>
<td>Gustatory</td>
<td>Olfactory</td>
</tr>
<tr>
<td>Achievement through</td>
<td>.159</td>
<td>.001</td>
<td>.264</td>
<td>.194</td>
<td>.236</td>
<td>.131</td>
</tr>
<tr>
<td>Conscientious Effort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Confidence in Ability</td>
<td>-.021</td>
<td>.163</td>
<td>.039</td>
<td>.135</td>
<td>-.051</td>
<td>-.068</td>
</tr>
<tr>
<td>to Achieve Mastery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belief in Capacity of Mankind</td>
<td>-.171</td>
<td>.044</td>
<td>-.225</td>
<td>-.086</td>
<td>-.201</td>
<td>-.172</td>
</tr>
<tr>
<td>to Control Its Own Destiny</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful Planning and</td>
<td>.085</td>
<td>.104</td>
<td>.156</td>
<td>.116</td>
<td>.104</td>
<td>.074</td>
</tr>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control over Internal Processes</td>
<td>-.015</td>
<td>.033</td>
<td>-.114</td>
<td>.025</td>
<td>-.096</td>
<td>-.056</td>
</tr>
<tr>
<td>Control over Large-scale</td>
<td>.130</td>
<td>.083</td>
<td>.224</td>
<td>.198</td>
<td>.131</td>
<td>.085</td>
</tr>
<tr>
<td>Human Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control in Immediate Social</td>
<td>.299</td>
<td>.204</td>
<td>.183</td>
<td>.240</td>
<td>.236</td>
<td>.211</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
An outstanding series of significant negative correlations occurred between tactile, gustatory, and somesthetic imagery and a reported belief in the capacity of mankind to control its own destiny.

**Early Memories Scale**

Tables 3, 4, and 5 show the correlations of Early Memories scores with Imagery scores, Experience Inventory scores, and Personal Opinion Survey scores, respectively.

**Early Memory and Evoked Imagery**

The age of earliest memory showed a significant negative correlation with olfactory imagery. It tends toward negative correlation with auditory imagery. Negative correlation in the case of earliest memory means that an early age corresponds to a higher score on the variable with which it is related.

The number of specific memories recalled was positively correlated with auditory, tactile, kinesthetic, and gustatory imagery.

**Early Memory and Openness to Experience**

The age of earliest memory showed no significant correlation with Experience Inventory factor scores.

The number of specific early memories showed significant positive correlation with openness to
Table 3
Correlations of Early Memories Scores with Betts Imagery Scores

<table>
<thead>
<tr>
<th>Betts Imagery Modalities</th>
<th>Early Memories Variables</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age of Earliest Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual</td>
<td>-0.012</td>
<td>0.147</td>
<td>0.065</td>
<td></td>
</tr>
<tr>
<td>Auditory</td>
<td>-0.175</td>
<td>0.218</td>
<td>0.156</td>
<td></td>
</tr>
<tr>
<td>Tactile</td>
<td>-0.090</td>
<td>0.217</td>
<td>0.135</td>
<td></td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>-0.097</td>
<td>0.232</td>
<td>0.157</td>
<td></td>
</tr>
<tr>
<td>Gustatory</td>
<td>-0.166</td>
<td>0.252</td>
<td>0.116</td>
<td></td>
</tr>
<tr>
<td>Olfactory</td>
<td>-0.186</td>
<td>0.154</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>Somesthetic</td>
<td>-0.041</td>
<td>0.088</td>
<td>0.116</td>
<td></td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
Table 4
Correlations of Early Memory Scores with Experience Inventory Factor Scores

<table>
<thead>
<tr>
<th>Betts Imagery Modalities</th>
<th>Early Memories Variables</th>
<th>Age of Earliest Memory</th>
<th>Number of Specific Memories</th>
<th>Number of Revived Impressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic Sensitivity</td>
<td></td>
<td>.031</td>
<td>.125</td>
<td>.089</td>
</tr>
<tr>
<td>Unusual Perceptions and Associations</td>
<td></td>
<td>-.003</td>
<td>.230</td>
<td>.176</td>
</tr>
<tr>
<td>Openness to Theoretical and Hypothetical Ideas</td>
<td></td>
<td>-.044</td>
<td>.118</td>
<td>.116</td>
</tr>
<tr>
<td>Constructive Utilization of Fantasy and Dreams</td>
<td></td>
<td>-.068</td>
<td>.140</td>
<td>.066</td>
</tr>
<tr>
<td>Openness to Unconventional Views of Reality</td>
<td></td>
<td>.029</td>
<td>.075</td>
<td>.096</td>
</tr>
<tr>
<td>Indulgence in Fantasy</td>
<td></td>
<td>.054</td>
<td>-.088</td>
<td>.007</td>
</tr>
<tr>
<td>Need for Deliberate and Systematic Thought</td>
<td></td>
<td>.164</td>
<td>-.197</td>
<td>-.181</td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
Table 5
Correlations of Early Memories Scores with Personal Opinion Survey Factor Scores

<table>
<thead>
<tr>
<th>Betts Imagery Modalities</th>
<th>Early Memories Variables</th>
<th>Age of Earliest Memory</th>
<th>Number of Specific Memories</th>
<th>Number of Revived Impressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement through Conscientious Effort</td>
<td>-0.023</td>
<td>-0.024</td>
<td>-0.121</td>
<td></td>
</tr>
<tr>
<td>Personal Confidence in Ability to Achieve Mastery</td>
<td>-0.168</td>
<td>0.109</td>
<td>0.088</td>
<td></td>
</tr>
<tr>
<td>Belief in Capacity of Mankind to Control Its Own Destiny</td>
<td>-0.047</td>
<td>0.126</td>
<td>0.132</td>
<td></td>
</tr>
<tr>
<td>Successful Planning and Organization</td>
<td>0.080</td>
<td>-0.092</td>
<td>-0.037</td>
<td></td>
</tr>
<tr>
<td>Control over Internal Processes</td>
<td>-0.179</td>
<td>0.090</td>
<td>0.136</td>
<td></td>
</tr>
<tr>
<td>Control over Large-Scale Human Events</td>
<td>-0.078</td>
<td>0.231</td>
<td>0.137</td>
<td></td>
</tr>
<tr>
<td>Control in Immediate Social Interaction</td>
<td>-0.149</td>
<td>0.211</td>
<td>0.128</td>
<td></td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
unusual perceptions and associations. The number of specific early memories and the number of revived early impressions showed significant negative correlation with the need for deliberate and systematic thought. (The need for deliberate and systematic thought is a negatively keyed Experience Inventory factor.)

Early Memory and Experience of Control

The age of earliest memory showed significant negative correlation with reported experience of control over internal processes.

The number of specific early memories recalled was positively correlated with control over large-scale human events and with control in immediate social interaction.

The number of revived impressions showed no significant correlation with scores for control factors.

The Cube Problem

Table 6 shows the relationship of Cube Problem scores to each other. The use of visual imagery contributed to the correct solution of the Cube Problem.

Table 7 shows the correlation of Cube Problem scores with imagery scores. There was no significant relationship between Cube Problem scores and Betts imagery
Table 6
Intercorrelation of Cube Problem Scores

<table>
<thead>
<tr>
<th>Correct Solution</th>
<th>Use of Imagery to Solve Problem</th>
<th>Use of Imagery to Deal with Special Aspects of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct Solution of the Problem</td>
<td>1.00</td>
<td>.190</td>
</tr>
<tr>
<td>Use of Imagery to Solve the Problem</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
Table 7
Correlations of Cube Problem Scores with Imagery Scores

<table>
<thead>
<tr>
<th>Betts Imagery Modalities</th>
<th>Correct Solution of Problem</th>
<th>Use of Imagery to Solve Problem</th>
<th>Use of Imagery to Deal with Special Aspects of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>-.131</td>
<td>.000</td>
<td>.013</td>
</tr>
<tr>
<td>Auditory</td>
<td>.102</td>
<td>-.036</td>
<td>-.039</td>
</tr>
<tr>
<td>Tactile</td>
<td>-.039</td>
<td>-.066</td>
<td>-.024</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>.051</td>
<td>-.112</td>
<td>-.007</td>
</tr>
<tr>
<td>Gustatory</td>
<td>-.131</td>
<td>.012</td>
<td>-.136</td>
</tr>
<tr>
<td>Olfactory</td>
<td>.007</td>
<td>.027</td>
<td>.033</td>
</tr>
<tr>
<td>Somesthetic</td>
<td>.150</td>
<td>-.164</td>
<td>-.100</td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
scores. Correlations which did occur between the two tests tended to be negative.

Table 8 shows the correlation between Cube Problem scores and Experience Inventory scores. The use of imagery to solve the Cube Problem was positively correlated with the need for deliberate and systematic thought.

Table 9 shows correlations between Cube Problem scores and Personal Opinion Survey factor scores. Personal confidence in the ability to achieve mastery contributed to the correct solution of the Cube Problem. The use of imagery to solve the Cube Problem was related to successful planning and organization.

**Sex Differences**

Table 10 shows T scores for differences between means for males and females for all variables.

Male responses contributed to greater variance in variables having to do with theoretical and intellectual endeavor, achievement, and interest, and with control of feelings and reactions. These were: Openness to Theoretical and Hypothetical Ideas, Achievement through Conscientious Effort, Personal Confidence in the Ability to Achieve Mastery, Capacity of Mankind to Control Its Own Destiny, Control over Internal Processes, and Correct Solution of the Cube Problem.
Table 8
Correlations of Cube Problem Scores with Experience Inventory Factor Scores

<table>
<thead>
<tr>
<th>Experience Inventory Factors</th>
<th>Cube Problem Variables</th>
<th>Use of Imagery to Deal with Specific Aspects of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct Solution of Problem</td>
<td>Use of Imagery to Solve Problem</td>
</tr>
<tr>
<td>Aesthetic Sensitivity</td>
<td>-.128</td>
<td>.010</td>
</tr>
<tr>
<td>Unusual Perceptions and Associations</td>
<td>-.101</td>
<td>-.071</td>
</tr>
<tr>
<td>Openness to Theoretical and Hypothetical Ideas</td>
<td>.090</td>
<td>.056</td>
</tr>
<tr>
<td>Constructive Utilization of Fantasy and Dreams</td>
<td>-.053</td>
<td>-.033</td>
</tr>
<tr>
<td>Openness to Unconventional Views of Reality</td>
<td>-.082</td>
<td>-.021</td>
</tr>
<tr>
<td>Indulgence in Fantasy</td>
<td>-.049</td>
<td>-.108</td>
</tr>
<tr>
<td>Need for Deliberate and Systematic Thought</td>
<td>.164</td>
<td>.179</td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
Table 9

Correlations of Cube Problem Scores with Personal Opinion Survey Factor Scores

<table>
<thead>
<tr>
<th>Personal Opinion Survey Factors</th>
<th>Cube Problem Variables</th>
<th>Use of Imagery to Solve Specific Aspects of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct Solution of Problem</td>
<td>Use of Imagery to Deal with Specific Aspects of Problem</td>
</tr>
<tr>
<td>Achievement through Conscientious Effort</td>
<td>.034</td>
<td>.146</td>
</tr>
<tr>
<td>Personal Confidence in Ability to Achieve Mastery</td>
<td>.386</td>
<td>.145</td>
</tr>
<tr>
<td>Belief in Capacity of Mankind to Control Its Own Destiny</td>
<td>.148</td>
<td>.005</td>
</tr>
<tr>
<td>Successful Planning and Organization</td>
<td>.088</td>
<td>.197</td>
</tr>
<tr>
<td>Control over Internal Processes</td>
<td>.108</td>
<td>.070</td>
</tr>
<tr>
<td>Control over Large-scale Human Events</td>
<td>-.032</td>
<td>-.073</td>
</tr>
<tr>
<td>Control in Immediate Social Interaction</td>
<td>-.090</td>
<td>-.042</td>
</tr>
</tbody>
</table>

P .05 r = .177
P .01 r = .231
122 degrees of freedom
Table 10

T Scores for Differences between Means for Males and Females for All Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>T Scores</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Betts Imagery Modalities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Imagery</td>
<td>2.38</td>
<td>.05*</td>
</tr>
<tr>
<td>Auditory Imagery</td>
<td>1.55</td>
<td></td>
</tr>
<tr>
<td>Tactile Imagery</td>
<td>2.61</td>
<td>.05*</td>
</tr>
<tr>
<td>Kinesthetic Imagery</td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>Gustatory Imagery</td>
<td>2.35</td>
<td>.05*</td>
</tr>
<tr>
<td>Olfactory Imagery</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>Somesthetic Imagery</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td><strong>Experience Inventory Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic Sensitivity</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Unusual Perceptions and Associations</td>
<td>.28</td>
<td></td>
</tr>
<tr>
<td>Openness to Theoretical and Hypothetical Ideas</td>
<td>3.28</td>
<td>.01**</td>
</tr>
<tr>
<td>Constructive Use of Fantasy and Dreams</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Unconventional Views of Reality</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Indulgence in Fantasy</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>Deliberate and Systematic Thought</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td><strong>Personal Opinion Survey Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement through Conscientious Effort</td>
<td>1.92</td>
<td>.05**</td>
</tr>
<tr>
<td>Personal Confidence in Ability to Achieve Mastery</td>
<td>3.00</td>
<td>.01**</td>
</tr>
<tr>
<td>Capacity of Mankind to Control Its Own Destiny</td>
<td>3.47</td>
<td>.01**</td>
</tr>
<tr>
<td>Successful Planning and Organization</td>
<td>1.52</td>
<td></td>
</tr>
<tr>
<td>Control over Internal Processes</td>
<td>3.59</td>
<td>.01**</td>
</tr>
<tr>
<td>Control over Large-scale Human Events</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>Control in Immediate Social Interaction</td>
<td>.94</td>
<td></td>
</tr>
</tbody>
</table>
Table 10—Continued

<table>
<thead>
<tr>
<th>Variables</th>
<th>T Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early Memories Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Age of Earliest Memory</td>
<td>2.40</td>
</tr>
<tr>
<td>Number of Specific Memories</td>
<td>.93</td>
</tr>
<tr>
<td>Number of Revived Impressions</td>
<td>.79</td>
</tr>
<tr>
<td><strong>Cube Problem Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Correct Solution of Problem</td>
<td>3.19</td>
</tr>
<tr>
<td>Use of Imagery to Solve Problem</td>
<td>.96</td>
</tr>
<tr>
<td>Use of Imagery to Deal with Specific Aspects of Problem</td>
<td>.79</td>
</tr>
</tbody>
</table>

Significance Levels: 1.98 P .05  
2.62 P .01  

122 degrees of freedom

* = Female Scores Contribute to Greater Variance  
** = Male Scores Contribute to Greater Variance
Female responses contributed to greater variance in imagery variables and to an earlier age of reported early memories. Female responses contributed to greater variance for visual imagery, tactile imagery, gustatory imagery, and age of earliest memory.
DISCUSSION

Betts Imagery Scores and Experience Inventory Factors: the General Picture of Relationships

Several of the Experience Inventory factors deal with experiences to which voluntary imagery might theoretically be expected to contribute: Indulgence in Fantasy, Constructive Utilization of Fantasy and Dreams, Openness to Unusual Perceptions and Associations. Some of the imagery modalities dealing with moving, touching, and sensing might be expected to show a relationship to Aesthetic Sensitivity, which involves questions having to do with becoming immersed in works of art, being affected by music, feeling a physical sense of movement while watching dancers, etc.

Yet, imagery scores failed to correlate significantly with all Experience Inventory factors except Openness to Theoretical and Hypothetical Ideas. Visual imagery correlated negatively with this factor (see Table 1). Evidently, the kinds of imagery experiences which are an integral part of openness to certain kinds of experience are not the kind of imagery experiences measured by the Betts. Our results suggest that evoking
imagery is not a receptive, passive process involving relaxing of mental controls and allowing images to occur.

At this point, the results do not tell us just what processes are involved in evoking imagery.

Evoked Imagery and Openness to Theoretical and Hypothetical Ideas

Imagery and Thinking

Openness to Theoretical and Hypothetical Ideas deals with freedom in abstraction and thought. The results of the present study indicate that openness to theoretical and hypothetical ideas is not enhanced by evoked imagery. To the extent that this factor deals with abstraction and thought, our findings are consistent with a number of earlier observations concerning the incompatibility of vivid imagery and various kinds of thinking. Galton (1883) found that the experience of vivid mental imagery tended to be denied by many well-educated, intellectual persons. Betts (1909) observed that evoked imagery, measured by his questionnaire, was unrelated to a wide variety of types of thinking and concluded that intellectually efficient people are likely to ignore vivid imaginal experience when thinking. A study by Binet (1966) substantiates this conclusion. Binet reported that expert chess players claimed that they
frequently found it necessary to modify or replace imagery with verbal or mathematical techniques lest it interfere with rather than facilitate their game. Pear (1927) has commented that the use of imagery is simply not the most efficient way to accomplish a sizeable range of intellectual tasks.

Vivid and Persistent Imagery and Mental Flexibility

There is another aspect of openness to theoretical and hypothetical ideas which serves to strengthen the negative relationship between this factor and evoked imagery. To some extent, openness to theoretical and hypothetical ideas represents the reported ability to perceive numerous alternatives in the course of mental activity and may be interpreted in terms of openness to a wide variety of unusual and novel modes of thinking. For example, some of the items loaded by this factor are: "When solving a problem, I am inclined to consider all possibilities, even though some are unrealistic or absurd." "I am quick to see 'double meanings' in things people are saying or in what I am reading." "I enjoy working on 'mind twister' type puzzles which require an unexpected approach to achieve solutions."

The quality represented by such questions might be described as a kind of mental flexibility. Several
studies have shown that certain kinds of mental flexibility are inconsistent with the experience of vivid or persistent imagery. (Persistence or lack of controllability might be said to constitute an aspect of vividness of imagery.) Gordon (1951) has observed that an inability to experience perceptual shift characterizes people whose evoked imagery is persistent and uncontrollable. In another study, Gordon (1949) found that subjects whose evoked imagery was persistent tended to make more stereotyped statements about people of religion, nationality, or race different from their own. Bartlett (1921) observed (as did Binet [1966] with his chess players) that people who most successfully solved various perceptual and thinking tasks were those who were able to shift away from their visual imagery and use some other process when this was required.

Evidently, strong imagery serves to compel and focus the attention rather than direct it across alternatives (as in scanning). A study by Sheehan (1969) suggests that imagery may be helpful in remembering discrete bits of information upon which the attention may not be directly focused. He found that vivid imagery accompanied successful recall of incidentally learned block designs. Kamiya (1969) observed that a good number
of those of his subjects who were able to volitionally alter their brain waves to achieve and maintain alpha reported frequently focusing their attention on a vivid image to accomplish this.

We are not certain that evoked imagery reported on the Betts questionnaire for our present study represents some manifestation of focused attention. All that we can say at this point is that it is not unreasonable to suspect the operation of such a process. Our findings do suggest that processes involved in evoked imagery and those involved in the capacity to consider many and unusual alternatives in thinking are almost mutually exclusive. Both concentration of attention and flexibility in thinking are essential to the most creative types of thinking. It could be considered quite an achievement in mental discipline to be able to use both processes interchangeably or to use one process to elaborate or enhance the other.

**Evoked Imagery and the Experience of Control**

Evoked Imagery and Effort

Certain of our findings suggest a reciprocal relationship between concentrated effort and evoked imagery.
We found that achievement through conscientious effort correlated positively with three kinds of imagery: kinesthetic, tactile, and gustatory (see Table 2). These three kinds of imagery have to do with certain types of effort, tension, or tendency to action or with actual physical activity. Kinesthetic imagery involves volition and motion. Tactile imagery involves tangibility. Gustatory imagery involves the active taking in of sensation.

Achievement through conscientious effort includes an attitude of trying or making attempts to accomplish certain things, and the formulation of exact things to do in order to achieve certain goals, e.g., eating the right food to stay healthy, spending time and devoting effort to achieving a position of authority, etc.

No doubt, such effort involves concentration which, theoretically, imagery may serve to facilitate. On the basis of our results, it is also possible to say that willingness to expend effort in a particular direction may enhance certain (evoked) imagery activity.

Incidental Imagery

One factor which may have contributed to the correlation between achievement through conscientious effort and imagery scores is the observed tendency for
imagery activity to accompany directed intellectual activity. Betts (1909) observed that such imagery activity was frequently incidental to actual thinking processes. Such imagery became fully conscious and usable only when thinking was stymied or interrupted.

There is some justification for assuming that this incidental imagery is represented in the Betts questionnaire. Subjects taking the Betts are required to direct their attention to images stimulated by the verbal descriptions. Essentially, these are memory images. Thus, it is possible that the Betts measures reports of memory images incidentally stimulated by the subject's conscientious effort to recall some scene, sound, event, taste, etc. Evoking images on the Betts may be just this process.

Evoked Imagery and Control in Immediate Social Interaction

The reported experience of control in immediate social interaction correlated positively with evoked imagery for all modalities except somesthetic.

Control in Immediate Social Interaction is a factor which deals with feelings of confidence in social and interpersonal interaction. Items loaded by this factor which are keyed positively deal with the ability
to converse with other people, to enter social situations without self-consciousness and shyness, interest in other people, etc.

While Control in Immediate Social Interaction and Achievement through Conscientious Effort are only slightly correlated in a positive direction, it is not unreasonable to speculate in terms of some common factor which contributes to their correlation with imagery scores. Both factors measure a certain kind of confidence, i.e., confidence in the capacity of one's own specific actions to facilitate success in certain undertakings, e.g., academic success, forming relationships with other people, etc. Conscientious effort contributing to such confidence could be directed toward areas tapped by the factor, Achievement through Conscientious Effort; toward interaction with other people; or toward recalling things and attending to images.

Other Personal Opinion Survey factors also deal with confidence in one's own efforts to handle certain things, but most of these factors contain items which have to do with intellectual functioning and abstract issues. Where this is the case, the factor is not correlated with imagery scores.
Lack of Relationship between Imagery Scores and Control over Internal Processes

Control over Internal Processes is a factor which deals with the reported capacity to limit and control emotional reactions, somatic reactions, thinking, and other internal processes. This factor shows some slight, insignificant negative correlation with imagery scores.

Theoretically, it would make sense for control over internal processes to include control over imagery to the extent of being able to make it appear or disappear at will. This does not seem to be the case. According to the relationships observed, Control over Internal Processes seems to involve a kind of shutting off or limiting of experience. This factor is significantly correlated in a negative direction with such openness factors as Constructive Utilization of Fantasy and Dreams, Indulgence in Fantasy, and it is fairly highly (although insignificantly) correlated in a negative direction with Unusual Perceptions and Associations and even with Openness to Theoretical and Hypothetical Ideas. (These relationships are not shown in a table but are part of the intercorrelations of the present study. They were incidental to our primary interest.)
While evoked imagery does not seem to involve the processes which contribute to openness to experience as measured by the Experience Inventory, it seems to involve, in comparison with Control over Internal Processes, an active involvement with, rather than limiting of, experience.

Evoked Imagery and Beliefs about What Will Happen to Man

The Personal Opinion Survey not only taps confidence and feelings of control in various areas, it stimulates expression of these experiences in terms of beliefs.

There are two factors of the Personal Opinion Survey that deal with beliefs about mankind. These are Control over Large-scale Human Events, and Belief in Capacity of Mankind to Control Its Own Destiny. Control over Large-scale Human Events deals with belief in the capacity of individuals to bring about specific social changes, e.g., to affect elections, to deal with poverty and pollution, etc. Belief in the Capacity of Mankind to Control Its Own Destiny deals with somewhat similar issues on a more abstract level. It compares belief in fate or supernatural power as the director of man's destiny with belief in the power of mankind to determine its own destiny. (These beliefs are not necessarily mutually exclusive.)
These two factors show opposite relationships to imagery scores. Imagery scores are positively correlated with Control over Large-scale Human Events and negatively correlated with Belief in the Capacity of Mankind to Control Its Own Destiny.

We can account for this difference by considering the levels at which the two control factors deal with issues. Control over Large-scale Human Events treats of issues about which some solution can be formulated or for which people can conceptualize and proceed with some action. Belief in the Capacity of Mankind to Control Its Own Destiny treats of abstract and theoretical aspects of experienced beliefs. This factor is very highly correlated with Openness to Theoretical and Hypothetical Ideas. This makes sense in that both factors involve the abstracted consideration of a number of possibilities and hypothetical situations. Evidently, imagery of the kind measured by the Betts is not involved in this process. Both factors show significant negative correlation with imagery scores.

**Evoked Imagery and the Cube Problem**

We observed a positive relationship between Successful Planning and Organization and the use of imagery to solve the Cube Problem. This relationship suggests
that imagery was used to formulate and organize the problem (see Table 9).

The actual use of imagery to solve the Cube Problem contributed somewhat to the correct solution of the problem and seemed to exert its influence in company with two control factors: Confidence in the Ability to Achieve Mastery, which deals with confidence in the area of intellectual endeavor, and Need for Deliberate and Systematic Thought (see Tables 8 and 9).

Since the Cube Problem deals with verbal, mathematical, and abstract reasoning, it is not surprising that none of its scores are related to evoked imagery, which has showed a consistent tendency to be negatively related to such processes.

Essentially, the relation of Cube Problem scores with other variables shows us something about how imagery is used in thinking and about some of the processes involved in the kind of thinking represented by the problem.

**Evoked Imagery and Early Memories**

Although Betts sought to measure immediate imagery experience, his questions essentially stimulate memory images. The Early Memories Scale was especially designed to measure the immediate experience of memories, represented as memory images and revived impressions.
Comparison of Betts scores with Early Memories scores tells us something about the extent to which we can interpret Betts scores in terms of memory.

Age of Earliest Memory

Age of earliest memory was negatively related to olfactory imagery (see Table 3). Olfactory experience is one of the earliest modes of experience, and it is not surprising that olfactory imagery is related to people's earliest memories.

Number of Revived Impressions

This aspect of the Early Memories Scale requires the subject to recall a sensation, a feeling, an image, and several other impressions occurring before the age of eight. The wording is very general, i.e., specific impressions are not described. In this way, it is unlike the Betts, which provides a specific verbal description of what is to be imagined. It is partially this dissimilarity which may be represented by a lack of significant correlation between Betts scores and number of revived impressions (see Table 3).

Number of Specific Memories

This section of the Early Memories test requires subjects to remember exact scenes, people, events, and
places occurring in the person's life before the age of eight. It is worded very similarly to the Betts, which requires subjects to imagine specific people, scenes, sounds, tastes, etc.

The Early Memories Scale ostensibly deals with memories, while the Betts deals with immediate images (which may be memories). However, there is no real reason to assume that the Betts deals less with memory images than the Early Memories Scale, or that the Early Memories Scale deals less with immediate images than the Betts. The relationship of the number of specific early memories recalled to imagery scores for the Betts (four out of seven modalities) implies that the Betts and this section of the Early Memories Scale are measuring similar processes. The nature of the tests indicates that at least two aspects of the similarity between them have to do with memory of specific things and conscious access to memory images.

Another relationship, however, suggests that the processes involved in the two tests are not identical. The number of specific memories recalled is positively correlated with Unusual Perceptions and Associations, an Experience Inventory factor which deals with perceptions which children might have, e.g., seeing faces in clouds and rocks, believing that plants have feelings, seeing
people as certain animals, etc. This relationship implies that recall of specific memories requires a certain relaxation of mental controls which the experience of evoked imagery as measured by the Betts does not: Betts scores are unrelated to this Experience Inventory factor.

Specifically, the relationship of number of specific memories to Unusual Perceptions and Associations implies that this Early Memories factor involves access to a childlike mode of perception. This, in turn, emphasizes the memory aspect of whatever processes the Early Memories variable taps and points up a difference between it and evoked imagery. Evoked imagery may involve memory, but it is not the kind of return to early experience that the Early Memories variable involves.

**Sex Differences**

Sex differences, or cultural factors related to gender, contributed significantly to variance in some of the variables (see Table 10).

Male responses accounted for more variance with respect to variables having to do with mental and emotional control, interest in theoretical issues, confidence and experienced control in intellectual, mechanical, and athletic areas. Female responses accounted for more variance with respect to imagery scores in visual, tactile, and gustatory modalities.
The fact that female responses accounted for less variability in Personal Opinion Survey factors is not surprising. Men in this culture have traditionally been encouraged to develop control over their internal processes and to seek competence in intellectual, mechanical, physical, and social areas. It is important for them to indicate confidence in these areas whether or not they are competent in them.

In a previous section, we suggested that evoked imagery may involve a kind of volitional process comparable to that involved in certain Personal Opinion Survey factors to which they are related. If we interpret the finding that female responses account for more variance in evoked imagery and male responses account for more variability in certain control factors in the context of the experience of control, it seems feasible that imagery may represent areas of control and confidence for females and control factors may represent areas of confidence and control for males.
SUMMARY AND CONCLUSIONS

From the results of our study, we can formulate a general description of the processes involved and those not involved in evoked imagery as measured by the Betts questionnaire.

Evoked imagery seems to involve some sort of conscientious, volitional effort which does not limit experience but may serve to guide attention. Thus, we found that imagery scores (particularly in nonverbal modalities) were positively correlated with Achievement through Conscientious Effort and were unrelated to Control of Internal Processes.

Evoked imagery does not seem to involve thinking such as that used in problem-solving or in considering many ideas and alternatives. Thus, imagery scores were unrelated to Cube Problem scores and negatively related to Openness to Theoretical and Hypothetical Ideas.

Processes actually involved in successfully applied thinking as measured by the correct solution of the Cube Problem involved confidence in intellectual endeavor and need for systematic thinking. Visual imagery, evidently unlike evoked imagery, contributed to organization of the Cube Problem.
Evoked imagery does not seem to involve the relaxation of mental controls to allow experiences to affect one. Thus, imagery scores were unrelated to openness to experience as measured by the Experience Inventory.

Yet, evoked imagery seems to involve some kind of imaginal responsiveness to verbal stimuli, as does the recall of many specific memories, to which it is related.

Evoked imagery involves memory and access to immediate imagery. These processes are implied partially by their relationship to recall of specific early memories.

In general, variables which deal in some way with interpersonal relationships or other people, specific events or actions, or individual effort, correlate positively with evoked imagery scores. These variables include: Control in Immediate Social Interaction, Control over Large-scale Human Events, Achievement through Conscientious Effort, Number of Specific Memories, and Age of Earliest Memory.

Those variables dealing with abstract processes or issues, intellectual confidence and endeavor, private or internal processes, correlate negatively or do not correlate significantly with evoked imagery scores. These
variables include: All Experience Inventory factors, Confidence in the Ability to Achieve Mastery, Belief in the Capacity of Mankind to Control Its Own Destiny, Cube Problem scores, and Number of Revived Early Impressions.
APPENDIX A

MEASURING INSTRUMENTS

The measuring instruments used in this study are located in this section in the order of their administration. This was as follows:

1. The Short Form of the Betts Questionnaire upon Mental Imagery
2. Experience Inventory
3. Early Memories Scale
4. Cube Problem
5. Personal Opinion Survey
The Betts QMI Vividness Imagery Scale

Instructions for Doing Test

The aim of this test is to determine the vividness of your imagery. The items of the test will bring certain images to your mind. You are to rate the vividness of each image by reference to the accompanying scale, which is shown at the bottom of the page. For example, if your image is "vague and dim" you give it a rating of 3. Record your answer in the brackets provided after each item. Just write the appropriate number after each item. Before you turn to the items on the next page, familiarize yourself with the different categories on the rating scale. Throughout the test, refer to the rating scale when judging the vividness of each image. A copy of the rating scale will be printed on each page. Please do not turn to the next page until you have completed the items on the page you are doing, and do not turn back to check on other items you have done. Complete each page before moving on to the next page. Try to do each item separately independent of how you may have done other items.

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience ............ Rating 7

Very clear and comparable in vividness to the actual experience ........ Rating 6

Moderately clear and vivid ................. Rating 5

Not clear or vivid, but recognizable .......... Rating 4

Vague and dim .................................. Rating 3
So vague and dim as to be hardly
discernible . . . . . . . . . . . . . . Rating 2

No image present at all, you only
"knowing" that you are thinking of
the object . . . . . . . . . . . . . . Rating 1

An example of an item on the test would be one which asked you to consider an image which comes to your mind's eye of a red apple. If your visual image was moderately clear and vivid, you would check the rating scale and mark "5" in the brackets as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. A red apple</td>
<td>(5)</td>
</tr>
</tbody>
</table>

Now turn to the next page when you have understood these instructions and begin the test.

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degree of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The exact contour of face, head, shoulders and body</td>
<td>( )</td>
</tr>
<tr>
<td>2. Characteristic poses of head, attitudes of body, etc.</td>
<td>( )</td>
</tr>
<tr>
<td>3. The precise carriage, length of step, etc. in walking</td>
<td>( )</td>
</tr>
<tr>
<td>4. The different colors worn in some familiar costume</td>
<td>( )</td>
</tr>
</tbody>
</table>

Think of seeing each of the following, considering carefully the picture which comes before your mind's eye; and classify the image suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.
5. The sun as it is sinking below the horizon .... ( )

Rating Scale

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience .... Rating 7

Very clear and comparable in vividness to the actual experience .... Rating 6

Moderately clear and vivid .... Rating 5

Not clear or vivid, but recognizable .... Rating 4

Vague and dim .... Rating 3

So vague and dim as to be hardly discernible Rating 2

No image present at all, you only "knowing" that you are thinking of the object .... Rating 1

Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the images suggested by each of the following questions as indicated by the degree of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. The whistle of a locomotive ............</td>
<td>( )</td>
</tr>
<tr>
<td>7. The honk of an automobile ..............</td>
<td>( )</td>
</tr>
<tr>
<td>8. The mewing of a cat ....................</td>
<td>( )</td>
</tr>
<tr>
<td>9. The sound of escaping steam ............</td>
<td>( )</td>
</tr>
<tr>
<td>10. The clapping of hands in applause ...</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience .... Rating 7
Think of "feeling" or touching each of the following, considering the image which comes to your mind's touch, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Sand</td>
<td>( )</td>
</tr>
<tr>
<td>12. Linen</td>
<td>( )</td>
</tr>
<tr>
<td>13. Fur</td>
<td>( )</td>
</tr>
<tr>
<td>14. The prick of a pin</td>
<td>( )</td>
</tr>
<tr>
<td>15. The warmth of a tepid bath</td>
<td>( )</td>
</tr>
</tbody>
</table>

**Rating Scale**

The image aroused by an item of this test may be:

- Perfectly clear and vivid as the actual experience .... Rating 7
- Very clear and comparable in vividness to the actual experience .... Rating 6
- Moderately clear and vivid .... Rating 5
- Not clear or vivid, but recognizable .... Rating 4
Think of performing each of the following acts, considering carefully the image which comes to your mind's arms, legs, lips, etc., and classify the images suggested as indicated by the degree of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Running upstairs</td>
<td>( )</td>
</tr>
<tr>
<td>17. Springing across a gutter</td>
<td>( )</td>
</tr>
<tr>
<td>18. Drawing a circle on paper</td>
<td>( )</td>
</tr>
<tr>
<td>19. Reaching up to a high shelf</td>
<td>( )</td>
</tr>
<tr>
<td>20. Kicking something out of your way</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience \( \text{Rating 7} \)
- Very clear and comparable in vividness to the actual experience \( \text{Rating 6} \)
- Moderately clear and vivid \( \text{Rating 5} \)
- Not clear or vivid, but recognizable \( \text{Rating 4} \)
- Vague and dim \( \text{Rating 3} \)
- So vague and dim as to be hardly discernible \( \text{Rating 2} \)
- No image present at all, you only "knowing" that you are thinking of the object \( \text{Rating 1} \)
Think of tasting each of the following, considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Salt</td>
<td>( )</td>
</tr>
<tr>
<td>22. Granulated (white) sugar</td>
<td>( )</td>
</tr>
<tr>
<td>23. Oranges</td>
<td>( )</td>
</tr>
<tr>
<td>24. Jelly</td>
<td>( )</td>
</tr>
<tr>
<td>25. Your favorite soup</td>
<td>( )</td>
</tr>
</tbody>
</table>

**Rating Scale**

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience ....................................... Rating 7
- Very clear and comparable in vividness to the actual experience ................................ Rating 6
- Moderately clear and vivid ................................................................. Rating 5
- Not clear or vivid, but recognizable ................................................ Rating 4
- Vague and dim ................................................................. Rating 3
- So vague and dim as to be hardly discernible ........................................ Rating 2
- No image present at all, you only "knowing" that you are thinking of the object .... Rating 1

Think of smelling each of the following, considering carefully the image which comes to your mind's nose and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.
26. An ill-ventilated room .......... ( )
27. Cooking cabbage ............... ( )
28. Roast beef ..................... ( )
29. Fresh paint ..................... ( )
30. New leather ..................... ( )

Rating Scale

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience ..................... Rating 7

Very clear and comparable in vividness to the actual experience ........ Rating 6

Moderately clear and vivid ................ Rating 5

Not clear or vivid, but recognizable ........ Rating 4

Vague and dim ...................... Rating 3

So vague and dim as to be hardly discernible ................ Rating 2

No image present at all, you only "knowing" that you are thinking of the object .... Rating 1

Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degrees of clearness and vividness specified on the Rating Scale.

31. Fatigue ......................... ( )
32. Hunger ......................... ( )
33. A sore throat .................... ( )
34. Drowsiness ..................... ( )
35. Repletion as from a very full meal ... ( )

Rating Scale

The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience .................. Rating 7

Very clear and comparable in vividness to the actual experience ............ Rating 6

Moderately clear and vivid ........................................ Rating 5

Not clear or vivid, but recognizable .................................... Rating 4

Vague and dim .................................................... Rating 3

So vague and dim as to be hardly discernible ............................. Rating 2

No image present at all, you only "knowing" that you are thinking of the object ........ Rating 1
Experience Inventory

Below are some statements about different ideas and feelings that many people have experienced. Read each statement and decide whether it is true or false for you. Then write either T (for true) or F (for false) in the space provided. Work quickly but try to be truthful. Neither answer is necessarily "better" or "healthier" than the other.

---

1. Poetry has little effect on me.

2. Sometimes I have had the impression that the walls or the ceiling were moving and changing size or shape, even though I knew that this was impossible.

3. I often enjoy playing with theories or abstract ideas.

4. At times the solution to a problem has occurred to me in a dream.

5. It is possible that we had a previous existence of which we have no memory.

6. Fairly often I dream in color.

7. I often feel a need to gather a lot of clear-cut facts before I come to a conclusion about something.

8. To be worth reading, a poem should say something that makes fairly clear sense to any intelligent person.

9. While lying in bed or reclining in a chair I sometimes find myself perceiving faces, objects, etc., in the shadows of the light or the design of the ceiling, etc.
10. I like to play with ideas that other people consider strange or improper.

11. At times I have solved problems or created something (such as music or poetry) in my dreams.

12. It is possible that our sense organs (i.e., eyes, ears, etc.) do not bring us our most important information.

13. Sometimes I wander off into my own thoughts while doing a routine task so that I actually forget that I am doing the task, and then find a few minutes later that I have completed it without even being aware of what I was doing.

14. I often feel a need to think things out very carefully before I come to a conclusion about something.

15. I am often bored when left alone.

16. I often see things—like faces, animals, etc.—in cloud formations.

17. I have experienced moments of inspiration and creativity when artistic expression, ideas, or the solutions to problems I had struggled with came to me with a special intensity and clarity.

18. Sometimes I seem to be able to receive thoughts from certain people I know well when they are not with me.

19. I often have a strong feeling, which I cannot quite explain, that the situation I am in is one I have been in before.

20. I enjoy an active fantasy life and indulge in it fairly often.

21. Often when I have to choose between doing two different things, I try very hard to decide which is really more important in the overall scheme of things.
22. I think any painting or sculpture should represent something recognizable.

23. I sometimes think of trees as expressing certain feelings, attitudes, or movements.

24. When solving a problem I am inclined to consider all possibilities even though some are unrealistic or absurd.

25. I have sometimes had a very strong impression that a certain thing has happened even though there seems to be no way I could really know.

26. It is possible that the mind can leave the body and experience things at a great distance from the body.

27. I can daydream for long periods of time and completely forget where I am.

28. I often enjoy learning some clear-cut facts about people, historical events, or scientific matters.

29. Music has very little effect on me.

30. In some kinds of sounds—such as the wind, the noise of machinery, etc.—I often imagine I hear voices.

31. I am quick to see "double meanings" in things people are saying or in what I am reading.

32. Solutions to problems or ideas for new projects come to me "out of the blue."

33. It is possible for one to have foreknowledge of future events.

34. I enjoy reading fantasy stories and ghost stories.

35. I have difficulty working on a project if I don't clearly know what is expected of me.
36. I tire quickly of looking at beautiful scenery or things in nature.
37. I often think of various people I know as resembling certain animals.
38. I often try to formulate general principles to account for things that I read about and think about.
39. Fairly often when I am dreaming, I know I'm dreaming and feel that I have some control over my dream.
40. It may be possible for two people to communicate with each other over considerable distances via mental telepathy.
41. I enjoy imagining what it would be like if I could fly.
42. I frequently develop special systems or devices to help me remember things.
43. I prefer balanced designs in things.
44. At times I see unusual relations between things.
45. Sometimes I get so absorbed in my thoughts that I fail to notice a lot of things going on around me.
46. I often invent formulae or schemes to organize my ideas or help me remember something.
47. I believe that some people really do have extrasensory perception.
48. I have always enjoyed games of make-believe.
49. I don't feel really comfortable with a topic until I can fit all of its aspects together into some kind of pattern.
50. Art today does not require any talent because the lines and shapes don't have to be formed to look like anything recognizable.
51. I often feel an intense excitement when I see certain colors or color combinations.

52. I enjoy jokes based on a double meaning.

53. People are intolerable who take "sacred" things in a light and humorous way.

54. It is possible that ancient civilizations knew secrets of mystical power which we do not have.

55. When I was a child, I had an imaginary playmate.

56. I follow the adage, "A place for everything, and everything in its place," in my home.

57. An artist should always try to express his ideas clearly so that his audience can understand him and not just use his art to relieve his own feelings.

58. At times I have actively stared at something familiar and had it become very strange before my eyes.

59. I enjoy reading science fiction stories.

60. I am usually able to remember my dreams clearly.

61. It is possible that we are influenced by spirits from the past or by other people.

62. I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.

63. I enjoy studying subjects such as mathematics which have a clear-cut logical organization to them.

64. Psychedelic art is nonsensical and means nothing to me.

65. I have sometimes imagined myself as some kind of animal.
66. I would enjoy creating a social system with laws, etc., for an imaginary utopian country.

67. I sometimes have waking experiences when the familiar things around me seem strange and different and I see things in a new way.

68. It is possible that some places really are cursed or haunted.

69. I often imagine long conversations in which I would say to people what I really wanted to.

70. Whenever I have to study a topic, I try to organize it in outline form and get down to essentials.

71. If I were an artist, I would prefer scientific illustration to free form sculpture and painting.

72. I have sometimes had vivid visual images that have held my fascination for some time as I sat or lay still with my eyes closed.

73. I enjoy working on "mind twister" type puzzles which require an unexpected approach to achieve solutions.

74. Most of my dreams seem fairly meaningless.

75. It is possible for some people to experience color through their fingertips with their eyes closed and identify the color correctly.

76. I would enjoy imagining what it would be like to live on another planet.

77. When making an important decision, I like to list all of the positive aspects versus all of the negative aspects of the situation and compare them before deciding what to do.

78. The content or message of a picture holds more interest for me than its artistic style.

79. I often have dreams about people I have never seen before.
80. I enjoy imagining the kinds of life which might exist on other planets.

81. My dreams can almost all be explained by something that happened the day before or by a change in conditions during the night, e.g., a cold breeze from the window, getting hungry or thirsty, etc.

82. I usually trust my hunches or sixth sense.

83. When I imagine things, they seem very vivid and real to me. I can picture them clearly.

84. I do not like to make a hurried decision because I feel upset if I can't think things through carefully.

85. Sometimes when I am reading poetry or looking at a work of art, I feel a strong wave of excitement that seems to affect my whole body.

86. At times in my life I have spent a lot of time wondering why I experience myself as this person in this body and not as someone else.

87. I sometimes get annoyed by people who like to talk about very abstract theoretical matters.

88. A lot of dreaming is a sign that something is mentally wrong with a person.

89. The idea that any of the flying saucers people have sighted come from outer space is pretty silly. They can all be explained in other ways.

90. Without fantasy and daydreams, life would seem very dull and drab to me.

91. I like to plan my moves in a game well in advance and anticipate their consequences as completely as possible.

92. I have sometimes experienced a very powerful feeling of movement when looking at certain paintings or pieces of sculpture.
93. I sometimes get a great deal of enjoyment from listening to recordings of unusual sounds or sound effects.

94. I find myself uncomfortable in the presence of unconventional or "peculiar" people.

95. The more superstitious and primitive you are, the more you dream and pay attention to your dreams.

96. Children should read stories about real things, not stories about fantastic things like fairies, dragons, and giants.

97. I try to keep all my thoughts directed along realistic lines and avoid flights of fancy.

98. I prefer to have my time well structured without many unplanned moments.

99. There have been times when I have been completely immersed in nature or in art and had a feeling of awe sweep over me so that I felt as if my whole state of consciousness were somehow temporarily altered.

100. Certain sounds seem to give impressions like those of colors, so that I can almost see colors when I hear these sounds.

101. A theory isn't much good unless it can be put to practical use.

102. My most productive thinking occurs when I am wide awake and in full control of all my senses.

103. It is definitely impossible for one person to read another person's mind.

104. I prefer not to waste my time daydreaming.

105. In spare moments, I frequently find myself planning how to carry out my next job or project.
106. I have had experiences which inspired me to write a poem or a story, or make up a humorous tale, or paint a picture.

107. Sometimes I imagine what it would be like if the world were different, e.g., if there were no laws, if we could read each other's minds, etc.

108. I would prefer a job in which I had to perform active tasks to one in which I just sat and thought through problems.

109. Many dreams that I remember are disturbing, and thinking about them can ruin my whole day.

110. I have never had a strange or weird experience.

111. I seldom have dreams at night.

112. I find that my "snap" judgments are usually pretty good.

113. Sometimes when I am listening to music, I feel a strong wave of excitement that seems to affect my whole body.

114. Occasionally I have experienced a state in which it seemed hard to tell just where the boundary line was between me and my surroundings.

115. I do not enjoy solving mathematical problems or puzzles.

116. When I arrive at a conclusion, I generally know exactly how I got there.

117. Astrology has no validity whatever.

118. I prefer not to spend much time dwelling on the past.

119. When making a decision, I would rather flip a coin than spend a lot of time balancing the pros and cons of the situation.
120. I can look at an object—a leaf, a stone, a flower—for a long time, continuing to discover different things about it.

121. I can directly recall things that happened before I was five years old (not just from what people told me since then).

122. I have difficulty thinking through a problem unless I can picture it in some concrete form.

123. "Sleeping" on a problem is a waste of time. If you have a problem to solve, you should work on it until you solve it.

124. I seldom have hunches and do not rely on them.

125. I trust logical thought more than imagination to solve my problems.

126. I have trouble sticking to plans.

127. Abstract art can convey more feeling to me than a conventional still-life picture.

128. I can often see profiles or figures in the outlines of rock formations.

129. I prefer teachers who give lots of specific examples and practical illustrations of an idea rather than just describe a theory alone.

130. There must be something wrong with anyone who spends much time daydreaming.

131. I have difficulty believing in something I cannot see or logically prove.

132. I would have difficulty free-associating to things and letting my mind wander without guidance or control.

133. I try to avoid situations with a lot of rules.

134. Color in paintings makes an especially great impact on me.

135. I can imagine different kinds of flowers representing various types of people.
136. I seldom stop to speculate about the purpose of my life or where I am heading.

137. I get the best rest on nights when I don't have any dreams.

138. I prefer to read nonfiction books rather than fiction.

139. I very seldom spend time imagining what might have been if only conditions had been different in my past.

140. I like surprises and unexpected happenings.

141. I enjoy reading poetry that emphasizes feelings and images more than story line.

142. The idea that plants have feelings seems silly to me.

143. I think one's education should be aimed primarily toward helping you earn a living, not just toward learning ideas.

144. I almost never have dreams.

145. It is better to stick to everyday matters and not speculate about things you can never prove or disprove.

146. I didn't believe much in fairies, ghosts, or such make-believe creatures when I was a child.

147. I find a certain amount of confusion stimulating.

148. I can become so totally involved in looking at a painting or listening to music that I completely lose track of time and cease to be aware of my surroundings.

149. I find unusual sounds and sound effects generally disrupting and disturbing.

150. It often takes me a while to catch jokes based on puns or double meanings.
151. It's rather silly to spend much time trying to analyze or interpret your dreams.

152. I seldom indulge in daydreaming or flights of fancy.

153. If I feel my mind starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.

154. I don't mind my house being fairly cluttered.

155. I enjoy reading stories that include a lot of descriptive imagery.

156. I have a clear idea of who and where I am at all times.

157. It is difficult for me to see more than one way to solve a problem.

158. Sometimes experiences in my dreams have predicted later events in my waking life.

159. I have no doubts about what is real and what is not real.

160. I think it's a waste of time to think about things that could never really happen or are very unlikely to happen.

161. I like having a lot of free time when I don't have to think about doing anything in particular.

162. I enjoy looking through a kaleidoscope at the changing patterns.

163. Clouds always look just like clouds to me.

164. I have never been very interested in thinking up idealistic schemes to improve society.

165. I can often better understand the people around me as the result of my dreams.

166. I have never been aware of mystical sensations or moods surrounding a certain place.
Aside from the possible danger involved, I can't see anything appealing about the idea of having one's mind "expanded" through unusual and drug-induced experiences.

I tend to stay away from subjects that are very organized and systematic.

It is rather silly to think of people as looking like plants or animals.

My dreams are often related to my waking life.

I do not have much interest in spiritual or mystical things.

I generally try to avoid strange or "far-out" experiences.

Sometimes when playing a game, I like to take a wild chance just to see what will happen, even though I don't know what the outcome will be.

A sensible person always tries to see things just as they are, rather than letting his imagination run wild.

I often find that if I break away from a problem and think in an undirected, free-association way, the solution to the problem will suddenly appear to me.

I do not approve of children's T.V. shows that are unrealistic and depict fantastic creatures.

When gambling, I would rather play a hunch than try to figure out a winning system.

There must be something wrong with a person who tends to see people or faces in things like rocks or clouds.

I believe that some of my most productive thinking goes on in dreams and daydreams.
180. I don't get much pleasure from poetry or art that has fantastic images and no recognizable story line or message.

181. If I had to trouble to invent a tricky way of remembering something, I would probably decide that it wasn't worth remembering.
Early Memories

1. Very briefly describe the earliest event in your life that you can directly recall (not an event that you know about just because someone else has told you it happened).

2. How old were you at that time? (Estimate if necessary but be as precise as you can.)

3. Can you remember the name of your first-grade teacher (the earliest one if you had more than one)?

   If so, what was her (his) name?

4. Can you remember in what part of the room you sat in the first grade?

   If so, where did you sit?

5. Right now, what specific things can you remember that happened BEFORE YOU WERE EIGHT YEARS OLD? (Indicate by checking the appropriate spaces.)

   Can you remember:

   a. listening to a story before you were 8? Yes__ No__
   b. playing a game before you were 8? Yes__ No__
   c. a dream you had before you were 8? Yes__ No__
   d. a toy or other possession to which you felt strongly attached before you were 8? Yes__ No__
e. a time when you got hurt (physically or emotionally) before you were 8? Yes  No
f. a time when you were afraid before you were 8? Yes  No
g. a time when you were embarrassed or ashamed before you were 8? Yes  No
h. a time when you were angry before you were 8? Yes  No
i. a time when you were very pleasantly excited before you were 8? Yes  No
j. a particular place where you liked to spend a lot of time before you were 8? Yes  No

6. In some of our memories of early events, there is some particular impression, sensation, or image that seems to linger in our minds. The impression appears to be very close to what we actually experienced at the time of the event, so that we seem to feel, see, or hear something just as we did long ago. Of course, this is only true for some people and not for others. As you think about things that happened in the first 7 or 8 years of your life, what kinds of impressions do you experience (if any). (Please check where appropriate.)

  ___ visual images (of people, places, etc.)
  ___ sounds
  ___ odors
  ___ tastes
  ___ skin sensations (heat, cold, textures, etc.)
  ___ pain
  ___ feelings of movement or muscular effort
  ___ moods or emotions
  ___ no particular impression
Imagine a solid wooden cube which is painted red all over the outside. Suppose that it is resting on a table in front of you. Let us imagine that we are going to cut up this cube into smaller pieces without moving any part of it.

First, divide the large cube into quarters by making three horizontal slices. Now divide it into quarters again by making three parallel vertical slices. Finally, divide it again into quarters by making three vertical slices at right angles to the first set of vertical slices.

The large cube is now divided into a number of smaller cubes.

A. How many small cubes are there altogether?  
B. How many small cubes are painted red on 3 sides?  
C. How many small cubes are painted red on 2 sides?  
D. How many small cubes are painted red on 1 side?  
E. How many small cubes are painted red on 0 sides?
Cube Problem (continued)

1. Did you try to answer the questions on the previous page by using arithmetic operations? Yes ___ No ___

2. While trying to solve the cube problem, did you try to visualize the little cubes? Yes ___ No ___

3. More specifically, how did you go about trying to answer question A?

4. How did you go about trying to answer question B?

5. How did you go about trying to answer question C?

6. How did you go about trying to answer question D?

7. How did you go about trying to answer question E?
Personal Opinion Survey

The following statements are opinions about people and life in general. You will probably feel that some are true while others are false. Some of the statements are about your own feelings about yourself, or matters of health. There are no absolutely known "right" or "wrong" answers to the general statements, and only you know the answers to the personal statements; but we are asking for your opinion about all the statements.

Please mark T (true) or F (false) in front of each statement. You are not asked to give your name, and we hope you will answer as honestly as you can. Please mark your opinion on all the statements, after giving the information below.

Code Number ________

Sex ________

__ 1. Everyone can and should decide for himself what is right and wrong.

__ 2. No matter how I try, there are some things I'll never get the hang of.

__ 3. We should worry less about God's will and fate, and more about what we can do about our problems.

__ 4. I do a lot of things without much planning or organization.

__ 5. There is nothing I can do as an individual that will affect major political events.

__ 6. If I had enough time and the right tools, I could figure out how almost any machine is put together and how it works.

__ 7. My life is in the hands of a divine power who insures that things happen for my own good even if I don't understand them at the time.

__ 8. I usually plan my work carefully before I start it.
9. The individual in this country has much influence on political and social decisions, though many people don't seem to realize it.

10. I'm shy with people till I get to know them.

11. Everyone is responsible for what he is as well as for what he does.

12. I find it very difficult to understand scientific ideas.

13. Men working and thinking together can build a just society without supernatural help.


15. It is difficult for people to have much control over the things politicians do in office.

16. I think I could be a successful salesman.

17. If I had enough time and the right books to refer to, I could understand any kind of scientific theory.

18. Man cannot be trusted to manage his own affairs without some kind of supernatural guidance.

19. I like to schedule my time, so that I can get the important things done.

20. I have sometimes felt that difficulties were piling up so high that I could not overcome them.

21. There is plenty I can do about what is happening in the world today.

22. I don't think I have much influence on other people.

23. If one wants to badly enough, he can overcome any obstacle in the path of academic success.

24. I never was very good at things like card games and chess.

25. History can teach us more about how to manage our affairs than religion can.
26. I am usually rather disorganized, and I really should try to get better organized.

27. I can hide my feelings very well.

28. Even at the local level, it's difficult for one person to influence political decisions.

29. I can often change a person's mind by discussing things.

30. I've seldom been stumped by any intellectual problem I really wanted to solve.

31. I like to have everything in order.

32. I like to discuss local and national affairs with others, because I feel that everyone's opinion counts.

33. I'm more of a follower than a leader.

34. Anyone who is willing to work hard can be successful.

35. I stay out of many conversations because I don't really understand what's being talked about.

36. Our increasing technology should someday enable us to control natural phenomena like the weather.

37. Living on a schedule bothers me.

38. I almost always keep good control of my emotions.

39. Trying to change the social or political system is a waste of energy—you might as well try to fit into it.

40. If I see that people are uncomfortable, I can usually put them at ease.

41. If I had time, I could figure out the solution to almost any kind of puzzle.

42. Society will always be imperfect because man is imperfect.
43. I try to live by the motto, "A place for everything and everything in its place."

44. At times, I have been so angry that I just couldn't help doing or saying things I wouldn't ordinarily do or say.

45. As a member of our society, I want to participate as fully as I can in its decision-making processes.

46. I can never think of good conversational comebacks until long after I need them.

47. Anyone who is willing to devote enough time and effort to it can attain a position of leadership or authority.

48. I have more trouble with numbers or arithmetic problems than I do with most other things I try to figure out.

49. My desk is usually a mess.

50. I don't let things bother me the way some people do.

51. The people who work voluntarily for political parties accomplish little more than to keep themselves busy.

52. If I want to talk to somebody I haven't met, I introduce myself and start a conversation.

53. In our scientific and medical research, we must be careful not to go against God-given laws of life and death.

54. If he is sincerely concerned, any individual can have some real influence on national and world events.

55. I hate to walk into a room full of people.

56. No matter how she looks to begin with, almost any woman can make herself attractive by proper attention to her hair, skin, and clothing.
57. When I have a mechanical problem to solve, I usually ask someone to help me with it.

58. Advances in social science will someday make crime nonexistent and prisons unnecessary.

59. I manage to keep my weight pretty much where I want it.

60. One vote for President could make no difference in a country the size of the United States.

61. I think I could get good grades in any subject in college if I studied hard enough.

62. There is a law of just retribution that rewards and punishes us according to what we deserve.

63. Frequently I make a list before I go shopping.

64. People could make their individual opinions about national affairs count for much more if they'd just take the time and effort to write their elected officials.

65. People can stay healthy all the time by getting the right food, sleep, and exercise.

66. I've often wished that teachers or lecturers would slow down so that I could keep up with them.

67. If there is a supernatural power, it is not interested in the needs and wishes of individual human beings.

68. I've changed my mind too often about what career I wanted to go into.

69. I seldom have trouble with muscle spasms or cramps.

70. I don't worry much about social problems like poverty and air pollution, because there's nothing I can do about them.

71. Our problems can only be solved by a return to traditional religious principles.
72. I can nearly always finish the projects I start.

73. Sometimes an idea runs through my mind and I can't stop thinking about it no matter how hard I try.

74. My individual influence may be small, but I can still have a definite influence on important political events by voting, writing letters, and participating in organizations.

75. I wish I could flirt the way some people can.

76. If one just follows his own convictions he can get people to respect and admire him.

77. When I'm being shown how to do something new, I often have a lot of trouble learning.

78. What the world needs is more tolerance and reason and less blind faith.

79. I am often late for appointments.

80. It takes a lot to hurt my feelings.

81. Friends often come to me to "cry on my shoulder" and get my advice.

82. One of the troubles with our society is that there's too much emphasis on personal efforts toward success and achievement.

83. I enjoy the challenge of new ideas and new problems to solve.

84. Fate plays a much greater part in our lives than most people seem to realize.

85. I make it a point to pay bills as soon as I get them.

86. My moods swing back and forth a lot from high to low.

87. It would be a good thing if more people got involved in politics.
88. I envy people who are poised and at ease in social situations.
89. Anyone can break any bad habit if he wants to badly enough.
90. I often have to read things over several times before I fully understand them.
91. I'm seldom bothered by headaches.
92. I feel increasingly helpless in the face of what is happening in the world today.
93. If I really worked at it, I could be an expert chess player.
94. I get annoyed by people who are always late.
95. I often have trouble getting to sleep at night.
96. I've never been good at "small talk."
97. Anyone can learn to interact with people and have good friends.
98. Even if I wanted to, I don't think I could ever be a really good athlete.
99. I don't plan ahead very much.
100. I know how to relax for a few minutes when I'm getting tense and then go back to the grind.
101. In the realm of international affairs, most of us have absolutely no control over what happens.
102. When I'm upset over something, I usually know why and what to do about it.
103. If I had time, I could figure out the answer to almost any mathematical reasoning problem.
104. In a democracy, the people have only themselves to blame if things don't go the way they want them to go.
105. I think I could accomplish almost anything I wanted to if I tried hard enough.

106. It would be nice if wars could be prevented, but I think it's probably impossible.

107. I nearly always know where to find my belongings when I need them.

108. On some days, I seem to waste all of my time and do not accomplish anything worthwhile.

109. When I feel strongly about some issue that affects society, I think it's my duty to let people know how I feel.

110. In general, I do things deliberately, not impulsively.

111. Talking politics accomplishes nothing but to get people angry at each other.

112. If you try hard enough, you can make anybody like you.

113. Sometimes I worry a lot about something that is not really important.

114. When scientists have gained enough knowledge, we shall be able to control the future biological evolution of the species.

115. I'm often inclined to put off until tomorrow what I could do today.

116. I seldom have nightmares.

117. It's a waste of time and effort for people to get stirred up over political and military decisions they can't control.

118. The idea that our lives are controlled by some kind of predestination is sheer nonsense.

119. I've sometimes had to hunt for half a day for something I knew I had put away somewhere.
120. I don't like to waste time feeling sorry for myself.

121. People usually do as they please, no matter what I say.

122. I wish that I didn't forget things so often.
APPENDIX B

EXPERIENCE INVENTORY FACTORS

This section contains the items used for factor scores in this study which were significantly loaded by each factor. Items used were those substantially loaded by each factor but not by others.
Experience Inventory

**FACTOR 1** Aesthetic sensitivity vs. aesthetic insensitivity

<table>
<thead>
<tr>
<th>Item Key</th>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F Poetry has little effect on me.</td>
</tr>
<tr>
<td>8</td>
<td>F To be worth reading, a poem should say something that makes fairly clear sense to any intelligent person.</td>
</tr>
<tr>
<td>15</td>
<td>F I am often bored when left alone.</td>
</tr>
<tr>
<td>22</td>
<td>F I think any painting or sculpture should represent something recognizable.</td>
</tr>
<tr>
<td>50</td>
<td>F Art today does not require any talent because the lines and shapes don't have to be formed to look like anything recognizable.</td>
</tr>
<tr>
<td>57</td>
<td>F An artist should always try to express his ideas clearly so that his audience can understand him and not just use his art to relieve his own feelings.</td>
</tr>
<tr>
<td>64</td>
<td>F Psychedelic art is nonsensical and means nothing to me.</td>
</tr>
<tr>
<td>71</td>
<td>F If I were an artist, I would prefer scientific illustration to free form sculpture and painting.</td>
</tr>
<tr>
<td>85</td>
<td>T Sometimes when I am reading poetry or looking at a work of art, I feel a strong wave of excitement that seems to affect my whole body.</td>
</tr>
<tr>
<td>92</td>
<td>T I have sometimes experienced a very powerful feeling of movement when looking at certain paintings or pieces of sculpture.</td>
</tr>
</tbody>
</table>
There have been times when I have been completely immersed in nature or in art and had a feeling of awe sweep over me so that I felt as if my whole state of consciousness were somehow temporarily altered.

I can look at an object—a leaf, a stone, a flower—for a long time, continuing to discover different things about it.

Abstract art can convey more feeling to me than a conventional still life picture.

Color in painting makes an especially great impact on me.

I enjoy reading poetry that emphasizes feelings and images more than story line.

I enjoy reading stories that include a lot of descriptive imagery.

FACTOR 2 Unusual Perceptions and Associations

Item Key

2 T Sometimes I have had the impression that the walls or the ceiling were moving and changing size or shape, even though I knew that this was impossible.

9 T While lying in bed or reclining in a chair I sometimes find myself perceiving faces, objects, etc., in the shadows of the light or the design of the ceiling, etc.

16 T I often see things—like faces, animals, etc.—in cloud formations.

23 T I sometimes think of trees as expressing certain feelings, attitudes, or movements.

30 T In some kinds of sounds—such as the wind, the noise of machinery, etc.—I often imagine I hear voices.
I often think of various people I know as resembling certain animals.

I have sometimes imagined myself as some kind of animal.

I often have dreams about people I have never seen before.

At times in my life I have spent a lot of time wondering why I experience myself as this person in this body and not as someone else.

I sometimes get a great deal of enjoyment from listening to recordings of unusual sounds or sound effects.

Certain sounds seem to give impressions like those of colors, so that I can almost see colors when I hear these sounds.

Occasionally I have experienced a state in which it seemed hard to tell just where the boundary line was between me and my surroundings.

I can often see profiles or figures in the outlines of rock formations.

I can imagine different kinds of flowers representing various types of people.

The idea that plants have feelings seems silly to me.

It is rather silly to think of people as looking like plants or animals.

**FACTOR 3** Openness to Theoretical or Hypothetical Ideas

**Item Key**

3  T I often enjoy playing with theories or abstract ideas.
10 T I like to play with ideas that other people consider strange or improper.

24 T When solving a problem I am inclined to consider all possibilities even though some are unrealistic or absurd.

31 T I am quick to see "double meanings" in things people are saying or in what I am reading.

38 T I often try to formulate general principles to account for things that I read about and think about.

52 T I enjoy jokes based on a double meaning.

59 T I enjoy reading science fiction stories.

66 T I would enjoy creating a social system with laws, etc. for an imaginary utopian country.

73 T I enjoy working on "mind twister" type puzzles which require an unexpected approach to achieve solutions.

101 F A theory isn't much good unless it can be put to practical use.

115 F I do not enjoy solving mathematical problems or puzzles.

150 F It often takes me a while to catch jokes based on puns or double meanings.

157 F It is difficult for me to see more than one way to solve a problem.

164 F I have never been very interested in thinking up idealistic schemes to improve society.

**FACTOR 4** Constructive Utilization of Fantasy and Dreams

**Item Key**

4 T At times the solution to a problem has occurred to me in a dream.
11 T At times I have solved problems or created something (such as music or poetry) in my dreams.

18 T Sometimes I seem to be able to receive thoughts from certain people I know well when they are not with me.

25 T I have sometimes had a very strong impression that a certain thing has happened even though there seems to be no way I could really know.

32 T Solutions to problems or ideas for new projects come to me "out of the blue."

39 T Fairly often when I am dreaming, I know I'm dreaming and feel that I have some control over my dreams.

74 F Most of my dreams seem fairly meaningless.

102 F My most productive thinking occurs when I am wide awake and in full control of all my senses.

116 F When I arrive at a conclusion, I generally know exactly how I got there.

158 T Sometimes experiences in my dreams have predicted later events in my waking life.

165 T I can often better understand the people around me as the result of my dreams.

170 T My dreams are often related to my waking life.

175 T I often find that if I break away from a problem and think in an undirected, free-association way, the solution to the problem will suddenly appear to me.

179 T I believe that some of my most productive thinking goes on in dreams and daydreams.
FACTOR 5  Openness to Unconventional Views of Reality vs. Adherence to Mundane Material Reality

Item Key

5  T  It is possible that we had a previous existence of which we have no memory.

19  T  I often have a strong feeling which I cannot quite explain that the situation I am in is one I have been in before.

26  T  It is possible that the mind can leave the body and experience things at a great distance from the body.

33  T  It is possible for one to have foreknowledge of future events.

40  T  It may be possible for two people to communicate with each other over considerable distances via mental telepathy.

47  T  I believe that some people really do have extrasensory perception.

61  T  It is possible that we are influenced by spirits from the past or by other people.

75  T  It is possible for some people to experience color through their fingertips with their eyes closed and identify the color correctly.

89  F  The idea that any of the flying saucers people have sighted come from outer space is pretty silly. They can all be explained in other ways.

96  F  Children should read stories about real things, not stories about fantastic things like fairies, dragons, and giants.

103  F  It is definitely impossible for one person to read another person's mind.
117 F Astrology has no validity whatever.
131 F I have difficulty believing in something I cannot see or logically prove.
166 F I have never been aware of mystical sensations or moods surrounding a certain place.
171 F I do not have much interest in spiritual or mystical things.

FACTOR 6 Indulgence in Fantasy vs. Avoidance of Fantasy

**Item Key**

20 T I enjoy an active fantasy life and indulge in it fairly often.
34 T I enjoy reading fantasy stories and ghost stories.
41 T I enjoy imagining what it would be like if I could fly.
48 T I have always enjoyed games of make-believe.
62 T I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.
69 T I often imagine long conversations in which I would say to people what I really wanted to.
83 T When I imagine things, they seem very vivid and real to me. I can picture them clearly.
90 T Without fantasy and daydreams, life would seem very dull and drab to me.
97 F I try to keep all my thoughts directed along realistic lines and avoid flights of fancy.
I prefer not to waste my time daydreaming.

I would have difficulty free-associating to things and letting my mind wander without guidance or control.

I very seldom spend time imagining what might have been if only conditions had been different in my past.

If I feel my mind starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.

**FACTOR 7** Deliberate and Systematic Thought

**Item Key**

7  T  I often feel a need to gather a lot of clear-cut facts before I come to a conclusion about something.

14  T  I often feel a need to think things out very carefully before I come to a conclusion about something.

21  T  Often when I have to choose between doing two different things, I try very hard to decide which is really more important in the overall scheme of things.

49  T  I don't feel really comfortable with a topic until I can fit all of its aspects together into some kind of pattern.

56  T  I follow the adage, "A place for everything, and everything in its place," in my home.

63  T  I enjoy studying subjects such as mathematics which have a clear-cut logical organization to them.

70  T  Whenever I have to study a topic, I try to organize it in outline form and get down to essentials.
When making an important decision, I like to list all of the positive aspects versus all of the negative aspects of the situation and compare them before deciding what to do.

I do not like to make a hurried decision because I feel upset if I can't think things through carefully.

In spare moments, I frequently find myself planning how to carry out my next job or project.

When making a decision, I would rather flip a coin than spend a lot of time balancing the pros and cons of the situation.

I have trouble sticking to plans.

I try to avoid situations with a lot of rules.

I don't mind my house being fairly cluttered.

I tend to stay away from subjects that are very organized and systematic.
APPENDIX C

PERSONAL OPINION SURVEY FACTORS

This section contains the items loaded by each factor which were used for factor scores in this study. Items used were those substantially loaded by each factor but not by others.
Personal Opinion Survey

FACTOR 1 Achievement through Conscientious Effort

Item Key

1 T Everyone can and should decide for himself what is right and wrong.

11 T Everyone is responsible for what he is as well as for what he does.

23 T If one wants to badly enough, he can overcome any obstacle in the path of academic success.

34 T Anyone who is willing to work hard can be successful.

47 T Anyone who is willing to devote enough time and effort to it can attain a position of leadership or authority.

56 T No matter how she looks to begin with, almost any woman can make herself attractive by proper attention to her hair, skin, and clothing.

65 T People can stay healthy all the time by getting the right food, sleep, and exercise.

76 T If one just follows his own convictions, he can get people to respect and admire him.

89 T Anyone can break any bad habit if he wants to badly enough.

97 T Anyone can learn to interact with people and have good friends.

105 T I think I could accomplish almost anything I wanted to if I tried hard enough.

112 T If you try hard enough, you can make anybody like you.
FACTOR 2  Personal Confidence in the Ability to Achieve Mastery

Item Key

2  F  No matter how I try, there are some things I'll never get the hang of.

6  T  If I had enough time and the right tools, I could figure out how almost any machine is put together and how it works.

12  F  I find it very difficult to understand scientific ideas.

17  T  If I had enough time and the right books to refer to, I could understand any kind of scientific theory.

24  F  I never was very good at things like card games and chess.

30  T  I've seldom been stumped by any intellectual problem I really wanted to solve.

41  T  If I had time, I could figure out the solution to almost any kind of puzzle.

48  F  I have more trouble with numbers or arithmetic problems than I do with most other things I try to figure out.

57  F  When I have a mechanical problem to solve, I usually ask someone to help me with it.

61  T  I think I could get good grades in any subject in college if I studied hard enough.

66  F  I've often wished that teachers or lecturers would slow down so that I could keep up with them.

77  F  When I'm being shown how to do something new, I often have a lot of trouble learning.

90  F  I often have to read things over several times before I fully understand them.
If I really worked at it, I could be an expert chess player.

Even if I wanted to, I don't think I could ever be a really good athlete.

If I had time, I could figure out the answer to almost any mathematical reasoning problem.

Factor 3: Belief in the Capacity of Mankind to Control Its Own Destiny vs. Belief in Fate or Supernatural Forces

Item Key

3 T We should worry less about God's will and fate and more about what we can do about our problems.

7 F My life is in the hands of a divine power who insures that things happen for my own good even if I don't understand them at the time.

13 T Men working and thinking together can build a just society without supernatural help.

18 F Man cannot be trusted to manage his own affairs without some kind of supernatural guidance.

25 T History can teach us more about how to manage our affairs than religion can.

36 T Our increasing technology should someday enable us to control natural phenomena like the weather.

42 F Society will always be imperfect because man is imperfect.

53 F In our scientific and medical research, we must be careful not to go against God-given laws of life and death.
There is a law of just retribution that rewards and punishes us according to what we deserve.

If there is a supernatural power, it is not interested in the needs and wishes of individual human beings.

Our problems can only be solved by a return to traditional religious principles.

What this world needs is more tolerance and reason and less blind faith.

Fate plays a much greater part in our lives than most people seem to realize.

It would be nice if wars could be prevented, but I think it's probably impossible.

When scientists have gained enough knowledge, we shall be able to control the future biological evolution of the species.

The idea that our lives are controlled by some kind of predestination is sheer nonsense.

FACTOR 4 Successful Planning and Organization

I do a lot of things without much planning or organization.

I usually plan my work carefully before I start it.

I like to schedule my time, so that I can get the important things done.

I am usually rather disorganized, and I really should try to get better organized.

I like to have everything in order.

Living on a schedule bothers me.
43  T  I try to live by the motto, "A place for everything and everything in its place."

49  F  My desk is usually a mess.

63  T  Frequently I make a list before I go shopping.

68  F  I've changed my mind too often about what career I wanted to go into.

72  T  I can nearly always finish the projects I start.

79  F  I am often late for appointments.

85  T  I make it a point to pay bills as soon as I get them.

94  T  I get annoyed by people who are always late.

99  F  I don't plan ahead very much.

107  T  I nearly always know where to find my belongings when I need them.

108  F  On some days, I seem to waste all of my time and do not accomplish anything worthwhile.

110  T  In general, I do things deliberately, not impulsively.

115  F  I'm often inclined to put off until tomorrow what I could do today.

119  F  I've sometimes had to hunt for half a day for something I knew I had put away somewhere.

122  F  I wish that I didn't forget things so often.

**FACTOR 5  Control over Internal Processes**

<table>
<thead>
<tr>
<th>Item Key</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>T  I seldom cry.</td>
</tr>
<tr>
<td>20</td>
<td>F  I have sometimes felt that difficulties were piling up so high that I could not overcome them.</td>
</tr>
</tbody>
</table>
27  T I can hide my feelings very well.
38  T I almost always keep good control of my emotions.
44  F At times, I have been so angry that I just couldn't help doing or saying things I wouldn't ordinarily do or say.
50  T I don't let things bother me the way some people do.
59  T I manage to keep my weight pretty much where I want it.
69  T I seldom have trouble with muscle spasms or cramps.
73  F Sometimes an idea runs through my mind and I can't stop thinking about it no matter how hard I try.
80  T It takes a lot to hurt my feelings.
86  F My moods swing back and forth a lot from high to low.
91  T I'm seldom bothered by headaches.
95  F I often have trouble getting to sleep at night.
100 T I know how to relax for a few minutes when I'm getting tense and then go back to the grind.
102 T When I'm upset over something, I usually know why and what to do about it.
113 F Sometimes I worry a lot about something that is not really important.
116 T I seldom have nightmares.
120 T I don't like to waste time feeling sorry for myself.
FACTOR 6  Control over Large-scale Human Events

Item Key

5  F  There is nothing I can do as an individual that will affect major political events.

9  T  The individual in this country has much influence on political and social decisions, though many people don't seem to realize it.

15  F  It is difficult for people to have much control over the things politicians do in office.

21  T  There is plenty I can do about what is happening in the world today.

28  F  Even at the local level, it's difficult for one person to influence political decisions.

32  T  I like to discuss local and national affairs with others, because I feel that everyone's opinion counts.

39  F  Trying to change the social or political system is a waste of energy—you might as well try to fit into it.

45  T  As a member of our society, I want to participate as fully as I can in its decision-making processes.

51  F  The people who work voluntarily for political parties accomplish little more than to keep themselves busy.

54  T  If he is sincerely concerned, any individual can have some real influence on national and world events.

60  F  One vote for President could make no difference in a country the size of the United States.
People could make their individual opinions about national affairs count for much more if they'd just take the time and effort to write their elected officials.

I don't worry much about social problems like poverty and air pollution, because there's nothing I can do about them.

My individual influence may be small, but I can still have a definite influence on important political events by voting, writing letters, and participating in organizations.

It would be a good thing if more people got involved in politics.

I feel increasingly helpless in the face of what is happening in the world today.

In the realm of international affairs, most of us have absolutely no control over what happens.

Talking politics accomplishes nothing but to get people angry at each other.

It's a waste of time and effort for people to get stirred up over political and military decisions they can't control.

**FACTOR 7 Control in Immediate Social Interaction**

I'm shy with people till I get to know them.

I think I could be a successful salesman.

I don't think I have much influence on other people.

I can often change a person's mind by discussing things.

I'm more of a follower than a leader.
35  F  I stay out of many conversations because I don't really understand what's being talked about.

40  T  If I see that people are uncomfortable, I can usually put them at ease.

46  F  I can never think of good conversational comebacks until long after I need them.

52  T  If I want to talk to somebody I haven't met, I introduce myself and start a conversation.

55  F  I hate to walk into a room full of people.

81  T  Friends often come to me to "cry on my shoulder" and get my advice.

88  F  I envy people who are poised and at ease in social situations.

96  F  I've never been good at "small talk."

121 F  People usually do as they please, no matter what I say.
APPENDIX D

CORRECT SOLUTION OF THE CUBE PROBLEM

This section contains the correct solution of the Cube Problem used in this study.
Cube Problem

Imagine a solid wooden cube which is painted red all over the outside. Suppose that it is resting on a table in front of you. Let us imagine that we are going to cut up this cube into smaller pieces without moving any part of it.

First, divide the large cube into quarters by making three horizontal slices. Now divide it into quarters again by making three parallel vertical slices. Finally, divide it again into quarters by making three vertical slices at right angles to the first set of vertical slices.

The large cube is now divided into a number of smaller cubes.

A. How many small cubes are there altogether? 64
B. How many small cubes are painted red on 3 sides? 8
C. How many small cubes are painted red on 2 sides? 24
D. How many small cubes are painted red on 1 side? 24
E. How many small cubes are painted red on 0 sides? 8
REFERENCES


Gordon, Rosemary A. An investigation into some of the factors that favour the formation of stereotyped images. British Journal of Psychology, 1949, 39.


Sheehan, Peter W., and Neisser, Ulric. Some variables affecting the vividness of imagery in recall. *British Journal of Psychology*, 1969, 60, 81-84.