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REFLECTIVE EYE MOVEMENTS, AND THE
HOLTZMAN MOVEMENT RESPONSES.

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BARBARA WOLF-DORLESTER

1976

CREATIVITY, ADAPTIVE REGRESSION, REFLECTIVE EYE
MOVEMENTS, AND THE HOLTZMAN MOVEMENT RESPONSES

by

BARBARA WOLF-DORLESTER

A dissertation submitted to the Graduate
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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

CREATIVITY, ADAPTIVE REGRESSION, REFLECTIVE EYE MOVEMENTS, AND THE HOLTZMAN MOVEMENT RESPONSES

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Adviser: Professor Gertrude Schmeidler

This study attempted to investigate the relationship among creativity, adaptive regression, reflective eye movements, and the Holtzman Inkblot Technique Movement response.

Creativity in this study was measured by scores on a creativity battery, consisting of two essentially verbal tasks (the Modified Bennett Test and Alternate Uses) and two essentially visual tasks (Line Meanings and Pattern Meanings). A test of verbal intelligence, Thorndike's Vocabulary Test, G-T, Forms 1 and 2, was also administered as a means of documenting the discriminant validity of the creativity measures.

The presence of a high number of particular variables of the Holtzman Inkblot Technique, specifically the Movement, Integration, Popular, Human, Form Definiteness, and Barrier variables, together with the possible inclusion of the Anxiety, Hostility, and Form Appropriateness variables, provided the operational definition of "adaptive regression."

A list of 30 Verbal and 30 Spatial questions, adapted from Ehrlichman et al., was used to elicit reflective eye movements in the experimental situation.

It was hypothesized that: (1) those individuals who reveal adaptive regression will obtain high creativity summary scores on the creativity battery; (2) those individuals who reveal a consistent or a preference for a left or up reflective eye movement, will obtain high creativity summary scores; (3) those individuals who reveal adaptive regression will demonstrate consistent or a preference for a left or up reflective eye movement; and (4) within individuals, there should be a relationship between the production of adaptive regression and a left or up reflective eye movement measured at the time of producing those responses. Secondary hypotheses suggested that: (1) those individuals who reveal a left or up reflective eye movement will choose "soft" college majors; and (2) those individuals who reveal a preference for a left or up reflective eye movement will report more vivid visual imagery, and more vivid imagery extending to other modalities.

The subjects were 91 volunteer, female undergraduate college students, divided among five different classes. Both a group testing session and an individual testing session were necessary. The group testing sessions were scheduled during two extended class periods and the

individual sessions were scheduled either before or after the group testing. In the group testing session, the Holtzman Inkblot Technique, Form A, Line Meanings, Pattern Meanings, Alternate Uses, Modified Bennett Test, Thorndike's Vocabulary Test, G-T, Forms 1 and 2, and Sheehan's Shortened Form of the Bett's QMI were administered according to standard instructions for group administration. Each subject was presented with an answer booklet containing the above materials on which she was also asked to write her choice of college major and her preferred writing hand. In the individual session, the subject's direction of reflective eye movements was scored while responding to the Verbal and Spatial sets of questions. Additionally, a number of inkblots from the Holtzman Inkblot Technique, Form B were administered, using novel instructions, and the subject's direction of eye movements while responding to the blots was scored.

Scoring of the creativity battery was done by two independent judges whose inter-rater reliability was high, according to a scoring system developed by Price and extended by the author. Scoring of the Holtzman Inkblot Technique was done by two different, independent judges whose inter-rater reliability was high, according to standard instructions. The objective tests (Sheehan's Shortened Form of Bett's QMI, Thorndike's Vocabulary Test, G-T, Forms 1 and 2) were scored by one judge according to

standard instructions. Few high creativity scores were present.

A 42 X 42 correlation matrix was constructed containing selected scores from the creativity battery, specific variables from the Holtzman Inkblot Technique, Form A, the subject's direction of reflective eye movements, score on Thorndike's Vocabulary Test, Sheehan's Shortened Form of the Bett's QMI, handedness, and college major. Analyses of variance were computed on the Holtzman Inkblot Technique composite variables for those subjects who displayed consistent uni-directional eye movements. A 17 X 17 partial correlation matrix was constructed containing the subject's scores on the Holtzman Inkblot Technique, Form B and the direction of reflective eye movement while responding to the inkblots.

None of the correlations or analyses of variance were statistically significant at the .05 level. This suggested that no support could be given to the hypothesis that the production of Holtzman Movement responses are related to the production of creative responses as determined by the presence of high scores on a creativity battery. Additionally, no support could be given to the hypothesis that a particular direction of reflective eye movement is associated with high scores on a creativity battery, the production of fantasy material, the choice of a college major, or the reporting of vivid imagery. The model of cerebral asymmetry, hemispheric activation, and contralateral control of reflective eye movements has not been validated with this non-creative sample.

Dedicated to my husband, Michael, with
love and appreciation for his help.

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CHAPTER I
INTRODUCTION

Purpose

The investigation of individual differences in "creativity" has been a recurrent theme in the psychological literature. The definitions of creativity are numerous and no one theoretical framework has been generally accepted. The conceptual approaches to the problem of creativity have included studying the creative person (Roe, 1946; Myden, 1959; Dudek, 1968) as well as studying the creative product (Maltzman, 1960) and the creative process (Kris, 1952).

Kris (1952), following a psychoanalytic model, views the creative process as involving a "regression in the service of the ego," that is, a partial and temporary shift to a more primary process level of thinking which is followed by a return to a more secondary process, i.e., critical and reality-oriented, level of thinking. Other theoreticians and researchers (Holt, 1963; Wild, 1965) have used the term "adaptive regression" to refer to this shift in levels of psychic functioning. In this dissertation, creativity will be measured by an individual's scores on a creativity battery.

Since its inception, the Rorschach Inkblot Test, a projective technique, has been regarded as one method of

approach to the study of "imagination," a concept often associated with creativity. Rorschach (1951) hypothesized that a response to an inkblot containing a percept of a human being in action, the Human Movement response (M) was characteristic of those individuals who display a "productivity of the intelligence," with intelligence defined as the ability to create new, individual productions and associations. He hypothesized that the individual who obtained a high Movement response score would display an original intelligence, a creative ability, and a rich inner life. The rationale behind his assumptions as well as the relevant experimental studies will be discussed in the following sections.

Following Rorschach's lead, Holtzman developed a series of inkblots, the Holtzman Inkblot Technique (1958) designed to eliminate certain difficulties of the Rorschach Test as a research tool. While retaining similarities to the Rorschach and maintaining comparability to it as far as the meaning of the Movement responses, the Holtzman has a greater psychometric sophistication. Therefore, specific variables of the Holtzman Inkblot Technique (Movement, Form Definiteness, Integration, Popular, Human, and Barrier) will be used as an operational definition of adaptive regression.

In the current decade, another method of approach to the study of creativity has been the investigation of the

meaning of reflective eye movements. This phenomenon was first explored by Day (1964, 1967) who stated that the individuals who displayed right versus left lateral eye movements would differ from each other in terms of physiological and attentional processes, personality, and cognitive patterns, with the left mover showing an "internalized, subjective . . . distribution of attention." Other investigators (Bakan, 1969; Harnad, 1972) have spoken of the left mover as characterized by a greater use of pre-verbal activities and greater creativity. They have related their findings to a double-dominance model of hemispheric functioning and contralateral control of reflective eye movements (Bakan & Strayer, 1973). Recently, the phenomenon of horizontal lateral eye movement has been extended to include the vertical dimension, and a number of studies have discussed a connection between left and up eye movements (Libby & Yaklevich, 1973; Kinsbourne, 1972). While these studies and others in the area have been plagued with methodological flaws, their hypotheses about creativity are thought provoking and suggest a connection to the literature on adaptive regression.

Based on the hypothesis that adaptive regression underlies the creative process, this experiment will attempt to explore the relationship among the direction of reflective eye movements, adaptive regression, and creativity. The hypothesis of a physiological connection between the

direction of reflective eye movements and hemispheric brain organization will also be investigated. Additionally, a number of related issues which have been suggested by the literature on reflective eye movements will be explored.

Background

Creativity

The Neo-Freudian Psychoanalytic Approach. The question of who is or who is not "creative" and what is or is not "creative" remain puzzling ones for psychologists. The definitions of creativity are numerous and no one theoretical framework has been generally accepted. Therefore, as Price (1971) pointed out "at present, it seems advisable to define creativity in terms of limited, theoretical or quasi-theoretical frameworks" (p. 1). The conceptual approaches to the problem of creativity have included studying the creative person (Roe, 1946; Myden, 1959; Dudek, 1968) as well as studying the creative product (e.g. Maltzman, 1960) and the creative process (e.g. Koestler, 1964; Kris, 1952).

One psychoanalytic approach to the creative process has centered around the distinction between secondary and primary process thinking. Primary process thinking is characterized by its submission to the pleasure principle, by autistic logic, fluidity, condensations, displacements, immediate, direct, and uncontrolled discharge, and the

presence of aggressive and libidinal impulses (Schafer, 1954; Holt, 1970). Secondary process thinking is characterized by its submission to the reality principle, by logic, and reality testing, delay, indirectness, and modulation of discharge (Schafer, 1954; Holt, 1970). At every level of psychic functioning both primary and secondary processes are present, but their relative influence varies, and the individual will often shift levels, i.e., change the balance in the relative influence of primary or secondary process thinking.

One type of shift of level of functioning that has been described by Kris (1952) in relation to the creative process is that of "regression in the service of the ego." By "regression in the service of the ego" is meant a partial and temporary "inspiration" seeking shift to a more primary process level of thinking in which thinking and feeling characteristic of the primary process is admitted to consciousness because of a relaxation of defensive, regulatory, and organizing ego activities. This shift is usually followed by an "elaboration" phase in which secondary process thinking is present, and the primary process material is subjected to critical, reality-oriented and communication-oriented appraisal.

Kubie (1958) views creativity as the result of the "free play of preconscious processes" which is similar to free association and which rearranges experiences into new

constellations and filters out trivialities. Free associations "free the sensitive, fluid, and plastic preconscious system from the rigidity imposed at the conscious end of the symbolic spectrum" (p. 57), so that the creative person is one who "has retained his capacity to use his preconscious functions more freely than is true of others who may potentially be equally gifted" (p. 57). Koestler (1964), using the term "bisociation," discusses the creative process as a connecting of previously unrelated dimensions of experience through a synthetic act. MacKinnon (1962, 1965) speaks of his more creative group of architects as revealing egos that are "on more intimate terms with the id . . ." (1965, p. 280). Barron (1957) characterizes the "original" person as having the ability to "regress very far for the moment while being quite able to return to a high degree of rationality, bringing with him the fruits of his regression to primitive and fantastic modes of thought" (p. 739).

Based upon experimental data, Getzels and Jackson (1962) characterize the performance of their high creativity adolescents as showing the "ability to produce new forms, to risk conjoining elements that are customarily thought of as independent and dissimilar, to 'go off in new directions'" (p. 52). Additionally, they report that the productions of the high creativity adolescents contain more wit, humor and violence and an attitude of "toying" with the material

which they understand as revealing an acceptance of "impulses from within that are frequently inhibited, and descriptive of experiences from without that are often denied" (p. 42). They conclude that the productions of their high creativity adolescents reflect a greater availability of preconscious material that is judged "original" in that it is both "statistically unique" and "ingenious," i.e., "the use of preconscious material has not been blind but . . . in the service of the ego."

Maini (1973) believes that creative functioning requires the ability to "suspend convergent or logical considerations temporarily" and the "strength to stop this regressive mode of functioning and the ability to revert to more logical . . . ways" so that the novel ideas are offered in appropriate contexts. Gordon (1961) describes the Synectics theory approach to the study of the creative process. Synectics theory enumerates a number of clearly stated mechanisms for a group to use in order to engage in creative problem solving. The mechanisms attempt to allow the conscious use of preconscious psychological processes by encouraging the use of personal analogy, direct analogy, symbolic analogy, and fantasy analogy in an individual's thinking. The Synectics approach to a problem involves the use of primary and secondary process thinking in that the "apparently irrelevant analogy formation" must be constantly compared with the elements of the problem to arrive at a

realistic as well as novel solution.

Following this distinction between primary and secondary process thinking, Taft (1971) differentiates what he calls "hot creativity" from "cold creativity." The recognition of primary and secondary process thinking as two different types of cognitive activity led Taft to suspect that it may be possible to distinguish two types of creativity. He equates "cold creativity" with scientific creativity which is assumed to require more controls and less fantasy than does artistic, or "hot creativity." He speaks of "hot creativity" as being analagous to "ego permissiveness," i.e., a personality condition in which the ego is able to abandon its control in order to allow the realization of the potentialities of the unconscious and preconscious. Price (1970) also distinguishes between two different "types" of creative thinking. He sees "high creativity" as characterized by the "integration of thinking which is dominated by the primary process with thinking which is predominantly regulated by the secondary process" (p. 12), while "moderate creativity" is characterized by the predominance of concentrated secondary thinking, which reflects the deployment of effortful and voluntary attention.

Myden (1959) studied the personalities of creative people by testing a creative group (artists, writers) and a noncreative but equally professionally successful group (doctors, lawyers) with a battery of projective tests

(Visual-Motor Gestalt Test, Rorschach, Human Figure Drawings, Thematic Apperception Test, Vigotsky Concept Formation Test). The groups were matched for age and socio-economic status, and the only difference between them was demonstrated capacity for creative work in the arts. The Rorschachs were scored blind according to Piotrowski's system and also for manifestations of primary process, i.e., "uncontrolled discharge, autism, fluidity, and minimal selective and reflective capacity" (p. 141). Myden hypothesized that the creative group would reveal more primary process in their Rorschach than the noncreative group. The creative subjects were found to produce more regressive responses than the control Ss. That the regression was in the service of the ego (i.e. adaptive) was supported by his finding that both groups had a median F+% (good form level) of 85%.

Myden's study led the research into primary process thinking on the Rorschach and its relation to creativity, but had many methodological errors. For example, productivity on the Rorschach was not controlled, criterion contamination was not guarded against since he administered and scored the Rorschachs, and a subjective definition and scoring of primary process thinking was employed (Holt, 1970).

Holt (1963) addressed himself to the need for an objective, standardized scoring system of primary process

thinking and adaptive regression from the Rorschach Test. In his system, all responses that have aggressive derivatives, libidinal derivatives, anxious content or nonlogical or bizarre formal qualities are scored. The final ranking for amount of primary process is based upon the proportion of the subject's responses that have scorable primary process elements, with double weighting for extreme instances (Level 1 as compared to Level 2). "Defense-demand," and "defense-effectiveness" are also scored, where "defense-demand" refers to the acceptability of the response in usual social relationships, and "defense-effectiveness" refers to the success of the controlling factors associated with the primary process material (Pine & Holt, 1960). A quantitative measure of adaptive or maladaptive regression is arrived at by use of a formula which multiplies the "defense-demand" rating by the "defense-effectiveness" rating and divides by the number of primary process responses. The theoretical limits of the quantity are from +12 to -18, the positive values indicating primary process material with good control, the negative ones disruptive intrusions (Holt, 1970).

Dudek (1968) made use of a modified Holt scoring system in her exploration of adaptive regression and creativity. She studied a group of successful and creative painters and writers, a group of noncreative painters and writers, and a group of occupationally successful but

nonartist persons (businessmen, professionals, housewives). All the groups were matched for high productivity of Human Movement responses (M) on the Rorschach. She found that the creative artist group produced significantly more primary process responses than either of the two groups, and that the the two artist groups produced significantly more primary process responses than the nonartist group. In reference to whether the regression was adaptive or maladaptive, Dudek reports that the artists who gave a primary process response "frequently gave it in a body of responses that were essentially sound," with no indication of "incapacitating anxiety" and with an "easy and smooth" shifting from regressive to normal levels and vice versa. The nonartists, by contrast, showed "a disintegration of defenses and synthetic facilities under the force or intensity of their own energy" (p. 544).

Holt (1970) points out that two major approaches to a criterion measure of creativity have been used in research that attempts to test a psychoanalytic hypothesis of primary process and adaptive regression and its relation to creativity. One has been exemplified above. It is to select groups of people who differ in their creative behavior, as judged by evaluation of their creative products, but who are matched on all other variables. Another approach is to administer tests of creativity to an unselected group (in terms of creativity) of available subjects, thereby

asking them to be creatively productive in a specified way and evaluating their products with explicit criteria. The advantages of this second approach are that the judgmental operations going into the criterion are more explicit and the results more nearly approximate a continuous distribution along the continuum.

Using objective measures of creativity, Pine and Holt (1960), Pine (1962), and Wild (1965) investigated the suggested correlations between primary process and adaptive regression, and creativity. Pine and Holt (1960) administered a creativity battery, which contained among other tests Guilford's Brick Uses and Consequences tests, and a projective test, the Rorschach Inkblot Test, which was scored for primary process and adaptive regression according to Holt's system (with modifications by Goldberger). The subjects were 13 male and 14 female undergraduate students. The results indicated that the amount of primary process was not significantly related to the quality of creative productions in either the males or females. However, the measure of effectiveness of control and integration on the expression of primary process thinking on the Rorschach was significantly related to the quality of the created productions: i.e., effective control was associated with higher quality. The measure of adaptive regression correlated with higher quality productions for the males but not for the females. The authors concluded

that sample differences affect this measure. In a later study by Pine (1962) the finding of sexual differences affecting the measure of adaptive regression was supported. However, he also reported that the quality of literary production, which was judged in part for originality, was related to the expression, control, and integration of drive material within the production.

Wild (1965), using a "creative" (art students), a noncreative (teachers), and a schizophrenic group scored responses for adaptive regression and originality from an object sorting test. The responses were scored for pathology, drive, humor, response tone, and unusual property. The adaptive, original responses were defined as either original responses containing pathology but also containing adaptive elements (e.g. humor, unusual property, or pleasant tone), or original responses without pathology. She found that the creative group produced significantly more adaptive original responses than either of the other groups.

The psychoanalytic hypothesis as stated by Kris (1952), that adaptive regression and its primary and secondary process components underlies the creative process, has received broad support. What is most important is the generally accepted assumption that creative thinking is somehow different from the rational, logical, deductive kind of thinking. A number of researchers have been

concerned with the empirical specification of particular aspects of creativity.

Techniques of Scoring. Guilford (1954, 1967), in a major contribution, has analyzed creative processes into a number of discrete functions, devised tests to measure these functions, and has studied their relationship to intelligence. In his "structure of intellect" model, he proposes three dimensions of the intellect: operation, content, and product. The five classes of intellectual operations are cognition, memory, divergent production, convergent production, and evaluation. It is the divergent production abilities, i.e., the capacity to generate a wide variety of diverse ideas in a situation where no one right answer exists, that Guilford considers to be the most important for creativity. By contrast, the convergent production abilities, i.e., the ability to give a single correct answer to a problem, as well as cognition and memory are usually encompassed in intelligence testing.

The intellectual operations are associated with four categories of informational content: figural (measured by spatial or visual-perceptual tasks), symbolic (tests composed of numbers and letters), semantic (tests involving verbal meanings), and behavioral (information required to understand the behavior and emotions of others). They are also associated with six categories of intellectual products: units, classes, relations, systems, transformations, and

implications. Transformations are seen as being particularly important for creativity. The operation, content, and product dimensions form a cubical structure consisting of 120 cells, each of which supposedly corresponds to a specific intellectual ability.

Two of the tests developed by Guilford et al. are the Alternate Uses (1960) and Consequences (1958) tests. The Alternate Uses test has high loadings on the factors of "spontaneous flexibility" and originality (Wilson, Christensen, Merrifield & Guilford, 1960). It contains 9 items. It lists the name of a well-known object and a statement of its common use, and the subject is required to list as many as six other, less common uses. The less common uses must belong to different classes of uses. The Consequences test presents the subject with a hypothetical situation and asks him to list possible consequences of the event. This test loads on the originality and ideational fluency factors. Originality is defined as the ability to produce statistically rare, clever, and remotely associated responses.

Price (1970) developed the Modified Bennett Test (MBT), a modified version of Bennett's (1944) unpublished Test of Productive Thinking. The Bennett items consist of descriptions of imaginary situations to which the subject is asked to respond with consequences which might follow, given the hypothetical situations existed. Price (1970b)

reported interrater reliabilities for the criterion scales in the moderately low to high range. Contingency coefficients ranged from .30 to .64. Agreement between the scores of two judges ranged from 82 to 99%. Split half reliabilities ranged from .39 to .78. Price (1970b, 1971) also noted that some support for the construct validity of the test was provided by the significant differences in the predicted direction between the scores on the criterion and overall creativity scales in the "unregulated" condition and the corresponding scores in the "regulated" condition.

Both Price (1970) and Wild (1965) have found that higher creativity scores are achieved in the "unregulated" condition. Harris and Evans (1973, 1974) found increased divergent responses with instructions to the subjects to respond creatively. Barron (1969), using the Bennett Test in a study of originality in graduate students found it to be a good predictor of faculty ratings of originality when scored for originality and "cosmicity." Guilford's (1958) Consequences test is similar to the Modified Bennett Test and shows loadings on the factors of originality and ideational fluency. Barron (1969) found a correlation of .35 between originality on the Consequences test and an originality rating gotten from a "living-in-assessment" of 100 Air Force Captains. This brief review appears to present enough evidence that the Bennett type items of the Modified Bennett Test stimulates thinking that can be

categorized as to its originality, novelty etc.

Many other researchers in the area of creativity have echoed Guilford's concern with originality or novelty of the response (Barron, 1968; Wallach & Kogan, 1965; Jackson & Messick, 1965; MacKinnon, 1962; Price, 1971). However, other criteria were thought to be needed. Thus, Wallach and Kogan (1965) scored their protocols for uniqueness (statistically determined) and fluency (number of productions) while Barron (1968) scored his protocols for originality and adaptiveness (adaptive to, or of, reality).

Jackson and Messick (1965) suggest four criteria to be used in judging the creativity of a product: unusualness or novelty, appropriateness, transformation, and condensation. Unusualness is judged according to the response's statistical infrequency in light of certain norms. Appropriateness is judged according to whether the response fits the context. Transformations are judged according to the strength of the constraints that had to be transcended, while condensations are judged according to the product's "summary power," its concentration of meaning which causes one to re-examine and re-experience the response. Jackson and Messick (1965) point out that the criteria of transformation and condensation are closely related to two mechanisms of the dream work in psychoanalytic theory, so that "the present formulation includes elements that, from a psychoanalytic point of view, illustrate the role of

primary process in creative activity" (p. 321).

The personal qualities and cognitive styles that correlate with the 4 criteria are originality and the tolerance of incongruity, intuitiveness and sensitivity, openmindedness and flexibility, and spontaneity and a poetic orientation, respectively. They characterize the impact of the product on the viewer as evoking either surprise, satisfaction, stimulation, or savoring according to whether the response is unusual, appropriate, contains transformations or condensations, respectively.

Price (1970) has suggested 5 criteria which he had used in scoring the responses to the Modified Bennett Test items: novelty, appropriateness, non-triviality, surprise and stimulation of thought, and synthesis of divergent domains of thought. In an elaborate scoring manual, Price (1971) defines his criteria and explains his rating scale and scoring procedure. Briefly, novelty and appropriateness are defined according to Jackson and Messick's (1965) definitions. Non-triviality is listed as a criterion to prevent the trivial, and therefore oftentimes unusual, response from being regarded as creative. The surprise-stimulation criterion measures the appreciative response of the observer, and refers to a response which is highly surprising in that it stimulates additional thought on the part of the observer, and is unusual, appropriate, and non-trivial. The divergent synthesis criterion is included

as a means of assessing the structure of the creative process which resulted in the product. Creativeness is scored in terms of the extent to which the lines of thought initially diverge from one another before being brought together in a creative synthesis in the response.

In the assessment of "creativity," a distinction must be made between an individual's scores on a test that purports to measure creativity and a creative achievement or product, such as, for example, a painting or sculpture. This dissertation will consider only an individual's score on a battery of tests as a measure of his "creativity."

Certain Theoretical Concerns. The distinction between verbal and visual creativity as well as between creativity and intelligence must be made. Wallach and Kogan (1965) have pointed out that individuals may vary in the way in which they encode experiences; they may differentially rely upon semantic or iconic encodings. Kogan and Pankove (1972) reported differences among populations in productivity and uniqueness on semantic and figural creativity tasks and suggested that further experimentation is needed on the issue of verbal-figural differences. Wallach and Wing (1969) administered 4 creativity tasks, two verbal (Uses and Similarities) and two visual (Line Meanings and Pattern Meanings) to a sample of 503 male and female college freshmen. The Line Meanings test consists of 9 discrete abstract designs formed by a continuous line. It was

developed and first used by Wallach and Kogan (1965) in individual testing with fifth grade students. A shortened form was developed and used by Wallach and Wing (1969) with a college age population in a non-game-like situation. The Pattern Meanings test consists of 9 discrete abstract designs formed into a pattern by a number of discontinuous lines. It too was first developed and used by Wallach and Kogan (1965), and Wallach and Wing (1969) developed and used a shortened form with a college population in a non-game-like situation. Wallach and Wing (1969) reported that the correlations for productiveness and uniqueness among the four tasks were high, yet the listed correlations for the visual tasks with each other were higher than their correlations with the verbal tasks. It seems, therefore, that while creativity in response to a verbal or visual stimulus may be closely related, this relationship should be investigated. The statistical analyses of the data in this dissertation examined them separately.

A creativity battery has been assembled consisting of 4 tests, two tests using verbal stimulus materials and two tests using visual stimulus materials. The decision to include two verbal tasks and two visual tasks, as opposed to one of each, rests on the desirability of increasing the reliability of measurement by sampling a diverse range of task stimuli. Although Wallach and Wing (1969) reported high correlations for productiveness and uniqueness on four similar tasks administered to a similar

population, the inclusion of different scoring criteria, the need for further experimentation on the issue of verbal-figural differences on creativity (Kogan & Pankove, 1972), and the nature of the Holtzman Inkblot Technique as a visual stimulus argue for the inclusion of both verbal and visual stimulus materials.

Wallach and Kogan (1965) also showed that in a fifth grade, middle class sample, creative ability (as measured by individual fluency and unusualness) had virtually no relation with conventional IQ and achievement indices. Wallach and Wing (1968) have confirmed this finding for female college age students. Getzels and Jackson (1962) found low positive correlations between IQ (as measured by the Binet, Henmon-Wilson, or WISC) and creative thinking (as measured by the Word Association, Uses for Things, Hidden Shapes, Fables, and Make-Up Problem tests) in a large population of students from the sixth grade through the senior year of high school. They conclude that the positive correlations between IQ and each of the creativity measures indicates "that a certain amount of intelligence is required for creativity, but that intelligence and creativity are by no means synonymous" (p. 125). Barron (1957) administered a battery of tests designed to measure originality to a group of 100 Captains in the Air Force who participated in a "living-in-assessment" of their originality. The battery included Guilford's Unusual Uses,

Consequences, and Plot Titles Test, as well as an objective checklist which was filled out by both psychologists and the subjects, and an intelligence test (Concept Mastery Test). Barron found a significant relationship between scores on the Concept Mastery Test and the Originality Composite, but this relationship did not account for all of the differences in personality characteristics between original and non-original subjects. With the influence of verbal intelligence partialled out from the correlations between the Originality Composite and other test performances and ratings, the significant relationships that remained characterized the original person as showing a greater disposition towards integration of diverse stimuli, as having more energy and fluent output, as being more self-assertive, more responsive to impulse and emotion, and more clever and imaginative than the non-original person. While the issue of the relationship between scores on a creativity test and scores on an intelligence test is important and deserving of mention, it will not be fully dealt with in this dissertation. A test of verbal intelligence will be administered, however, as a means of controlling for differences in intelligence and documenting the discriminant validity of the creativity measures. Vocabulary tests in general have proven to be the best single measure of basic level of intelligence (Tomkins, 1948).

As was stated earlier, a quasi-theoretical framework

for the assessment of creativity has been suggested by Price (1971). Within this framework, 5 criteria are used conjointly in evaluating a subject's verbal responses to test items of the Modified Bennett Test. The Modified Bennett Test presents a verbal stimulus, and Price's criteria have not previously been used in assessing responses to visual stimuli. In this study, the criteria will also be applied to the evaluation of a subject's responses to visual stimuli.

The point of view that is presented here assumes that the creative process requires the facile and ready integration of primary process dominated thinking with the regulating influence of secondary process thinking. This integration is made possible by "rapid shifts in the levels of psychic functioning" (Kris, 1952). The concept of "regression in the service of the ego" assumes that the individual is able to partially and temporarily admit into consciousness primary process material and is then able to marshal this material, mold it into a reality-oriented form, and communicate it.

The Holtzman Inkblot Technique (HIT)

The HIT is a projective test of personality characteristics which was developed in an attempt to correct the psychometric deficiencies of the Rorschach Inkblot Test (Rorschach, 1951) but maintain its basic structure and qualitative data. The Rorschach has been

criticized for its failure to provide an objective scoring system (Zubin, 1962; Meehl, 1967), its lack of satisfactory test-retest reliability (Zubin, 1962), or internal validity (Salmon, Arnold, & Callyer, 1972), and for the failure to find any significant relationship between its scores and intelligence or creative ability (Zubin, 1962). While some researchers have found the Rorschach to be a reliable instrument (Dana, 1962; Dana & Comer, 1972; Erginel, 1972), other investigators have pointed to the Rorschach's tendency to be affected by the experimental situation (Greenberg, 1972; Hersen & Greaves, 1971; Lords, 1962). At least, then, the Rorschach Test appears to be of limited use because of psychometric difficulties.

Holtzman's (1961) goals were to maintain comparability with the Rorschach by eliciting and scoring similar variables while improving the psychometric utility of the blots. He developed two "parallel" sets of inkblots each containing 45 blots that were selected and matched on the basis of item analyses of hundreds of experimental blots (Gamble, 1972). Only one response is given per blot so as to hold the number of responses for each individual relatively constant and to assure that each response is given to an independent stimulus. Twenty-two variables are scored. Standardized instructions and norms for both individual and group administrations (Swartz & Holtzman, 1963; Swartz, Witzke, & Megargee, 1970) are both available,

and the comparability of individual and group scores has been established (Holtzman, Moseley, Reinehr, & Abbot, 1963). Interscorer correlations range from .89 to .99 when trained scorers evaluate individual protocols, and with less trained scorers, interscorer correlations range from .73 to .89 (Gamble, 1972). Intrascorer consistency ranges from .89 to .97 and test-retest stability ranges from .39 (for Penetration) to .82 (for Location) for a period of one week (Gamble, 1972). Test-retest correlations for a period of one year range from .24 (for Penetration) to .75 (for Location) (Gamble, 1972). The HIT has been shown to be susceptible to "examiner" variables (Hamilton & Robertson, 1966; Simkins, 1960), but the possibility of experimenter bias is minimized by its greater psychometric accuracy, the use of standardized instructions, and a group setting where examiner variables should be diluted.

The possibility of sex differences being related to differential reliance upon specific HIT variables was explored by Hanssen and Teigen (1971). Samples of men and women with comparable age and education were tested using the group version of the HIT. Ten HIT variables were included in the study (Rejection, Form Definiteness, Color, Shading, Movement, Integration, Human, Animal, Sex, and Popular). Significant sex differences were found for 7 of the 10 variables with women scoring higher on Movement, Integration, Human, Animal, and Popular. Men scored

higher on Rejection and Sex. Some of the original HIT variables on which significant differences were found belong to the Factor I (Movement, Human, Integration, Popular, Form Definiteness, & Barrier) found in the HIT factor analysis (Holtzman et al., 1961). The authors conclude, therefore, that the women tended to be more perceptually and imaginatively expressive than the men.

Holtzman et al. (1961) conducted an experiment in order to test their assumption that the HIT is comparable to the Rorschach. HIT and Rorschach protocols (scored independently according to Beck's system) of 72 high school students were compared on eight variables that were assumed to be comparable in the two tests. When Rorschach scores were adjusted for response frequency, the correlations between the two tests ranged from .30 for Form Appropriateness to .79 for Animal content and all correlations were significant beyond the .01 level. With corrections for attenuation (due to the sources of error of the unknown reliability of the Rorschach scores and the lack of exact equivalence between scores from the two systems), the correlations ranged from .51 (for Shading) and .57 (for Human Movement) to values greater than 1 for Human and Animal content.

The tentative comparability of the HIT and the Rorschach, and the placement of the HIT within the Rorschach tradition, suggest that a review of the relevant

literature on the Rorschach Human Movement response (M) may be helpful in showing what the Movement response implies in the HIT. With the introduction of his test in 1928, Rorschach (1951) hypothesized that a response to an inkblot containing a percept of a human being in action, or an animal in a humanlike action, (the Human Movement response or M) was characteristic of those individuals whose interests "gravitate more toward their intra-psychic living rather than toward the world outside" (p. 64). He claimed that the number of Movement responses rises in proportion to the "productivity of the intelligence" with intelligence being defined as the ability to create new, individual productions and associations. He hypothesized that the individual who obtained a high Movement response score would display an original intelligence, a creative ability, and a rich inner life which also would be reflected in a high number of good form responses, a large percentage of whole responses, a small percentage of animal percepts, and a large percentage of original responses.

Rorschach, however, did not clearly explain the dynamic process that would account for the association of the high Movement response with the presence of a rich imagination. Klopfer et al. (1954) stated that, in Rorschach's system, the Movement response implies a kinaesthetic projection which, in turn, implies an imaginal process. The individual who responds with a Movement is

viewed as being free to use his imaginal processes to enrich his perception of the world; he is exercising imagination when he reads movement into a static inkblot. According to Klopfer et al., "creativity" is characterized by Movement responses of good form and is suggestive of the capacity to integrate inner experience with external reality.

Kuhn (1960) and Fuerrer (1960) offer similar interpretations. Kuhn (1960) states: "the relationship between Movement and creativity. . . . may be derived without difficulty, since 'creativity' . . . actually means 'bringing to life' . . . the creative person at first glance perceives his environment as animated and moving. This experience he can direct either into artistic endeavor or into aesthetic enjoyment. Such creativity is revealed by. . . . movement responses on the Rorschach" (p. 336). Fuerrer (1960) advances the notion that a Human Movement response involves "a double falsification of perception," i.e., what is an inkblot is changed into a human figure and then is endowed with movement. The turning of the gestalt into a perceptual illusion of a moving form: "means not only that I detach myself from experience, but it also means that in my imagination I dissolve the stiffness and that I change over that which is given in reality. It means that I make a renovation, that I remodel, that I introduce a development, a happening, a becoming. It means that I

create life because life expresses itself mainly in movement. The interpretation of an inkblot as a moving form is a creative act" (pp. 311-312).

Schachtel (1959, 1966) views projection as the basis for the perception of movement. Projection is defined as "the psychic mechanism by which one attributes qualities, feelings, attitudes, and strivings of his own to objects of the environment" (p. 239, 1966). This capacity to enliven a percept by looking at it, by putting oneself inside of it in imagination, is what Schachtel defined as the capacity for "creative experience." The capacity for the "creative experience," then, is a creative factor in the act of experiencing and need not be associated with creative production. His discussion of allocentric perception as "the fullest perception of the object . . . characterized by an inexhaustible and ineffable quality, by the profoundest interest in the object, and by the enriching, refreshing, vitalizing effect which the act of perception has on the perceiver" (p. 177, 1959), clearly places it in the realm of a creative experiencing. It is this allocentric perception that is involved in the perception of movement in the Rorschach inkblots.

Stark (1965a, 1965b, 1966) relates the Rorschach Movement responses, not only the Human Movement response, to his "meaning context of creativity" and not to his "context of novelty." He states that the "context of

meaning is the one in which we speak . . . of a person or product possessing one or more of the following kinds of imagination . . . aesthetic, analogical, animistic, anthropomorphic, autistic . . ." (p. 852, 1965b). By contrast, the context of novelty is characterized by the adjectives "adventurousness . . . audacity, boldness" for example, and is represented by the original responses on the Rorschach Test. This novelty sense of creativity is associated with action and problem-solving while the meaning sense of creativity clusters with "experience" and "consciousness-expansion."

The theoretical literature, therefore, clearly points to a connection between the Rorschach Movement responses (human), or all Rorschach Movement responses (animal and inanimate objects), and some form of creative imagining or experiencing. The experimental literature, however, reveals conflicting findings.

In an investigation of the internal validity of the Rorschach profile analysis, Salmon, Arnold, and Callyer (1972) administered specially constructed blots (designed to vary all determinants simultaneously) to 47 undergraduate subjects. Using a repertory grid technique, they attempted to assess the relationship between four constructs referring to the determinant properties of inkblots (Shading, Movement, Form, Color) and four constructs referring to their supposed psychological meanings (Anxiety, Imagination,

Intellectual Control, Emotionality, respectively). The repertory grid involved the subjects individually rank ordering the 8 inkblots on each of the 4 constructs and the 4 affective responses. The results indicated that there is a common pattern of relationships between constructs which is significant above individual variations. The authors conclude that there is a definite general structure of conceptual relationships among the constructs used to define the test properties and personal reactions to the blots. However, the relationship is not necessarily the one hypothesized by Rorschach. For example, Movement, which was assumed to relate to Imagination, did so but also correlated with Emotion (Color). It should be kept in mind, however, that these results did not emerge from testing with the Rorschach Inkblots and their applicability may, therefore, be limited.

Wittenborn (1962) analyzed the responses of 247 students to a group testing using the Harrower-Erickson (1950) check list (a multiple choice form of the Rorschach Test). Twenty-one of the basic scores of the Klopfer (1954) system were intercorrelated and subjected to a centroid analysis as a means of evaluating certain hypotheses concerning the behavioral similarities and dissimilarities of Rorschach responses. The relevant hypotheses were that in a factorial analysis of the various Rorschach response categories: (1) the pattern of factorial composition for

the human movement response would be different from the one for responses involving the use of color; (2) the whole, color-form, pure color, pure texture, and pure diffusion response categories would be intercorrelated in a manner which would yield a factor different from the factor which is important in determining the common factor variance of the pure form, human movement, and the detail response categories; (3) a general factor of productivity would be present, and (4) the response scoring categories would differ in the degree to which their common factor variance was due to a productivity factor.

Four factors emerged which revealed several clustering tendencies after a series of orthogonal rotations. The relevant findings were related to Factors I, III, and IV. Factor I supported hypothesis 1 and showed that the factorial composition of the Movement category was different from the factorial composition of the color-form and color categories. Factor III supported hypothesis 2 while Factor IV supported 3 and 4 and implied that some separately interpreted scoring categories overlap each other because of productivity. Wittenborn's findings are important because they reveal that the Movement response category does indeed tap into a different personality dimension from the color category (contradicting Salmon et al.'s data), that the Movement response is factorially related to pure form response (as Rorschach hypothesized), and distinct from the

whole response (contrary to Rorschach) and that a control for productivity is necessary (as Holtzman stated). Although his study was administered using a different form of the Rorschach Inkblots, it deserves consideration because of its elegant statistical analysis. He explains his results in terms of differences in degree of perceptual control. The human movement, large detail, and pure form responses involve a higher order of perceptual control than the whole, color-form, pure color, pure texture, and pure diffusion responses.

Dudek (1968) hypothesized that individuals who give a large number of Movement responses (minimum 5) would show a greater ease in expressing themselves creatively than individuals who give a low number of Movement responses (0 to 2) on the Rorschach. Although creativity need not be associated with creative production (Schactel, 1966), Dudek pointed out that "persons with many Movement in their records whether they habitually use this energy creatively, reproductively, or receptively . . . should be capable of self-expressive productivity . . . if the request for this kind of expression is made . . ." (p. 453). The group Rorschach was administered to a large population out of which two groups were chosen, a high Movement group and a low Movement group. The groups were matched for age, education, and socioeconomic status. They were tested for creative expression by means of written and verbal TAT,

projective drawings, and the Lowenfeld Mosaic Designs. Their results revealed that: (1) the quantity of Movement shows a significant positive relationship to the ease of creative expression, and the quantity of whole responses (W) tends to show a significant positive relationship to ease of creative expression; (2) Sum C (color responses) and the number of responses (R) are not significantly related to the ease of creative expression in either the high Movement or low Movement groups.

Rawls and Slack (1968) administered a group Rorschach to a group of artists (painters and sculptures) and non-artists (teachers and students). The groups were matched for sex, age, verbal intelligence (Thorndike-Gallup Vocabulary Test), and education. The protocols were scored by 2 independent judges using both the Klopfer and Beck systems. The quantitative analysis of their data revealed that the M, sum of M, and M% as well as the W, sum W, and W% scores significantly differentiated the two groups according to both the Klopfer and Beck systems, with high M and high W being characteristic of the artists. In the content categories, the artists were characterized by a significantly higher number of sex, human, and abstract responses and a significantly lower number of animal responses. They discuss their results in terms of the artists displaying a greater capacity for perceptual organization, a greater intellectual flexibility, and

synthesis, a richer and more productive imagination, and a "willingness to express ideas beyond the everyday material world and conventionality" (p. 236).

Tomkins (1948) reported a positive correlation between M% and flexibility of thinking measured by the Guilford Zimmerman aptitude battery, Test V, a test of spatial orientation and no significant relationship between M% and intelligence scores, measured by the Guilford Zimmerman aptitude battery, Test I, which is a multiple choice vocabulary test.

Nicholls (1971) administered a group Rorschach and a test of divergent thinking (Wallach & Kogan's Pattern Meanings and Line Meanings) to 60 students in the 6th grade. The Rorschach was scored for Movement responses and the Pattern Meanings and Line Meanings were scored for number, uniqueness, and movement. Nicholls reported that "all scores were quite highly correlated and the two movement scores correlated as highly with number and uniqueness scores as with each other" (p. 698).

Prados (1944) attempted to arrive at a personality profile of artists using the Rorschach Test. He administered and scored the Rorschach according to the standardized instructions for the individual administration. His subjects were 20 male and female adult professional painters. The quantitative analysis revealed an overemphasis on whole responses, a high form percentage, a high number of movement

responses, a low number of animal responses, and a reliance upon the color-form response. In his discussion, he describes the artists as having among other things, a "richness of the inner interests and stimuli for spontaneous creative thought" (p. 183), and a "rich, rather mature and adjusted inner life" (p. 183).

The studies that have been reviewed so far all point to a positive relationship between the production of human movement responses on the Rorschach and creative potential. However, experiments by Roe (1946), Rust (1948), Griffin (1958), and Zubin (1962), for example, present contradictory data.

Zubin (1962), referring to several studies of creative ability on creative and non-creative writers, mathematical statisticians, and high school students claimed that "all have failed to reveal any differences in Rorschach performance, and even tests especially designed to elicit movement have failed" (p. 76).

Roe (1946) administered the Rorschach Test to 20 male American artists. The study was intended to explore the effects of alcohol on the creative process, so the painters ranged from moderate to heavy drinkers. The Rorschach was individually administered and scored according to the Klopfer system and was also recorded on Monroe's Inspection Technique Check List. No definite personality pattern emerged for the group as a whole but certain types of

responses were characteristic of most of the subjects. They showed an overproduction of whole responses, color and shading shock, a high number of anatomy and sex responses, vague or poor forms and a diminution in the human movement response but an excessive use of animal movement and inanimate object movement responses. Roe concluded that the Rorschach protocols did not show any evidence of creative ability as reflected in the Movement response, but this conclusion may be qualified as the excessive use of animal and inanimate object movement responses may point to creative potential (Holtzman et al., 1961; Stark, 1965a, 1965b, 1966).

Rust (1948) attempted to evaluate the relationship between the Movement response and creativity by simplifying the stimulus materials by utilizing only two determinants, contour and shading. He chose the Levy Movement Blots (an inkblot test constructed similarly to the Rorschach but thought to encourage more movement responses) for this purpose. These Blots were individually administered to children, 9 to 13 years old. The creativity of these children was rated by art supervisors according to the criterion of sensitivity of line, use of color, amount of detail, spatial arrangement, and interest value of their drawings. Differences in chronological age, mental age, IQ, or sex were not significant in influencing the number of Movement responses produced. He reported a negative

relationship between creativity and the Movement response.

Griffin (1958) also used the Levy Movement Blots in her studies of the creativity of 50 undergraduate women. The subjects were rated as highly creative or as non-creative by at least one teacher and two students. The groups were matched for age, sex, year in college, and intelligence (ACE scores). Ten subjects divided into two groups, one group creative and highly intelligent (superior ACE scores) and one non-creative and of average intelligence, were also included in an attempt to evaluate the relationship between intelligence and creativity. The results revealed no significant differences between the creative and non-creative groups, and the direction of difference was negative. In terms of intelligence, the differences were not significant and again tended to be in the negative direction.

Turning to the studies using the HIT, in a factorial analysis of the HIT, using individually administered protocols from both normal (e.g., college students) and abnormal (e.g., hospitalized schizophrenics) subjects, Holtzman et al. (1961) isolated two factors in which Movement responses were important. Factor I is defined by Integration, Movement, Human, Popular, Barrier, and Form Definiteness. A high amount of this factor is interpreted as revealing "well organized ideational activity, good imaginative capacity, well differentiated ego boundaries,

and awareness of conventional concepts" (p. 171). Factor III is defined by Pathognomic Verbalization, Anxiety, Hostility, and Movement, and a high amount of this factor is interpreted as revealing "disordered thought processes coupled with an active though disturbed fantasy life" (p. 171).

Holtzman et al. (1963) also developed a group form of the HIT. The group administration of the HIT requires the use of standardized 35mm color Kodak slides. The lack of any differences between the scores from the individual and group versions in a study by Holtzman et al. (1963) indicates that slight variations in hue or saturation on the slides do not affect the total scores when employed with normal college students. The split-half reliability coefficients of the group form range from a low of .23 for Space to a high of .91 for Location, with a median coefficient value of .64. These values are very similar to those found for the individual version based on a comparable sample of college students during the standardization of the individual HIT (Swartz & Holtzman, 1963). Test-retest reliability coefficients for an interval of one week range from a low of .25 for Penetration and Popular to a high of .65 for Location, with a median coefficient value of .49. These values are similar to those obtained with the individual version after an interval between tests of one week (Swartz & Holtzman, 1963). All of the variables

may be scored with the group version except for Reaction Time.

Megargee (1966), however, pointed out that Response Length (RL), i.e., the mean number of words used in each scorable response, may be an important variable of Factor I in both group and individually administered forms. Megargee correlated Response Length with all of the HIT variables in two samples (84 college students; 75 male juvenile delinquents, individually administered form) and found a number of significant positive relationships in both samples between Response Length, Movement, Abstract, Anxiety, Hostility, and Barrier scores. Furthermore, when Response Length was factor analyzed with the other HIT variables, it was found to load (.71) on Factor I. Megargee also manipulated Response Length in an attempt to assess its relationship to Movement. One group of high Movement subjects and one group of low Movement subjects (determined on the basis of HIT, Form B) were subdivided into groups encouraged to give long responses (30 words) and groups encouraged to give short responses (10 words). Form A of the HIT was individually administered. The manipulation of Response Length had a highly significant influence on Movement production in all groups. For example, the high-Movement-long group produced a mean Movement of 71.20 while the high-Movement-short group produced a mean Movement of 25.53. Megargee's findings throw doubt on Holtzman et al.'s

contention that they have satisfactorily dealt with the contaminating influence of variable response productivity on the scores by limiting the subjects to one response per card. It appears that the influence of Response Length must also be controlled and analyzed.

Megargee's (1966) findings influenced Gray's (1969) study of the relationship between creativity and primary process thinking. Gray attempted to determine whether HIT measures of primary process would still correlate significantly with measures of creativity when Response Length was partialled out. The HIT (Forms A & B) was individually administered to 100 male college students and was scored for primary process thinking using Holt's (1963) system. Creativity was operationally defined by a score on a battery of six tests of divergent thinking. The correlation between the HIT primary process score and the score on the creativity battery was low but significant. However, when productivity scores (Response Length on the HIT and number of responses on the creativity tests) were partialled out, the correlation level fell and was no longer significant. Productivity on the HIT correlated .77 with the total primary process score while productivity on the creativity tests correlated .81 with the total creativity score. Dudek (1968) and Myden (1959), however, report a positive relationship between primary process and creativity.

Echoing Dudek (1968) and Myden's (1959) positive

results, Richter and Winter (1966) administered the group form of the HIT to two groups of female undergraduate students. One group was defined as having good creative potential and one group was defined as having poor creative potential, based on the Myers-Briggs Type Indicator. The groups were matched for age and verbal ability. They found significant differences between the two groups with the high creative potential group scoring higher scores on the Form Definiteness, Form Appropriateness, Movement, Human, Integration, Anxiety, Hostility, Abstract, Color, and Pathognomic Verbalization variables. The authors explain these results as showing, within the creative group:

- (1) a richer perception and productive imagination (Movement, Human, and Abstract);
- (2) emotional responsiveness (Color);
- (3) perceptual precision (Form Definiteness);
- (4) complex and integrated percepts (Integration);
- (5) more susceptibility to emotional disturbance (Hostility, Anxiety, and Pathognomic Verbalization); and
- (6) good reality testing (Form Appropriateness).

They conclude that "the overall picture is one of richness and tension, an ability to go beyond the commonplace and matter-of-fact aspects of the real world without losing sight of the requirements of reality" (p. 68).

Lehrer (1969) administered the group HIT and three creativity tests (Southern California Tests of Creative-Thinking Abilities consisting of Associational Fluency,

Alternate Uses, and Match Problems) to 92 female and 42 male undergraduate students. He found creativity in males significantly correlated with the Movement, Abstract, Hostility, and Barrier variables of the HIT. For females, the significant correlations of creativity with the HIT were for Location, Form Appropriateness, Color, Abstract, Form Definiteness, Integration, Human, Animal, and Popular. Hanssen and Teigen (1971) reported women scoring higher on the Movement, Integration, Human, Animal, and Popular variables.

Clark, Veldman, and Thorpe (1965) investigated convergent and divergent thinking in a group of talented adolescents which included 16 HIT variables in an analysis of several measures related to these cognitive styles. Convergent thinking was measured by total IQ scores in the California Test of Mental Maturity, Short Form, and divergent thinking was measured by a composite score on Guilford's Consequences, Common Situations, and Seeing Problems tests. They found that there were no significant main HIT effects associated with convergent thinking but that Location, Movement, Anxiety, Hostility, Color, and Penetration successfully discriminated between the two levels (high and low) of divergent thinking. They interpreted their results as showing "a consistent tendency for subjects high on divergent thinking ability to give freer rein to imaginative production when presented with the opportunity to do so . . . the high divergent thinking

subject is more responsive to the stimulus characteristics of the inkblots but, at the same time, has greater freedom to go beyond the immediate stimuli" (pp. 162-163).

The ability to see human movement in the HIT does not seem to be a function of the form of the blots but rather is related to the individual's capacity for imagination. Tedford and Lake (1969) conducted an experiment to investigate the hypothesis that the balanced composition of the blots contributed to the production of Movement responses. Holtzman (Form A) protocols were analyzed for differences in number of Movement responses evoked by balanced versus unbalanced blots. Two judges had independently preselected specific blots as symmetrical and unsymmetrical. Additional protocols were obtained where symmetry was destroyed by masking half of the slide. The results indicated that symmetrical blots do not produce more Movement responses. The authors concluded that the Movement responses are resistant to environmental influences and seem to originate in the fantasy life of the individual.

Holtzman, Swartz, and Thorpe (1971) studied 31 male architects, 28 male artists, and 26 male engineers over a 5 year period in an attempt to investigate the influence of different perceptual styles on inkblot responses. The subjects represented three different modes of visual experience as defined by their fields of study: architecture, abstract art, and engineering drawing, respectively.

A battery of psychological tests were administered, but only the results on the HIT will be discussed. The results indicated that the artists showed significantly lower mean scores on Location, Integration, and Form Appropriateness. This was interpreted as the artists' reliance upon the whole response and their lack of concern with details of form and structural organization. This finding is in accordance with previous research with the Rorschach and HIT (Richter & Winter, 1966; Roe, 1946). Furthermore, the artists scored higher in the variables of Human, Sex, Anatomy, and Pathognomic Verbalization, which was interpreted as the artists' greater willingness to reveal their inner feelings and thoughts. These findings are also reflected in previous studies (Rawls & Slack, 1968). There were no significant differences among the groups for the variables of Color, Movement, and Abstract, which is contrary to the data of earlier studies (Richter & Winter, 1966; Lehrer, 1969).

In summary, the literature on the relationship between creativity and the Rorschach and HIT Movement scores and their related variables is conflicting and, therefore, confusing. The most profitable way of investigating this relationship appears to be by the use of objective and psychometrically sophisticated measures of both creativity and the Movement response. A number of studies using the HIT and objective measures of creativity have tended to

report similar findings (Richter & Winter, 1966; Lehrer, 1969; Clark, Veldman, & Thorpe, 1965). They have generally found that individuals and groups who have been defined as creative have scored higher on Factor I and Factor III variables in addition to Color and Abstract variables. These creative individuals have, therefore, been characterized as revealing a richer perception and productive imagination, a greater emotional responsiveness and greater susceptibility to emotional disturbance, and complex and integrated perceptual styles mixed with perceptual precision and good reality testing.

In the previous section, it was assumed that the creative process involves the integration of thinking dominated by the primary process with thinking regulated by the secondary process. This assumption has been described by the terms "regression in the service of the ego" and "adaptive regression." Holt (1963) has developed an extensive, elaborate and complicated procedure for scoring "adaptive regression" from projective inkblot tests like the Rorschach and HIT. He has cautioned that this scoring procedure, because of its complexity, should only be used after extensive training (Holt, personal communication). However, it appears to the author that Holt's basic approach to the projective test material and the data from the HIT studies on the interpretive significance of the Factor I and Factor III variables (Richter & Winter, 1966;

Lehrer, 1969; Clark, Veldman, & Thorpe, 1965) may be used in arriving at a simplified version of Holt's system. In Holt's system, the responses that have aggressive derivatives, libidinal derivatives, anxious content, or non-logical or bizarre qualities are considered to be reflective of primary process thinking. The "defense-demand" and "defense-effectiveness" scores represent the degree of control and critical evaluation (i.e., the regulation of the secondary process thinking) that is maintained over the primary process thinking.

A number of variables on the HIT appear to reflect dimensions equivalent to those isolated by Holt. While they have been discussed above (p. 38) it seems best to repeat them here in order to clarify the connection. Holtzman et al. (1961) isolated one factor (Factor I) which was defined by Integration, Movement, Human, Popular, Barrier, and Form Definiteness, and which was interpreted as revealing "well organized ideational activity, good imaginative capacity, well differentiated ego boundaries, and awareness of conventional concepts" (p. 171). Another factor (Factor III) was defined by Pathognomic Verbalization, Anxiety, Hostility, and Movement and was interpreted as revealing "disordered thought processes coupled with an active though disturbed fantasy life" (p. 171). Holt's aggressive and libidinal derivative dimensions are similar to the HIT Hostility variable, while his anxious content

and bizarre quality dimensions are similar to the HIT Anxiety and Pathognomic Verbalization variables. His "defense-demand" and "defense-effectiveness" dimensions are similar to the HIT Integration, Movement, Popular, and Form Definiteness variables. Thus, it is necessary for a high score to be achieved on the Integration, Human, Movement, and Form Definiteness HIT variables in order for "adaptive regression" to be considered to be present. "Adaptive regression" may also be considered to be present when in addition to the above variables, a high score is achieved on the Anxiety, Hostility, Popular, and Form Appropriateness variables. "Adaptive regression" may never be considered to be present if a high score is achieved on the Pathognomic Verbalization variable. This operational definition of "adaptive regression" is suggested by and is in accordance with Holtzman et al.'s interpretation of Factors I and III given above. The inclusion of the Form Appropriateness, Anxiety, and Hostility variables within the operational definition of "adaptive regression" allows for the condition of aggressive and libidinal derivatives being found together with good control and reality-oriented thinking.

Reflective Eye Movements

The phenomenon of reflective eye movements was first described by Day (1964) as a voluntary, unconscious movement of the eyes away from a questioner's face which occurs when

a person is asked a question which requires reflective thought. The movement occurs between the time the questioner stops speaking and the subject begins to answer. Day related the right or left direction of eye movement to the shifting of attention from a passive to active mode, to basic personality differences, and to individual differences in the subjective experience of anxiety. Based on clinical observations, he reported that individuals characteristically and reliably move their eyes in one direction, with right movers (right eye toward the temple) experiencing anxiety as a panic feeling, externally caused. Left movers (right eye toward the nose) experience anxiety as an inner tension, internally caused. The individual's characteristically internal (left mover) or external (right mover) mode of attention is discussed in relation to genetic predispositions and environmental conditions which reinforce a particular attentional development. He stated that no eye movement occurs if severe anxiety is present, if factual rather than reflective questions are asked, if the individual is schizophrenic, or if he is a child under three years of age. It should be emphasized, however, that Day's research consisted mainly of "casual observations made under non-experimental clinical conditions" (1964, p. 1).

In later publications, Day (1967a, 1967b, 1968) elaborated upon certain of his observations and submitted them to experimentation. The right mover is characterized

as showing an externalized, active distribution of attention involving the visual-haptic mode, while the left mover is characterized as showing an internalized, passive distribution of attention involving sensitivities to auditory and subjective visceral experiences. He observed differences in language usage and physiological patterns between left and right movers on the passive-subjective vs. active-objective dimensions. Using high speed electrooculographic and electroencephalographic recordings, he found that right movers and left movers have "different specific temporal organization of the brain's activity while engaged in the same simple perceptual motor task" (p. 146) and that they differ in "the gross aspects of frequency and amplitude of brain wave activity" (p. 146). This study suffers from the failure to subject his findings to statistical analysis and from the statement of conclusions based on a simple perusal of his data. Day also stated that the direction of the eye movement seems unrelated to handedness or eye dominance, a finding that was supported by Etaugh (1972) for handedness and Duke (1968) for eye dominance.

Day's observations, then, related the reflective eye movement phenomenon to personality characteristics and physiological differences. These two variables, as well as the reliability of the phenomenon itself, have received much attention in the succeeding literature. Duke (1968) found that eye movements were a significant characteristic

response to reflective questions, that subjects consistently (86% of the time) move their eyes in one direction rather than the other, that males are insignificantly more consistent than females, and that there is no general preference for one direction over the other. Bakan and Strayer (1973) found test-retest reliability to be .78 for all subjects (.72 for males and .80 for females) where the score was defined as the number of left eye movements in 12 trials. Their procedure involved using a proverb interpretation task with subjects being retested after an average interval of 3 days, and with one experimenter sitting directly opposite the subject scoring for either left or right movement. Their conclusion of individual consistency in lateral eye movement, however, conflicts with the findings of Templer, Goldstein, and Penick (1972).

Templer et al. (1972) reported a lack of stability in the direction of lateral eye movements as assessed by retesting after an interval of one week. For 14 subjects, they reported that only 5 subjects showed a consistent direction of eye movement over time. They were also interested in inter-rater reliability so that their research design consisted of having two experimenters seated opposite the subject, independently scoring the eye movements as either right, left, or absent. The inter-rater reliability ranged from 86.8% to 94.5%. Bakan and Strayer (1973) comment upon Templer et al.'s procedure and results, pointing

out that the use of two experimenters seated opposite the subject created an asymmetry in the visual field which could have influenced the preferred direction of eye movement. That is, subjects are more likely to look away from the experimenter as one of the functions of reflective eye movements appears to be a breaking of eye contact so as to allow for internal processing.

Etaugh and Rose (1973) also investigated the reliability of eye movements both within and across sessions, using children and adults as subjects. In their first experiment, 24 girls and 43 boys, ranging in age from 6 to 12 years old, were individually tested in two sessions, the time between the two sessions ranging from one week up to one month. To measure eye movements, the subject was seated in a chair facing the examiner and five "opinion" questions were asked. The eye movements were scored as left, right, none, or invalid. The same set of five questions were used in both sessions. They report high stability in eye movements within a single session, but of the 67 subjects, only 30 maintained consistency in direction of eye movement from one session to the next. Because this initial study had several drawbacks, i.e., the small number of questions asked, the repetition of questions from one session to the next, and the possibility that children do not show consistent eye movements, they designed a second study using 20 "opinion" questions, a different but analogous set

of questions in the second session, and an adult population. The two sessions were scheduled two days apart for each subject. They report a high consistency within a single testing session (reliability coefficient of .92) and a moderate stability over brief time intervals (reliability coefficient of .55).

Gur, Gur, and Harris (1975) have suggested that the position of the experimenter in relation to the subject, i.e., whether the experimenter is face-to-face with the subject or behind him while asking the questions, may affect the lateral direction of eye movements. In right-handed subjects, they found a characteristic uni-directional lateral eye movement regardless of type of question (Verbal or Spatial) in the face-to-face situation. However, when the experimenter sat behind the subject, they found that the lateral direction of eye movements of the right-handed individuals were affected by question type; their eyes moved left when solving spatial problems and right when solving verbal problems. They discuss these findings in terms of the added demands of an inter-personal situation: the face-to-face situation is a more intense inter-personal situation than when the experimenter sits behind the subject and, therefore, in the first circumstance possibly more anxiety is aroused and the individual relies upon preferred modes of response. In the latter situation, less anxiety is aroused and the individual can concentrate more

fully upon solving the problem presented by the question, and use the most adaptive means of solving the problem. The authors relate this difference to a differential stimulation of either the right or left brain hemisphere. The left-handed subjects revealed a more haphazard pattern of lateral eye movements which the authors interpret as reflecting a poorer hemispheric lateralization in left-handed subjects. Ehrlichman et al. (1973) found no significant differences in horizontal and vertical eye movements related to the presence or absence of an experimenter in a face-to-face situation.

Ehrlichman, Weiner, and Baker (1973) checked on inter-rater reliability by having the subject look into the lens of a camera which projected his image on a monitor in another room and also video taped his eye movements. Two experimenters scored eye movements from the monitor according to a refined system developed by Ehrlichman et al. to allow for more precision in scoring. Briefly, the scoring system follows the schema of a clock. An imaginary clock is superimposed upon the subject's eyes and the eye movements are scored according to the position of the clock's numbers. For example, a horizontal movement to the subject's left is scored as 3 o'clock or 3. Before correcting discrepancies from the video tape, the reported inter-rater reliability was 68% for exact agreement and 86% for agreement allowing for a discrepancy in one clock

position. Ehrlichman et al. claimed that this percentage is a conservative estimate, since scorers knew that a video tape was available and did not score if they were in doubt. Ehrlichman (unpublished document) reported that subjects are "highly consistent" in the direction of their lateral eye movements, with eye movements being scored from a video tape according to the schema of a clock. The literature, therefore, appears to support the contention that lateral eye movements are a reliable phenomenon and can be reliably scored under well-specified conditions in which a symmetrical visual field is assured.

Numerous personality variables and cognitive features have been hypothesized to be related to an individual's characteristic direction of eye movement. Day has characterized the left mover as passive and as showing a tendency to focus attention on internal subjective experiences. Bakan (1969) reported that left movers are more susceptible to hypnosis because of their subjective orientation, are more likely to choose "soft" majors (e.g., humanities and social science) rather than "hard" majors (e.g., natural sciences) in college, and are more likely to score higher on the Verbal subtest of the Scholastic Aptitude Test (SAT). These results however, must be regarded with scepticism because of the small number of questions (4) that were used to classify subjects as left or right movers. Furthermore, based on the subject's rating of one visual image on a

scale from one ("no image") to five ("very clear image, just like real"), clearer and more vivid visual imagery was reported by left movers, but the difference between the left and right movers did not reach significance. Bakan and Svorad (1969) stated that left movers were generally characterized by a higher resting EEG alpha rhythm, although this was truer for males than for females, and Bakan and Shotland (1969) reported that left movers show a slower reading speed than right movers. Etaugh (1972), however, reported contradictory results with reference to personality characteristics in that he found left movers to be "less affected by feelings," more "assertive, suspicious, and shrewd," based on their responses to the 16 PF Test. He explained that these contradictory findings may be due to: (1) differences between his college population and Day's psychiatric population; or (2) a particular influence of self-report personality inventory because an individual's self-report of his behavior may have little relationship to his observed behavior.

In a later study, however, Weiten and Etaugh (1973) replicated Bakan's findings that individuals show consistency (75%) in the direction of reflective eye movements across sex, and that left movers tend to choose college majors in the classical-humanistic areas. While all subjects in their population scored higher on the Mathematics subtest of the SAT, the left movers showed

significantly less of a discrepancy between the Mathematics and Verbal subtests, which is consistent with Bakan's findings. Additionally, they administered a concept identification task requiring verbal analytic skills, an inverted alphabet printing task requiring perceptual-motor skills, and the Allport-Vernon-Lindzey Study of Values. They predicted that left movers should perform worse on the concept identification task and better on the inverted alphabet printing task. Too, the left movers should show greater aesthetic and social values because of their supposed greater creativity and aesthetic potentialities, while the right movers should show greater theoretical and economic values because of their supposed greater rationality and assertiveness. Their results tended in the direction predicted although they did not reach significance perhaps because of the smallness of the sample ($N = 18$).

Bakan's description of left movers as more able to focus attention internally and as more susceptible to hypnosis, led Sherrod (1972) to investigate the left movers' reactions to persuasion. She hypothesized that left movers would show more extreme attitude change than right movers, since people react to persuasive messages by generating internal argument, either pro or con. Left movers are supposedly more likely to tap subjective experiences relevant to the message and generate more internal arguments. Her assumption was confirmed, using a pre- and posttest

design, a taped persuasive message, and a questionnaire containing an attitude measure.

Harnad (1972) was similarly influenced by Day and Bakan and undertook an investigation of differences between right and left movers within the field of mathematics. He predicted that among the mathematicians, both students and teachers, the left movers would use more visual imagery in problem solving, exhibit more aesthetic attitudes in their work, and be more creative than the right movers. The subjects were asked to rate, on a 5 point scale, the degree to which they used visual imagery in solving problems, and to list the artistic activities in which they participated. A significant difference was found between the right and left movers in the predicted direction. Also, graduate students were asked to rank the teachers according to how creative they were, and the creativity measure consisted of the average ranks assigned to each teacher. The left movers among the teachers were rated as significantly more creative than the right movers. In a second study, a layman (nonstudent) population was administered the Remote Associates Test (RAT), was asked to evaluate several pieces of prose on a scale of pleasingness-displeasingness, and was tested for lateral eye movement. The left movers scored higher on the RAT and showed a tendency to make fewer neutral responses (on the rating scale) in evaluating the prose pieces.

Barnat (1974) related reflective eye movements to personality characteristics revealed by the subjects' performance on the Rorschach, a projective test. The variables that he investigated were form-level, location, use of populars, color responsiveness, and indices of primary process thinking with the assumption that right movers would reveal greater conventionality and preciseness than left movers in projective responses. He concluded that the Rorschach variables were only marginally related to reflective eye movements, with organization and the production of popular responses favoring right moving males. Productivity favored left moving males, while left moving females showed significantly more color responsiveness. Left-movers were expected to produce responses of a "low" form-level and he found a significant relationship between strong left-movers and form-level. Strong left movers (85% unidirectional eye movement) of both sexes produced more vague responses, but among males the left movers accounted for more high level, organized responses. Barnat found no correlation between direction of eye movement and choice of college majors or preferred occupation.

In the past two years, the phenomenon of horizontal lateral eye movement (left-right) has been extended to include the vertical dimension (up-down). Personality characteristics and physiological processes also have been linked to this latter dimension. Libby and Yaklevich (1973)

investigated the influence of three personality needs, nurturance, intraception, and abasement, on the direction of gaze shifts in dyadic interaction and on the individual's tendency to maintain or break eye contact. Abasement was hypothesized to be related to a right-left and downward gaze shift, nurturance was hypothesized to be related to the tendency to maintain eye contact, and intraception was hypothesized to be related to an upward gaze shift. Eye movements were scored as the individual responded to a set of questions which were classed as non-embarrassing and embarrassing, and the personality characteristics were determined by the Edwards Personality Preference Scale. Their results indicate that abasement affects specifically the right-left response with women high on abasement looking more to the left than the right, and that strong needs for nurturance affect both men and women to maintain eye contact. In a post-hoc analysis of their data, they found a predominance of left lookers in their population and a lack of a natural dichotomy of looking types into right and left movers. Unfortunately, their results must be questioned because of a methodological flaw, i.e., there was an asymmetry in the room due to the position of the subject in relation to the door to the room. They recognize this and discuss their results in terms of a situationally determined looking behavior; the door to the room was to the subject's left in an otherwise symmetrical room.

Reflective eye movements have been tied to the double-dominance model of hemispheric functional organization, which claims that in right-handed individuals the left hemisphere of the brain dominates abstract, symbolic, verbal, analytic, and objective functions, while the right hemisphere dominates pre-verbal, concrete, spatial, emotional, and subjective functions such as spatial perception and visual imagery (Bakan, 1969; Cohen et al., 1968). Thus, Bakan (1969, 1973) has proposed that the tendency for the eye movement to go in one direction is associated with a tendency for the contralateral brain hemisphere to be activated. For individuals who tend to make right lateral eye movements the left hemisphere is more important, while for individuals who tend towards left eye movements, the right hemisphere is more important for total psychological functioning. In light of his various studies, he concluded that the left mover is characterized by a more active right hemisphere, by a greater use of pre-verbal activities (e.g., imagery), greater hypnotic susceptibility, greater interest in humanistic majors, less mathematical skill, and more EEG resting alpha. The theory that the direction of lateral eye movement is related to the brain hemispheric organization also assumes reliability of the movement over time. Bakan related these findings to Schachtel's (1966) differentiation of allocentric and autocentric perception, where allocentric perception suggests a greater contribution

of the right hemisphere (left mover) and autocentric perception suggests a greater contribution of the left hemisphere (right mover). It will be remembered that allocentric perception is thought to be related to the Movement response on the Rorschach. Additionally, he indicated that there appear to be sex differences in the lateral hemispheric organization of the brain, with women showing more hemispheric integration. Sherrod (1972), Weiten and Etaugh (1973), and Harnad (1972) explain their findings in accordance with Bakan's utilization of the theory of functional brain asymmetry. Furthermore, Harnad hypothesizes that the right hemisphere (the "nondominant" one) "has a property by which the activities of that hemisphere are less bound by reality (the data of the senses and reason) . . ." (p. 653). He hypothesizes asymmetrical functional connections between the hemispheres and sub-cortical emotional centers, so that the output of the right hemisphere is guided by emotions accompanying aesthetic experiences.

Bogen and Bogen (1969) advance the idea that two different modes of thought, "appositional" and "propositional," tend to characterize the right and left brain hemispheres, respectively. Propositional thinking is logical and rational, while appositional thinking is non-logical and irrational. Based upon experiments with animals and upon observations of the behavior of humans whose

corpus callosum is either intact or not intact, they state that differential lateralization in humans is a usual phenomenon which is dependent upon the inherent, intrinsic asymmetry of function of the human brain. The integration of verbal (left hemisphere) and visuo-spatial (right hemisphere) thinking is accomplished by interhemispheric communication, which may require an intact corpus callosum. They hypothesize that artistically "creative" behavior is dependent upon this interhemispheric communication, as it requires the presence of both appositional and propositional thinking. Furthermore, they suggest that the callosal fibres have both inhibitory as well as excitatory functions so that certain types of left hemisphere activity may directly suppress or block access to right hemisphere activity. A physiological basis, therefore, is possible for understanding a lack of "creative" behavior, i.e., that a reliance upon a propositional mode has an inhibitory effect upon the source of appositional thinking.

Galín (1974) supports and extends Bogen and Bogen's hypotheses. He describes each hemisphere as specialized for a different cognitive style, the left for an analytic, logical mode and the right for a holistic mode. His studies of the EEGs of normal subjects performing verbal and spatial tasks revealed a higher resting alpha over the right hemisphere during the verbal tasks and a higher resting alpha over the left hemisphere during the spatial tasks.

Changes in the asymmetry of flash evoked potentials were found as subjects switched from verbal to spatial tasks. It is the right hemisphere that is more actively involved in responses to complex visual forms. He relates right hemisphere functioning to primary process thinking in that both are characterized by a non-verbal mode of representation (visual, tactile, kinaesthetic, and auditory images), a nonlinear mode of association, a lack of concern with time and sequence, and a "holistic" verbal style reflected in the use of puns, metaphors, and double-entendre. The similarities between right hemisphere functioning and primary process thinking led Galin to suggest that there may be an anatomical locus for unconscious mental contents in the right hemisphere and that in normal intact people right hemisphere functioning can be interrupted by inhibition from the left hemisphere through neural transmissions across the corpus callosum. Again, creative responses occur when the two hemispheres are active and integrated with one another.

Hall, Hall, and Lavoie (1968) conducted an experiment that is particularly relevant as it relates to the question of specialized cognitive styles for each hemisphere as they are revealed in responses to the Rorschach Inkblot Test. Fifty right-handed subjects with well-localized brain lesions were studied in an attempt to support the hypothesis that in relation to involved ideational processes, persons with

right as compared to left unilateral brain lesions would differ from each other and from those with bilateral lesions. The Rorschach Inkblot Tests were individually administered to the subjects. Age, educational level, and IQ (WAIS, Full Scale) were controlled. On a multiple-discriminant analysis, seven selected Rorschach variables (Perplexity, Fabulizing, Sum R, Sum M, Sum C, Sum of Shading, Sum of F minus, Sum of Rejection) differentiated the left, right, and mid-line bilateral groups at the .0001 level. The lesions are associated with an exaggeration of normal functioning. Subjects with left hemisphere lesions showed a limited and constricted approach to the inkblots. Subjects with right hemisphere lesions were spontaneous, gave many visual percepts, were responsive to the kinaesthetic possibilities on the inkblots, and were expansive in a way that reflected a loss of good judgment and self-critical abilities. The authors conclude that: "if these conditions are indeed the exaggeration of normal functioning, then one can speculate that the left hemisphere is the critic, the judge, the evaluator and the right is the innovator, the phantasizer, the artist" (p. 531).

Kocel, Galin, Ornstein, and Merrin (1972) attempted to test Bakan's hypothesis that the direction of the lateral eye movement is contralaterally controlled. They argued that if Bakan were correct, it would be possible to influence the direction of lateral eye movements by

systematically activating either the right or left hemisphere. Therefore, they presented their subjects with spatial and musical questions which were designed to activate the right hemisphere and with verbal and mathematical questions which were designed to activate the left hemisphere. Their results indicated that the cognitive demands of the question influence the direction of lateral eye movements. Kinsbourne (1972) reported similar findings in that verbal problems elicited right lateral eye movements in right handed subjects, but he also found a vertical eye movement to be present in that spatial problems elicited an up and left eye movement in right handed subjects. Kinsbourne claimed that his results provided support for Bakan's hypothesis of contralaterally controlled eye movements, as well as providing support for a general theory relating perceptual laterality effects and cerebral asymmetry. The theory claims that the asymmetrical unfolding of attention in external space and shifts in physical orientation may result out of an asymmetrical activation of hemispheres. Ehrlichman et al., (1973) attempted to replicate Kinsbourne's and Kocel et al.'s findings. Using their clock schema for scoring (p. 54) they reported results contradictory to those of Kinsbourne and Kocel et al. Ehrlichman et al. found that the vertical dimension of eye movements was significantly affected by the type of question: verbal questions

elicited more downward eye movements than spatial questions. They did not find any significant effect of type of question on horizontal eye movements, but they did find a tendency for verbal questions to elicit more leftward eye movements. They also reported that spatial questions elicited significantly more "stares" (no eye movements) than verbal questions. In light of their findings about the vertical gaze shifts, they criticize the assumption that eye movements are contralaterally controlled and advance the notion that vertical gaze shifts may be related to many variables, such as social factors, and not to particular hemispheric activity. They also noted that their set of verbal questions was different from Kocel et al.'s, who used questions that tended to call for numerical calculations and rote knowledge of the characteristics of English, while their questions were designed to sample a wider range of language related processes. Furthermore, they stated that their data "indicate a tendency for horizontal gaze shifts to be, if anything, ipsilateral to the hemisphere presumably involved" (p. 20). They interpret their findings about stares as reflecting a reduced ocular motility for spatial relative to verbal questions. Ehrlichman et al. concluded that the effects of verbal and spatial questions on the direction of eye movements seemed to be reliable only for the vertical dimension, and that the theory that asymmetrical hemispheric activation by different types of questions is

responsible for differences in the direction of eye movements was unsupported by their data.

Galín and Ornstein (1972) investigated differences between people in preferred cognitive mode (verbal-analytic versus spatial-holistic) and the ability to shift modes when it is beneficial to do so. They chose two groups whose vocations were thought to emphasize either the verbal-analytic or spatial-holistic cognitive modes, i.e., lawyers and ceramicists, respectively. They administered verbal and spatial questions to both groups. Their verbal questions consisted of semantic items, logic questions, and arithmetic items. The spatial questions were designed to evoke visualizations of complex forms. They predicted that ceramicists as a group would make more left movements than lawyers and would make more up movements (based on Kinsbourne's report of spatial processing being associated with up movements). Furthermore, for each subject, they predicted that verbal questions would evoke more right movements than spatial ones and that spatial questions would evoke more up movements than verbal ones. Their results indicated that the lawyers and ceramicists as a group differed only in the vertical dimension: the ceramicists made significantly more up movements and less down movements than the lawyers. There were no significant differences between groups in lateral eye movements and even on a subject-by-subject basis there were no more left

movers among the ceramicists than among the lawyers. In terms of the effects of question type, it was found that verbal questions elicited significantly more down eye movements and less up movements than spatial questions, and that significantly more stares (no eye movement) were elicited by spatial questions than verbal questions. They found no significant differences in lateral eye movements according to question type although there was a tendency for verbal questions to elicit more right movements. In a second experiment, using a more divergent sample, the verbal questions elicited significantly more right movements than the spatial questions. In their discussion, Galin and Ornstein commented upon the finding that the question type affected the distribution of lateral eye movements only in the right movements and stares and not in the percentage of left movements. They explained this as follows: the stare response is a product of competing tendencies to look right and left; in the experiments, the subject is forced to respond to the spatial questions with a verbal response so that those questions cannot be considered as eliciting "pure" right hemisphere activation but an activation of both hemispheres (bilateral activation); the stares in spatial questions, therefore, indicate bilateral activation. The verbal questions, however, evoke a more unilateral left hemisphere activation.

Scoring Difficulties in Reflective Eye Movements. The analysis of the data on eye movements presents problems related to the arbitrary nature of the right, left, up, and down categories, to the multiple systems of classification that have been used by different researchers, and to the appropriateness of classification per se. The phenomenon of reflective eye movement is a recent observation and it remains unclear whether it should be considered as a discrete phenomenon with a finite number of possible responses (or clock positions) or as a continuous phenomenon with no finite number of possible responses. Kocel et al. (1972) and Kinsbourne (1972) have used systems of assigning the direction of eye movements to mutually exclusive categories although their definition of the categories have differed. Kocel et al. limited their classification to "right" or "left" with all eye movements to the right of the vertical midline being scored as "right" and all those to the left of the vertical midline being scored as "left." Kinsbourne (1972) classified the direction of eye movements as either "up," "down," left, or "right" using the vertical and horizontal midlines as dividing lines for scoring. Kinsbourne's categories are grossly and loosely defined and using his system one is unable to differentiate between two "left" movements although one may be above and one below the horizontal midline. Ehrlichman et al. (1973) score the direction of eye movements according to the schema of a

clock and use a centroid analysis which gives a measure of the average position of the eye following the first eye movement, using X and Y coordinates with the initial position of the eye being considered the origin. Galin and Ornstein (1972) criticize this method of analysis. They point out that Ehrlichman et al.'s system assumes a unit length for each eye movement resulting in a larger eye movement, e.g., towards 11 o'clock, being scored as having a smaller lateral part than a smaller eye movement, e.g., towards 9 o'clock. Too, by assuming a unit length, the horizontal and vertical components of the eye movements are made interdependent and negatively correlated. This built in negative correlation results in an obscuring of the data, as a strong tendency to vertical movements might cover a difference in the lateral component. Additionally, they comment that Ehrlichman et al.'s analysis was computed excluding stares, based, therefore, on total eye movements and that an alternative method might be to include stares and base the analysis on total trials. These two methods of analysis would yield different results which may be of theoretical importance, since Galin and Ornstein contend that the stare responses are not distributed randomly across question type, a contention that Ehrlichman et al. (1973) support, while commenting on the lack of knowledge concerning the status of stares.

Galín and Ornstein (1972), scoring the direction of

eye movements according to the schema of a clock, analyzed the lateral and vertical eye movements separately. For the vertical dimension they considered any eye movement to 10, 11, 12, 1 or 2 o'clock as an up movement, any movement to 8, 7, 6, 5 or 4 o'clock as a down movement, and any movement to 3 or 9 o'clock as "no vertical movement." For the lateral dimension, they considered any eye movement to 7, 8, 9, 10, 11 o'clock as a right movement, any movement to 1, 2, 3, 4, or 5 o'clock as a left movement and any movement to 6 or 12 o'clock as "no lateral movement." Stares were scored as no movement. The frequency of each type of eye movement was expressed as a percentage of the total number of scorable trials, with stares being included in the count of the number of trials. The percentage score was computed separately for their neutral, verbal, and spatial questions for each subject and then totalled for their two groups. They also computed a difference score of R-L and U-D in order to assess the total shift along each dimension. With these percentage scores, a 3 X 2 analysis of variance was computed on each of the separate indices and a one-way analysis of variance was computed on subject group and question type.

Summary of Ideas Leading to the Major Hypotheses. It will be remembered, that the point of view that is adopted here assumes that the creative process requires the facile and ready integration of primary process dominated thinking

with the regulating influence of secondary process thinking. This integration is made possible by a "regression in the service of the ego" which assumes that the individual is able to relax and temporarily admit into consciousness primary process material, which he is then able to marshal, mold, and communicate. It assumes that the ready use of reality-oriented imagination, as opposed to the heavy reliance upon intellectual controls or logical thinking, may be seen as one aspect of adaptive regression.

The facile and efficient use of reality-oriented imagination, i.e., the integration of primary and secondary process thinking that constitutes the creative process, may be measured by specific HIT variables. It is suggested here that an individual's ability to easily regress in an adaptive way may also be related to physiological properties. The researchers on reflective eye movements regard this eye movement as being related to and indicative of stimulation to the cortex of the brain. Bakan views the direction of the lateral eye movement to be contralateral to the stimulated brain hemisphere. He sees characteristic left movers as being dominated by the right hemisphere in their total psychological functioning. He describes the right hemisphere as pre-verbal, emotional, and subjective as opposed to the left hemisphere which he describes as verbal, analytic, abstract, and rational. It appears that the left hemisphere may be thought of as primarily dominant

for secondary process thinking (i.e., verbal, analytic, rational) while the right hemisphere may be thought of as primarily dominant for primary process thinking (i.e., pre-verbal, subjective).

Thus, based on the assumption of adaptive regression as underlying the creative process, three major questions arise in relation to reflective eye movements. The questions are: (1) Do left or up movers reveal a greater degree of adaptive regression than right movers? (2) Do left or up movers achieve higher scores on a creativity battery than right movers? (3) Is this greater degree of adaptive regression related to a physiological hemispheric organization, in terms of their being dominated in their total psychological functioning primarily by the right hemisphere?

In exploring these questions, a number of replications will be undertaken. First, the consistency of the direction of eye movements within subjects will be investigated. Consistency is defined as a 55% or more uni-directional reflective eye movement occurring in one particular quadrant out of the four quadrants in which the eye is divided. If consistency is not found, the preferred direction of eye movements will be investigated, with a preference for a particular direction of eye movement being defined as the direction in which the largest percentage of eye movements occur (see p. 118). Second, Bakan (1969)

and Harnad (1972) found that more vivid visual imagery was reported and used by left movers. In relation to the orientation of this study, a greater access to and use of imagery may be seen as one aspect of adaptive regression. Therefore, this replication has important connections to the primary thrust of the dissertation. Third, Bakan's findings that left movers choose "soft" college majors will be investigated. Fourth, Barnat related differences in the direction of reflective eye movements to differential reliance upon specific Rorschach variables. His research, however, suffered from the failure to include data from vertical eye movements, from the neglect of the M (Human Movement) response as a variable, and from the use of the Rorschach Test as a psychometric device. The current experiment will also attempt to relate a subject's characteristic gaze shift to performance on a projective test, but Barnat's errors will be circumvented by the scoring of horizontal and vertical eye movements, by the inclusion of the Movement response as an important variable, and by the use of the HIT, whose superiority to the Rorschach as a psychometric device for research purposes has been discussed.

CHAPTER II
SPECIFIC HYPOTHESES

Major Hypotheses

1. It is hypothesized that those individuals who reveal "adaptive regression" as defined (see p. 48) will obtain high primary creativity and secondary creativity scores (see p. 88) on the creativity battery.

2. (a) It is hypothesized that, if consistent reflective eye movements are found, those individuals who demonstrate consistent left or up reflective eye movements will obtain higher primary creativity and secondary creativity scores than those who demonstrate consistent right or down reflective eye movements.

Consistency is defined as a 55% uni-directional reflective eye movement occurring in one quadrant of the eye.

(b) Additionally, those subjects who display a preference for left or up reflective eye movements but not a consistent left or up reflective eye movement, will also obtain higher primary creativity and secondary creativity scores than those subjects who display a preference for right or down reflective eye movements. A preference for a particular direction of reflective eye movement is defined as the direction in which the largest percentage of reflective eye movements occur.

3. (a) It is hypothesized that those individuals who reveal "adaptive regression" as defined (see p. 48) will demonstrate a consistent left or up reflective eye movement rather than a consistent right or down reflective eye movement. (b) Additionally, those individuals who reveal "adaptive regression" will demonstrate a preference for left or up reflective eye movements rather than a preference for right or down reflective eye movements, if consistency of eye movements are not found.

4. It is hypothesized that within individuals there should be a relationship between the production of "adaptive regression" and left or up reflective eye movements measured at the time of producing those responses.

Secondary Hypotheses

1. It is hypothesized that those individuals who show a preference for left or up reflective eye movements will choose a "soft" college major. "Soft" majors are defined in general as art, drama, psychology, sociology, cultural anthropology, classics, English, language studies, political science, history, economics, education, law, communication, and philosophy. "Hard" majors are defined in general as physics, chemistry, biology, zoology, geology, mathematics, physical anthropology, engineering, pre-med curriculum, nursing, and speech. Some subspecialties in each will be excluded, e.g., grammatical studies of Latin and Greek.

2. (a) It is hypothesized that those individuals who show a preference for left or up reflective eye movements will report more vivid visual imagery. (b) Furthermore, they will report the presence of more vivid imagery extending to other modalities.

CHAPTER III

METHOD

Subjects

The subjects were 91 volunteer, female undergraduate college students, ranging in age from 17 to 40 years old. The subjects were recruited from psychology and education classes at Hunter College, Manhattan, Jersey City State College, Jersey City, and St. Joseph's College, Brooklyn. Five different classes were required, with class size ranging from 30 to 10 women students present.

Two subjects were unable to complete the entire testing, so that certain analyses were based on the remaining 89 protocols. Due to a technical failure in the cassette tape recorder, three of the subjects' response protocols to the HIT, Form B were not recorded, so that the analyses of the HIT, Form B data are based on a subject pool of 86 subjects.

Materials

The HIT, Form A and B

The group administration of the HIT requires the use of standardized 35mm color Kodak slides. Form A of the HIT slides were used, and it consists of 2 demonstration slides, labelled X and Y, and 45 additional slides of inkblots.

The standardized instructions for the group administration were followed (see Appendix A). The subjects were required to write their responses on the Holtzman Inkblot Technique, Record Form A (1958). This Record Form was developed for the individual administrations, but it is comparable to the group record form (Swartz & Holtzman, 1963).

An individual administration of specific HIT, Form B blots was given as outlined in the Procedure (see p. 86).

Creativity Battery

Line Meanings (LM). Each design ($1\frac{1}{2}$ " X $1\frac{1}{2}$ ") was xeroxed on the top of a fresh sheet of blank $8\frac{1}{2}$ " X 11" paper, on which lines were drawn, with the reverse side of the sheet also available for writing down further ideas. The three sheets of paper were stapled together. Following Wallach and Wing's procedure, only 3 of the original designs were administered (nos. 1, 3, 7). The subject was verbally instructed to list what the complete line might suggest to her (Appendix B). The test is untimed, but in a pilot study, five minutes for each design proved to be sufficient for every student.

Pattern Meanings (PM). Each pattern ($1\frac{1}{2}$ " X $1\frac{1}{2}$ ") was xeroxed on the top of a fresh sheet of blank $8\frac{1}{2}$ " X 11" paper on which lines were drawn, and with the reverse side of each sheet available for writing down additional ideas.

The three sheets of paper were stapled together. Following Wallach and Wing's procedure, only 3 of the original 9 patterns were used (nos. 1, 5, 7). The subject was verbally instructed to list what the complete pattern might suggest to her (Appendix C). The test is untimed, but in a pilot study, five minutes for each pattern proved to be sufficient for every student.

Alternate Uses, Form A (AU). Guilford's (1960)

Alternate Uses test presents the subject with a verbal stimulus. It is a group test which is divided into 3 parts, with 3 items per part. Each item presents the name of a well-known object and a statement of its most common use. The subject was asked to list as many as 6 other, less common uses. Four minutes are allotted for each part. A standardized answer form was provided and standardized instructions were followed. In this study, only the first 2 parts, consisting of 6 items, were administered.

Modified Bennett Test (MBT). The Modified Bennett Test consists of descriptions of imaginary situations to which the subject is asked to respond with consequences which might follow, given the hypothetical situations existed. Three of the items from the Modified Bennett Test (Items D, E, F: Price, personal communication) were used in this study and they are listed in Appendix D. The subjects were allowed 3 minutes per item, as per standardized

instructions.

The Modified Bennett Test was administered using the instructions for the "unregulated" condition. In this condition, the subject was asked to imagine that she is a "clever" and "unconventional" individual who typically has novel thoughts. The exact instructions are found in Appendix E.

Thorndike's Vocabulary Test, G-T, Forms 1 and 2

The Vocabulary Test, Forms 1 and 2, is a 40 word wide range vocabulary test based on items standardized for the I.E.R. Intelligence Scale CAVD developed by Thorndike et al. (1942, 1944). The test is self administering and is an untimed power test. However, on a pilot study, it was found that the subjects completed both forms of the test in 10 minutes. A corrected score (Miner, 1957), representing the number of right answers corrected for the number of items skipped as well as Thorndike and Gallup's (1944) score of number of right answers are available. Thorndike (1942) developed mental age equivalents for the vocabulary test scores by giving it together with the American Psychological Examination to entering college freshmen.

Shortened Form of the Bett's QMI

Sheehan (1967) has developed a shortened form of the Bett's Questionnaire Upon Mental Imagery (QMI). The

shortened group form consists of 35 items and attempts to measure a general ability to image in a variety of sensory modalities (including the visual one). Sheehan reported an obtained correlation of .92 between the total scores on the complete Bett's form and the shortened form (Sheehan, 1966). The short form takes approximately 10 minutes to complete.

Reflective Eye Movements

A list of 30 Verbal and 30 Spatial questions was compiled from the questions used by Ehrlichman et al. (1973). The Verbal questions ask the subject to elaborate the meanings of proverbs and give word definitions, and require the use of semantic knowledge of language. The Spatial questions require visuo-spatial processing and the use of visual imagery. The questions are listed in Appendices F and G. Both sets of questions are considered reflective in that they do not call for over-rehearsed and over-learned answers.

Answer Booklet

A booklet for each subject was prepared. The booklet contained answer forms for all of the group tests: Gorham-Holtzman Record Form for the HIT, Form A, Line Meanings, Pattern Meanings, Alternate Uses, Modified Bennett Test, Thorndike's Vocabulary Test, G-T, Forms 1 and 2, and Sheehan's Shortened Form of the Bett's QMI.

Procedure

Group tests were administered during the students' usual class period. The class periods run for 60 minutes, so that two class periods were required to complete all of the group tests. The HIT requires 60 minutes to administer and the other group tests require a total of approximately 67 minutes. The subjects were asked to stay the extra 7 minutes so as to complete the total test battery. All the subjects in a single class followed the same order of tasks but the five classes followed five randomly chosen orders, which differed from each other.

The subjects had all volunteered for the experiment, and in an attempt to insure their full cooperation, at the beginning of each group test they were encouraged to leave if they did not wish to participate. The subjects were told that they were participating in an experiment that was designed to validate a new test measure of how people think. They were asked to write their name, their choice of a college major, and their usual writing hand on the top of the first page of the booklet.

The experimenter monitored the time for and the order of the tasks, so that every student was working on the same task for the same amount of time. Each group test was administered according to the standardized instructions for that task.

An individual testing session was required in order to score for reflective eye movements and administer the HIT, Form B. The individual session took place either between the two group testings or after the completed group testing, whichever could be scheduled for the subject.

The individual session took place in an average size office, approximately 6' X 9'. At each college, an unused, bare-walled office was provided. Care was taken that in each case the room was symmetrical with no distracting physical features within the subjects' view. The subject was seated in front of a desk and the experimenter was seated directly opposite from her, approximately four feet away. The experimenter read the question and recorded the direction of eye movement. The subject's response to the questions was not recorded. Although no mention was made to the subject about looking behavior, the experimenter attempted to assure that eye contact existed at the end of the question by maintaining a stable gaze, because a centered gaze position is necessary to score for eye movements. This procedure proved to be successful most of the time. When eye contact was not maintained, the response was omitted. The eye movements were scored (according to the schema of a clock) on a scoring sheet held in the experimenter's lap and hidden from the subject's view. In order to assure the body symmetry of the subject, she was asked to sit as

straight as possible and not to shift from side to side.

Items from the lists of 30 Verbal questions and 30 Spatial questions were asked until 10 scorable (i.e., eye movement present) responses were obtained from each category. The number of questions asked until the criterion of 10 was reached was recorded. "No Contact" responses, i.e., the subject blinking or closing her eyes, are not included in the computation. Stares are also not included in the computation because of Ehrlichman et al.'s (1973) conclusion that since "the nature of the relationship between stares and gaze shifts is unclear at this point, it is probably best to compute centers of mass excluding stares" (p. 23). Stares were recorded, however, in order to determine if there are differences between subjects in the number of stares produced. For approximately 40% of the subjects, the questions within each block (Verbal and Spatial) were presented in a random order, while for approximately 60% of the subjects, the questions within each block were presented in a set, sequential order. The blocks of questions were presented in the same order.

The individual session also encompassed a specific test of the hypothesis that within subjects those responses which are reflective of an "adaptive regression" will be accompanied by a left reflective eye movement. The HIT, Form B was used as a means of measuring "adaptive regression." The subject was told that she would be shown

an inkblot; that she would have 10 seconds in which to look at the blot; then the blot would be taken away; after the blot was taken away she would be signaled by the cue "O.K." to start her response about what the blot looked like to her. The subject was told to give one response per blot, but to make that response as elaborate as possible and to include in the response what aspects of the blot influenced the response and which part of the blot she was using in the response. The cue "O.K." acted to center the subject's gaze so that the eye movement could be scored. All eye movements after the cue were scored according to the schema of a clock on a scoring sheet held in the experimenter's lap.

From the set of 45 HIT, Form B inkblots, only a limited number of blots were shown until 10 scorable (i.e., eye movement present) responses were gotten. The number of blots shown until the criterion of 10 was reached was recorded. The blots were presented in the same order to all subjects. HIT, Form B inkblots numbered 1B-2B, 4b-12B, 14B-21B were used. Blots numbered 3B and 13B were not used as they were judged by the experimenter to be too amorphous and too difficult to organize in the amount of time provided. The subject's responses were tape recorded on a cassette solid state recorder placed on the floor next to the experimenter. The microphone was hung around the subject's neck by a cord so that the symmetry of the desk

was not influenced, and a moment was spent informally talking with the subject to help her adjust to the presence of the microphone. The subject's responses to 10 inkblots were scored using the standard Holtzman system.

Scoring of the Creativity Battery

To insure that scoring would be blind, the subjects' response protocols for each of the 4 tasks were separated and were randomly assigned an identifying code number for that task. Each subject had a different code number for each task. The protocols were then given to two judges for independent scoring who scored the creativeness of the responses without knowledge of the hypotheses of the experiment. The responses to the MBT were scored according to procedures outlined in a revised scoring manual developed by Price (1971), and the responses to the Alternate Uses and visual tasks were scored according to an extension of the Price system developed by the author.

Price's manual proposes 5 criterion scales according to which a particular response is to be evaluated:

- (1) novelty, (2) appropriateness, (3) non-triviality,
- (4) surprise-stimulation, and (5) divergent synthesis.

The novelty of a response is defined in terms of its statistical infrequency within a given sample of responses. To score novelty, responses are assigned to response categories with the novelty score of a specific response

being derived from the frequency of occurrence of the response category to which it is related. The scoring of a response with respect to the other four criterion scales consists of assigning it a rating on a three point scale (0-2). To be appropriate, a response must fit the context specified in the item. A rating of 2 on this criterion denotes an appropriate response; a rating of 1 denotes a somewhat inappropriate response; and a rating of 0 indicates a totally inappropriate response.

In terms of non-triviality, a rating of 0 is given to a response which either recapitulates the information given in the test item or is so general that it can apply to more than one of the test's items. A non-triviality rating of 1 is assigned to a response which requires little thought to produce, and a rating of 2 is given to a response which meets neither of the above specifications.

The surprise-stimulation criterion measures the response of the observer, and a rating of 2 is given to those responses which are very surprising and which stimulate additional thought by the audience. A rating of 1 is given those responses which are mildly surprising but which do not provoke additional thought by the reader. A rating of 0 is assigned those responses which are not surprising or stimulating.

The criterion of divergent synthesis is used to assess the extent to which the lines of thought initially diverge

from one another before being brought together or synthesized. A rating of 2 is given those responses which involve a good deal of synthesis of initially divergent thoughts. A rating of 1 is assigned those responses which are moderately divergent and a rating of 0 is assigned those responses which involve only a single line of thought. The five criteria are used conjointly in assessing creativity.

Each response is scored first for novelty, next for non-triviality and appropriateness, and then for surprise-stimulation and divergent synthesis. If a response is judged to be trivial or inappropriate, it may not receive a higher than 0 rating on surprise-stimulation, and divergent-synthesis. Only a totally novel response with a surprise-stimulation rating greater than 0 may receive a divergent-synthesis score of greater than 0. The effects of this scoring system are that the non-trivial and appropriateness scores are used to exclude bizarre or trivial responses from the highly novel category; surprise-stimulation scores differentiate the remaining novel responses; and the divergent-synthesis scores differentiate the surprising responses. In this experiment, the judges were also required to score each response for the number of words used in the response (response length) and to note the number of responses given to each test item as a measure of fluency.

A twenty-eight year old male graduate student in

clinical psychology and a twenty-six year old male case-worker with a sizeable background in psychology served as judges for the evaluation of creativity. These individuals were selected from a number of potential judges because of their excellent sense of humor, their reputation as punsters, and their interest in science fiction novels and movies. After a brief training period, independent scoring was begun. Disagreements were resolved by discussions between the judges to establish a consensus score rather than by averaging the scores of the judges so that variations in mood or interest, or range of knowledge of one of the judges would not penalize a particular response.

A total creativity score (C) for each response was determined from the judges' ratings, by the experimenter, according to the following procedure. Five novelty categories were formed so that the sum of the frequencies in the five categories was negatively related to the novelty category, with the highest value given to the category containing the most infrequent responses. By scanning the frequency counts, an attempt was made to equate the novelty categories across items and tasks. A response in the novelty category containing the most infrequent responses was given a novelty score of six, a response in the novelty category containing the more frequent responses was given a novelty score of five and so forth up to a novelty score of 2 denoting the category of most frequent responses (Table 1).

Scores on the surprise-stimulation and divergent-synthesis scales were added to the novelty score as follows. For a response judged to be totally inappropriate or trivial, the novelty score is subtracted. For a response judged to be moderately inappropriate or trivial, the novelty score is subtracted and one point is added. For a response judged to be appropriate and non-trivial but not surprising or divergently synthetic, the entire novelty score is assigned. The total creativity score can range from zero to ten. A response which does not merit a maximum rating on the non-triviality or appropriateness criterion, achieves a total creativity score of zero or one. A response which achieves a maximum rating on the non-triviality and appropriateness criterion but is not surprising or divergently synthetic achieves a C ranging from 2 to 6, depending upon the novelty category to which it is assigned. A response which is novel, appropriate, non-trivial, somewhat or highly surprising and divergently synthetic or not, achieves a total creativity score ranging from seven to ten.

Primary creativity (PC) and secondary creativity (SC) scores were computed according to Price's (1970) method. First, the total creativity score was determined. The total creativity scores of 8-10 were thought to contribute to the primary creativity score while the total creativity scores of 2-7 were thought to contribute to the secondary

creativity score. To determine primary or secondary creativity scores, the total creativity scores of 0 and 1 were ignored. For primary creativity, total creativity scores of 8 were weighted as one point and scores of 9 and 10 were weighted as two points. The sum of the point weights gives the primary creativity score. For secondary creativity, total creativity scores of 2-4 were weighted as one point and scores of 5-7 were weighted as two points. The sum of the point weights gives the secondary creativity score.

The degree of interrater reliability was computed separately for each of the five criterion scales for each of the tasks. A contingency coefficient was determined, where the data permitted (Table 2). The contingency tables were reduced to two-by-two tables so that all contingency coefficients derived from the tables could be compared with one another (McNamar, 1955). For certain of the surprise-stimulation and divergent-synthesis scales, contingency coefficients were not computed as the scores of both judges fell within the same cell, that is, the responses were judged to be commonplace and not synthetic. For a two-by-two table, the upper limit of the contingency coefficient is 0.71 (McNamar, 1955). In all cases where coefficients could be computed, the coefficients reached significance ($p < .01$).

Scoring of the Holtzman Inkblot
Technique, Forms A and B

The two sets of response protocols were randomly assigned code numbers and were given to two independent judges for scoring. The two judges were different from those who scored the creativity battery and there was no communication between the two groups of scorers. Both the group and individual Holtzman responses were scored using the standard Holtzman scoring system, as outlined in the Holtzman Inkblot Technique, Administration and Scoring Guide (1961).

One scorer was the author, a twenty-six year old female, who possessed an extensive familiarity with the Rorschach Inkblot Test, a moderate acquaintance with the Holtzman Inkblot Test and a knowledge of the hypotheses of the experiment. The second scorer was a twenty-one year old female, undergraduate student majoring in psychology who was not told about the nature of the experiment and who was not familiar with the Holtzman or Rorschach Inkblot Tests but who understood the theory behind a projective test. She was chosen because of her lack of experience with the inkblot tests as it was thought that she would act as a check on the biases that the author might bring with her due to the author's extensive use of the Rorschach Test and the author's knowledge of the hypotheses of the experiment. After an initial training period, during which the scorers

familiarized themselves with the Holtzman Inkblot Technique, Administration and Scoring Guide (1961) and scored a number of practice protocols that were not part of the experiment's population, independent scoring was begun. Again, disagreements were resolved by establishing a consensus score rather than by averaging the scores of the judges so that variations in mood, or biases of a particular judge would not necessarily penalize a response. The variable of Response Length was added to the Holtzman variables and was scored by counting the number of words used in the response.

The responses to Form B were transcribed by the author before any scoring was begun. The degree of interrater reliability was computed separately for Form A and B. For Form A, a frequency of agreement score for each variable was determined by tabulating the number of times the judges agreed before discussion on the scoring of a response out of the total number of responses. The frequency of agreement for all variables is high and is summarized in Table 3. For Form B, interrater reliability was determined by a Pearson Product Moment correlation coefficient (r) and again the consistency between scorers is high (Table 4). The negative correlation for Balance may be explained by the fact that there were only two responses in that category and the scorers disagreed about both of them. The need for two different methods of evaluating interrater reliabilities arose out of the different methods of

recording scoring disagreements. On Form A, only a frequency count of disagreements and the consensus scores were recorded while on Form B, the original scoring of both judges and the consensus scores were retained. However, the resulting scores from the two methods are comparable, and while they are uniformly high and the differences on each variable inconsequential, it can be seen that interrater reliability is somewhat lower on Form B. This can be explained by the greater freedom of the task and the consequent greater ambiguity of the responses. It should be noted that the obtained interrater reliabilities are comparable to those reported by Holtzman et al. (1961) for highly trained scorers where correlations ranged from .89 to .99 and above those reported for moderately trained scorers, when correlations ranged from .57 to .94 (p. 105).

Scoring of Sheehan's Shortened Form of the Bett's
QMI and Thorndike's Vocabulary Test, G-T,
Forms 1 and 2

A code number was randomly assigned to each of the protocols for these tasks. The scoring was done by one judge, the author, according to standardized instructions. It was felt that only one judge was needed as both of these tasks involve objective scoring outlined in a scoring manual with no possibility of bias due to personality factors or knowledge of the experimental hypotheses.

The scoring for the Bett's scale, as outlined by

Sheehan (1967), is accomplished by adding the subject's rating scales (ranging from 1 to 7) for each of the five items in the separate modalities to get a modality score. A total score is computed by adding the different modality scores, with the lower scores representing a greater reporting of imagery being present.

Thorndike's Vocabulary Test, G-T, Forms 1 and 2 were scored for both number right (Thorndike & Gallup, 1944) and for number right plus a correction for the number of items not attempted (Miner, 1957). For each subject, two total vocabulary scores were computed, one using Thorndike et al.'s scoring (1944) and one using Miner's scoring (1957), with the totals representing a simple addition of achieved scores on Form 1 and Form 2.

Scoring of Reflective Eye Movements

For the Verbal and Spatial sets of questions the direction of the initial eye movement after the end of the question was scored by noting a number which represented a position on a clock-face which was imagined to be superimposed upon the subject's eyes. This system of scoring was adopted from Ehrlichman et al. (1973) who first scored the direction of initial eye movements according to the schema of a clock (Figure 1). A scoring sheet, divided into two sections, labeled "Verbal Questions" and "Spatial Questions," with numbers 1 through 20 in each section, was held in the

scorer's lap and the direction of the initial eye movement was noted in the appropriate section next to the number of the question asked. If the subject stared, "S" was written next to the question number. If the subject closed her eyes, "NC," meaning "no contact" was written in the appropriate space. The number of questions asked until the criterion of 10 scorable eye movements was reached was written on the scoring sheet. Stares and no contact were not considered as scorable eye movements.

In a second procedure the direction of initial, as well as subsequent, eye movements were scored while subjects spoke about what they had perceived in an inkblot that had been held in front of them for 10 seconds. The direction of eye movements was scored according to the schema of a clock. A scoring sheet with the numbers of the Holtzman Inkblots, Form B, was held in the scorer's lap, out of sight of the subject, and the direction of eye movements was entered in the appropriate space. In an attempt to gain greater insight into the status of stares, short initial stares before an eye movement, (coded SS), and long initial stares before an eye movement, (coded LS), were recorded in addition to a stare response without any subsequent eye movement (coded S) and a no contact response (coded NC). Short initial stares were defined as stares of approximately 1-2 seconds duration and long initial stares were defined as stares of approximately 3-6 seconds

duration. The number of seconds elapsed was easily determined by a silent count. The inkblots were shown to the subject until the criterion of 10 scorable eye movement responses was reached. Short initial stares and long initial stares with subsequent eye movements were considered scorable eye movement responses. Stares with no subsequent eye movement and no contact responses were not considered as scorable eye movement responses. A subject's rejection of an inkblot (i.e., "it doesn't look like anything," "I don't see anything there") with a scorable eye movement present was considered as contributing to the criterion score.

One judge, the author, scored eye movements. A brief training period was needed to familiarize her with the scoring system. It should be noted that the direction of eye movements was scored without knowledge of the subject's performance on any of the other tasks. The possibility of the subject's eye movement responses on the Verbal and Spatial sets of questions influencing the judge's scoring during the subject's response to the Holtzman Inkblots must be recognized. However, it was hoped that with hyper-vigilant awareness of this possible contamination, the possibility of influence would be diminished.

Handedness and Choice of Major

The subjects' handedness and choice of major were coded and included in the final correlation matrix. Right-handedness was coded as 0 and left-handedness was coded as 1. A choice of a "soft" major (see p. 77) was coded as 0 and a choice of a "hard" major (see p. 77) was coded as 1.

CHAPTER IV
SUB-ANALYSES AND PREPARATION OF THE DATA
FOR THE FINAL CORRELATION MATRIX

Creativity Battery

As outlined above, the novelty score for each response was decided by assigning the answer to a response category with the frequency of occurrence of the response category determining the novelty score. This novelty score became a part of the total creativity score which was then used to compute a primary and secondary creativity score. In addition to having a primary and secondary creativity score, it was felt that the distinction among the various novelty response categories should be maintained in the final correlation matrix. The reasoning was that a uniquely novel response, one given by only one person in the population, was qualitatively different from a response that was unusual but shared with other people. At this point in the analysis, then, the novelty categories were divided into three groups: 1) The uniquely novel response (UN), i.e., those responses that were given by only one subject in the population; 2) The unusual novel response, (NN), i.e., those responses that were not uniquely novel but were given by 7% or less of the subjects in the population; and 3) the common novel response (CN),

i.e., those responses that were not uniquely or unusually novel but were given by 50% or less of the subjects in the population.

A coefficient alpha (Cronbach, 1951) was computed to determine the internal consistency of the eight scores that served as item scores for the individual items within each task. The eight item scores are: uniquely novel (UN), unusual novel (NN), common novel (CN), non-triviality (NT), appropriateness (AP), surprise-stimulation (SS), divergent-synthesis (DS), and fluency (F). There were no item scores for primary creativity (PC), secondary creativity (SC), and response length (RL) as these served as summary scores across items and within each task. The obtained reliability scores for each of the eight item scores for each of the tasks are presented in Table 5. Where there was no variance within a particular score, such as on the common novel score on the second item of the Pattern Meaning task, an additional coefficient alpha was computed for that score based on the remaining number of items within the task, and these additional coefficients are also presented in Table 5. Furthermore, coefficient alphas were not computed for the common novel score on the Modified Bennet Test and the divergent synthesis score on the Alternate Uses test as there were no responses in those categories. Looking at Table 5, it can be seen that a number of the eight item scores are not reliable which is a function of

the small variance within the scores.

A correlation matrix was compiled to examine the correlations among all the scores (uniquely novel, unusually novel, common novel, non-triviality, appropriateness, surprise stimulation, divergent synthesis, primary creativity, secondary creativity, fluency, response length) on all the creativity tasks. Due to the interdependencies in scoring, it was anticipated that within tasks, a number of scores would be highly correlated with one another. For example, since secondary creativity is a summary score, it was anticipated that it would be highly correlated with the three novelty scores, non-triviality, appropriateness, and the surprise stimulation scores. It was also expected that the scores on the two visual tasks (Pattern Meanings and Line Meanings) would be more highly correlated with each other than with either verbal task (Modified Bennet Test and Alternate Uses) and that the scores on the two verbal tasks would be more highly correlated with each other than with either of the visual tasks. If the expected correlations were in fact present, it was thought that a consolidation of the final correlation matrix could be accomplished by establishing marker variables for the highly correlated scores.

One overriding pattern that emerged in the creativity correlation matrix was the highly significant correlations among non-triviality, appropriateness, secondary creativity,

and fluency within each task (Table 6). The high correlations among non-triviality, appropriateness, and secondary creativity were expected based on their interdependence in scoring while the presence of fluency in this complex may be explained by the greater the number of responses given the greater the likelihood of achieving a "creative" response. The surprise stimulation and divergent synthesis scores had no or low reliability and displayed significant correlations on all four tasks only with the primary creativity score, which is a summary score determined by ratings on surprise stimulation and divergent synthesis. The correlations ranged from $r = .51$ ($p < .01$) to $r = .94$ ($p < .01$). The primary creativity score was not significantly correlated with scores other than surprise stimulation and divergent synthesis. Of the three novelty scores, due to its low reliability, the common novel score was not significantly correlated with any other scores across all four tasks. The unusual novel and uniquely novel scores showed significant correlations with non-triviality, appropriateness, secondary creativity, and fluency on the visual tasks, with r ranging from .64 to .79 ($p < .01$) but displayed a large variability on the verbal tasks, for example revealing non-significant correlations of Alternate Uses uniquely novel with Alternate Uses non-triviality ($r = .15$, $p > .01$). Again, this large variability on the verbal tasks appears to be related to the lower internal

consistency of uniquely novel and unusually novel on the verbal tasks than on the visual ones.

Based on the highly significant correlation and the interdependence in scoring, it was decided that the secondary creativity score on all four tasks would serve as a marker variable for the non-triviality and appropriateness scores in the final correlation matrix. For conceptual reasons, both because of the controversies in the creativity literature on the influence of fluency and because of the desire to evaluate its particular relationship with several Holtzman Inkblot variables, it was decided that fluency be considered a separate variable in the final matrix. The common novel, surprise stimulation, and divergent synthesis scores were excluded from the matrix due to their overall low internal consistency. Although the primary creativity score showed no pattern of significant correlations with any creativity score other than surprise stimulation and divergent synthesis, its component parts, it was included as a separate variable due to its relevance to the central thrust of the experiment. The uniquely novel and unusually novel scores were kept as separate variables due to their fluctuating patterns of correlations and to the possible theoretical importance of the uniquely novel response as expressive of "creativity."

In an attempt to achieve a further consolidation for the final matrix, the correlations between and across the

visual and verbal tasks for the uniquely novel, unusually novel, primary creativity, secondary creativity, fluency, and response length variables were assessed. Referring to Table 7, it can be seen that no consistent pattern of correlations emerged in the correlations between the two visual and the two verbal tasks. Furthermore, the positive significant correlations on selected variables, which are theoretically interesting in that they suggest a tendency to be judged creative across visual and verbal domains, do not provide a strong argument for combining the variables across the visual and verbal tasks in light of the generally low levels of correlation. Additionally, it seemed that combining variables across visual and verbal tasks at this stage of the analysis might result in a loss of theoretically enlightening information in the final correlation matrix. The correlations between the two verbal tasks on the above variables were insignificant or showed significantly positive but low correlations so that consolidating the two tasks seemed inappropriate (Table 8). However, the visual tasks showed significantly positive and higher correlations on the specified variables with the exception of primary creativity whose reliability is questionable (Table 9), so that a consolidation of these two tasks seemed appropriate. The reliability of the consolidated scores was assessed by stepping up the correlation between Pattern Meanings and Line Meanings on these specific scores

according to the Spearman Brown Prophecy Formula (Snedecor & Cochran, 1967). The reliabilities were uniformly high, ranging from .62 ($p < .01$) for response length to .85 ($p < .01$) for fluency with the exception of primary creativity ($r_{11} = .38$, $p < .01$) which again was affected by the lack of internal consistency of its component scores.

It should be noted that the higher correlations between the two visual tests appears to be related to the degree of similarity of the creativity tests. Both Pattern Meanings and Line Meanings present the subject with similar stimuli and similar instructions and encourage a comparable cognitive orientation or set. The Modified Bennett Test and Alternate Uses present a wider divergence between tasks in that although both tests seek to encourage divergent and possibly abstract thinking, the Alternate Uses test may be dealt with on a cognitively more concrete level. In this way, it is similar to the Pattern Meanings and Line Meanings tests and this similarity appears to be reflected in the higher correlations on the secondary creativity and fluency variables between Pattern Meanings and Alternate Uses and Line Meanings and Alternate Uses.

In summary, it was decided that the secondary creativity score on all the four tasks would serve as a marker variable for the non-triviality and appropriateness scores. The fluency score would remain as a separate variable in the final matrix. The common novel, surprise-stimulation, and

divergent synthesis scores would be excluded from the matrix, and the primary creativity, uniquely novel, and unusually novel scores would be included in the matrix. The final correlation matrix, therefore, included the secondary creativity, fluency, primary creativity, uniquely novel, and unusually novel variables. These variables were combined across visual tasks but not combined across verbal tasks.

The Holtzman Inkblot Technique, Forms A and B

Using a factor analysis, Holtzman et al. (1961) isolated two factors which have been adopted in modified form in this experiment as definitions of adaptive and maladaptive regression, i.e., Factor I and Factor III, respectively. The first step in examining the data, then, was to determine if a similar pattern of relationship of variables emerged in this college sample to establish the reliability of the HIT. It should be remembered that while the HIT, Form A was administered and scored according to standardized instructions, the HIT, Form B was administered in a novel way and was scored in the standardized way. Therefore, a greater divergence from Holtzman et al.'s results in the patterning of the variables was expected for the HIT, Form B.

It was decided that a matrix of correlations within each Form of the HIT, and across Forms would allow one to

examine the pattern of relationships among variables with the idea that if the correlations of variables within Factor I and within Factor III, as defined by Holtzman et al., were positive and moderately high, a factor analysis would be unnecessary. The correlation coefficient values listed in Table 10 reveal a satisfactory pattern. Of the 36 correlations, 27 are significant and positive and only one is negative ($r = -.04$). The positive correlations range from $r = +.04$ to $r = +.84$, with a median at $r = +.37$. A comparison of Table 10 and Table 11 reveals that these significant, positive, and moderately high correlations for the above variables are found exclusively within the designated pattern. The significantly positive correlations of Anxiety and Hostility with Sex, Abstract, and Penetration is not surprising as Holtzman et al. state that these variables will frequently show significant loadings on Factor III. Additionally, the variable of Response Length (RL) was added to Holtzman et al.'s scoring as Megargee (1966) found a high loading of this variable on Holtzman's Factor I. Tables 11 and 12 show the correlations of response length with Holtzman's Factor I and Factor III variables for Form A and Form B, respectively. While the pattern of significant correlations varies between the two Forms, a consistent positively significant correlation of Movement with Response Length emerges, lending support to Megargee's argument. Surprisingly, the pattern of

positively significant and moderately high correlations was similar for the Holtzman et al. Factor I variables on the HIT, Form B although the Holtzman et al. Factor III variables were not significantly correlated with each other (Tables 13 and 14). One interesting deviation is the positive and moderately high correlation of the Form Appropriateness variable with Movement. Holtzman et al. state that "the fragmentation of the inkblot into smaller parts generally does tend to be associated with more accurate form" (1961, p. 161), and the procedure used with the HIT, Form B tends to encourage the focusing on a small detail, so that procedural differences do appear to be reflected in the resultant correlation coefficients. However, the reliability of the HIT appears to be essentially good and to be resistant to procedural differences as evidenced in the generally comparable pattern of results in Form A and Form B and in the significantly positive correlations between the individual variables on Form A and Form B (Table 14).

In the final correlation matrix, only the data from the HIT, Form A was included. The use of the HIT, Form B was conceived of as a means of assessing the relationship between the direction of eye movement while fantasy material is being produced, so a separate correlation matrix was devised to analyze this relationship (see p.121). In the final correlation matrix the Movement, Integration, Human,

Popular, Form Definiteness, Anxiety, Hostility, and Pathognomonic Verbalization of the HIT, Form A were included as distinct variables. Additionally, three linear combinations of variables were included: (1) FI; the sum of Movement plus Integration plus Human plus Form Definiteness plus Popular, corresponding to Holtzman et al.'s definition of Factor I; (2) FII: the sum of Movement plus Integration plus Human plus Form Definiteness without Popular, as a measure of a "unique" response on the HIT; and (3) FIII: the sum of Movement plus Anxiety plus Hostility plus Pathognomonic Verbalization, corresponding to Holtzman et al.'s definition of Factor III. An alpha coefficient (Cronbach, 1951) was computed on each of the three linear combinations to determine their internal consistency. The alpha coefficient for FI is .78, for FII is .79 and for FIII is .70. All are significant at $p < .01$.

Sheehan's Shortened Form of the Bett's QMI

Sheehan's Shortened Form of the Bett's QMI was analyzed by forming a correlation matrix encompassing the seven sub-parts of the scale and the total score on the scale in order to determine the intercorrelations among the sub-parts and between each sub-part and the total score. The seven sub-parts of the QMI are: (V) Visual, (A) Auditory, (C) Cutaneous, (K) Kinesthetic, (G) Gustatory, (O) Olfactory, and (Or) Organic.

The Auditory, Gustatory, Kinesthetic, Cutaneous, and Olfactory sub-parts showed positive and significant correlations with each other, with r ranging from .42 ($p < .01$) to .59 ($p < .01$) (Table 15). These sub-parts also showed uniform high, positive correlation with the total score, with r ranging from .70 ($p < .01$) to .78 ($p < .01$). The visual sub-part only showed a significant correlation with Auditory ($r = .32$, $p < .05$) and the Organic sub-part only showed a significant correlation with Olfactory ($r = .29$, $p < .05$). Visual displayed a much lower correlation with the total score than did Auditory, Cutaneous, Kinesthetic, Gustatory, or Olfactory, although it was still a significant correlation ($r = .49$, $p < .01$) and Organic echoed this significant but lower correlation ($r = .47$, $p < .01$). Sheehan (1967) reports inter-modality differences with lower means for the V and Or scales.

It is interesting to speculate that the lower correlations for the Visual and Organic sub-parts with the total score might reflect a positional effect as they are the first and last sub-parts of the scale. For example, as the test is presented in an eight page pamphlet, the subjects might regard it as a long test and might react with an initial hesitation, annoyance, or apprehension at having to complete the whole test. At the end of the scale, the desire might be to finish the task as quickly as possible so that in both cases the level of anxiety or

irritation is high and not much thought is given to the answers.

Sheehan's Shortened Form of the Bett's QMI had been included in order to investigate Bakan's (1969) and Harnad's (1972) statements that more vivid visual imagery was reported and used by left movers. The primary interest, therefore, was in investigating the use of visual imagery. As it was thought that the use of more vivid visual imagery might extend to other imagery modalities, the secondary interest was in investigating the relationship of other imagery modalities to the direction of eye movement. This line of thought and the pattern of intercorrelations that emerged in the correlation matrix of the QMI data pointed to the inclusion of the subjects' scores on the Visual sub-part of the QMI as a discrete variable in the final correlation matrix. Furthermore, since the Auditory, Cutaneous, Kinesthetic, Gustatory, and Olfactory sub-parts showed high, significant, and positive correlations with one another and with the total score, a linear combination of these sub-parts was formed and included as one variable in the final correlation matrix.

An alpha coefficient was computed to determine the reliability of this linear combination, and the resultant value was highly significant ($\alpha = .82, p < .01$). The Organic sub-part was not included in this linear combination as its correlation with the above variables was either

nonsignificant or of low significance, and its correlation with the total score was drastically lower than the other variables' uniformly high correlations. The Organic sub-part was also not included in the final correlation matrix as a variable because there was no strong conceptual reason for its inclusion, as contrasted with the Visual sub-part, and because of its low intercorrelations with the other sub-parts.

Thorndike's Vocabulary Test, G-T, Forms 1 and 2

On Thorndike's Vocabulary Test, G-T, Forms 1 and 2, the correlations between Forms 1 and 2 and between each of the Forms and the total scores were assessed for both of the scoring methods, i.e., for scoring according to the number right (Thorndike et al., 1944) and according to the corrected number right (Miner, 1957). Using the number right scoring method, the correlation between Form 1 and Form 2 was $r = .75$ ($p < .01$) and the correlations between Form 1 and the total score and Form 2 and the total score were $r = .93$ ($p < .01$) and $r = .94$, ($p < .01$) respectively. The test's reliability using this scoring method was determined to be .86.

Using the corrected number right scoring method, the correlation between Form 1 and Form 2 was $r = .68$ ($p < .01$) and the correlations between Form 1 and the total score and Form 2 and the total score were $r = .92$ ($p < .01$) and

$r = .93$ ($p < .01$) respectively. The test's reliability using this corrected scoring method was determined to be .81. The two scoring methods, therefore, were considered to yield equivalent reliability as well as similar high intercorrelations between Forms and among Forms and the total score on the Vocabulary Test. It was decided therefore that only the corrected number right total score be included in the final correlation matrix.

Reflective Eye Movements

The analysis of the data on eye movements that was adopted in this dissertation arose out of a consideration of Ehrlichman et al.'s and Galin and Ornstein's approaches to the analysis of the phenomenon of reflective eye movements and stands as a modification of their analyses.

The data on reflective eye movements was gathered using two different procedures, one being the subject's eye movements in response to sets of verbal and spatial questions, the other being the subject's eye movements in response to a set of 10 inkblots. The analysis of the data on reflective eye movements in response to the verbal and spatial questions will be discussed first.

For each subject, a number of scores were computed separately for the verbal and spatial sets of questions and were then totalled across sets. The lateral and vertical directions of the eye movements were analyzed

separately. Stares were considered as reflecting no eye movements. Blinking, or the subject's closing of her eyes was considered as "no contact" and was not scored as a movement. For the vertical dimension, any eye movement to 11, 12, or 1 o'clock was considered as an Up (U) movement and any eye movement to 5, 6, or 7 o'clock was considered as a Down (D) movement. For the lateral dimension, any eye movement to 2, 3, or 4 o'clock was considered as a Left (L) movement, and any eye movement to 8, 9, or 10 o'clock was considered as a Right (R) movement. The frequency of each type of eye movement was expressed as a percentage of the total number of scorable movements, with stares being excluded from this total number. Furthermore, the individual's propensity to move his eyes right as opposed to left and up as opposed to down was evaluated by two additional scores: (1) The difference between the individual's right and left eye movements was expressed as a percentage of the total number of the individual's right and left eye movements; and (2) The difference between the individual's up and down eye movements was expressed as a percentage of the total number of the individual's up and down eye movements. For these last two scores, up was defined as an eye movement to 10, 11, 12, 1 or 2 o'clock, down was defined as an eye movement to 4, 5, 6, 7, or 8 o'clock, left was defined as an eye movement to 1, 2, 3, 4, or 5 o'clock and right was defined as an eye movement

to 7, 8, 9, 10, or 11 o'clock.

A 25 X 25 correlation matrix was constructed containing the above six percentage scores for each set of questions and for the combined sets, the number of stares for each set of questions and for the combined sets, and the number of "no contact" for each set of questions and for the combined sets. Additionally, whether the questions were presented in a random or non-random order was coded as 0 or 1 respectively and included as a variable in this matrix.

Table 16 displays the intercorrelations among the scores. Within each set of questions, the correlations among the percentage score of the individual's right movements out of the total number of scorable movements ($\% \frac{R}{total}$), the individual's left movements out of the total number of scorable movements ($\% \frac{L}{total}$), and the percentage score of the difference between the individual's right and left movements out of the total number of the individual's right and left movements ($\% \frac{R-L}{R+L}$) were significant and strong, ranging from $r = .79$ ($p < .01$) to $r = -.87$ ($p < .01$). The correlations for the equivalent percentage scores in the up and down dimension were also significant, albeit somewhat less strong, related to their lower frequency, ranging from $r = -.42$ ($p < .01$) to $r = .57$ ($p < .01$).

Based on the above significant intercorrelations it seemed that these percentage scores within the vertical and lateral dimensions and within question sets were

replicating each other so that only one type of percentage score within each dimension need be used. It was decided that the percentage score of the frequency of each type of eye movement out of the total number of movements would be used, as this score represented the individual's favored direction of eye movement out of all of his eye movements and thereby provided a simple and viable means of classification. Thus, within question sets, four scores were retained: (1) $\frac{R}{\text{total}}$; (2) $\frac{L}{\text{total}}$; (3) $\frac{U}{\text{total}}$; and (4) $\frac{D}{\text{total}}$. A further reason for this decision was that the intercorrelations across question sets for each of these four scores ranged from $r = .49$ ($p < .01$) to $r = .71$ ($p < .01$) (Table 16), providing significant and strong enough intercorrelations to support a totalling of scores across question sets. It was decided, therefore, that the totals for the above four scores, combining scores on the verbal and spatial questions, would be used in the final correlation matrix. There appeared to be no significant relationships among the number of stares, the number of "no contact" responses, and the percentage scores both within and across question sets (Table 16), so that the frequency score of the number of stares and the number of "no contact" responses were omitted from the final correlation matrix.

The random order of questions within each question set appears to have had no effect on the direction of eye

movement except for one negatively significant but weak relationship on the spatial set of questions between the $\frac{R}{\text{total}}$ score and the non-random order of questioning (Table 16). However, this significant intercorrelation appears to be an artifact as the corollary relationship does not reach significance, i.e., there is no significant intercorrelation between the tendency to show left reflective eye movements and the effect of question order on the spatial set of questions. Also, the significant negative correlation drops to insignificance when the scores on the verbal and spatial sets of questions are combined.

In addition to the four percentage scores that were retained, a difference score of Verbal (V)-Spatial (S) was computed for each of the four directions of reflective eye movements. It was thought that this difference score would reflect the relative frequency of each direction of eye movement on the verbal as opposed to the spatial set of questions, providing information on the individual's tendency to move on the verbal versus the spatial set of questions. For these difference scores, the definitions of R, L, U, D were the same as for the four retained percentage scores. The four V-S difference scores were included in the final correlation matrix. The V-S difference score reflects a shift in emphasis from looking at the individual's favored direction of eye movement

across verbal and spatial sets of questions to looking at the individual's response to the different types of questions, thereby focusing on the possibility of question type being related to and affecting a particular direction of eye movement.

From the complete group of subjects, those subjects who displayed 11 or more reflective eye movement responses in one particular direction was defined as "consistent" subjects and their data were used in a further analysis. Again, the classification of subjects into categories of "right movers," "left movers," "up movers," and "down movers," was accomplished using the four percentage scores defined for the final correlation matrix. For all of these consistent subjects, a comparison of means on the HIT, Form B and creativity battery variables was undertaken.

The seven percentage scores that were initially computed on the individual's eye movement responses to the verbal and spatial sets of questions were also computed for the individual's eye movement responses to the series of inkblots. In a 12 X 12 correlation matrix, the correlation among these seven scores, the presence of a "long stare" (LS), "short stare" (SS) or "stare" (S) before a response, the number of "no contact" responses, the number of inkblots shown, and the number of rejected inkblots was analyzed. The correlations between the $\frac{R-L}{R+L}$ and the $\frac{R}{total}$ and $\frac{L}{total}$ were significant and

generally strong ($r = .49$ ($p < .01$) and $r = -.70$ ($p < .01$) respectively) as were the correlations between the $\frac{U-D}{U+D}$ and $\frac{U}{total}$ and $\frac{D}{total}$ ($r = .58$ ($p < .01$) and $r = -.56$ ($p < .01$) respectively). These significant correlations again suggested that the $\frac{R-L}{R+L}$ and $\frac{U-D}{U+D}$ scores replicated the information contained in the other four percentage scores and could be eliminated from further analysis.

The other correlations in this matrix will be discussed in the Results section (see p.128). The consistency of the individual's eye movements across procedures was assessed by a 15 X 15 correlation matrix, showing the correlations among the four percentage scores and the number of stares for the verbal and spatial sets of questions and for the eye movement responses to the inkblots.

In scoring the direction of reflective eye movements while the subject was presumably engaged in a greater or lesser degree of fantasy activity, an attempt was made to investigate the effect, if any, of fantasy activity on the subject's preferred direction of reflective eye movement. Thus, in analyzing the subject's eye movement responses to the HIT, Form B it was necessary to consider and control for the individual's preferred direction of eye movement. Furthermore, particular inkblots are associated with a greater degree of fantasy activity in the form of eliciting more movement responses (Holtzman et al., 1961), so that it was also necessary to consider and control for the

effect of the specific inkblot. The analysis was based upon 10 inkblots, with a "right movement" being defined as any movement to 8, 9, 10 o'clock, a "left" movement being defined as any movement to 2, 3, 4 o'clock, an "up" movement being defined as any movement to 11, 12, 1 o'clock, and a "down" movement being defined as any movement to 7, 6, 5 o'clock. The means across blots for the variables were computed. A partial correlation matrix was computed among all the variables with controls for blot effect and person effect.

An adjusted sum for the rows and columns was computed by subtracting the row means and column means in order to eliminate person effect and blot effect and the correlation among all the variables was attained. The correlations were presented in a 17 X 17 partial correlation matrix, encompassing the four directions of eye movement, the number of stares, and 12 HIT variables that theoretically might show a relationship to the amount of fantasy that was produced (Rejection, Form Definiteness, Form Appropriateness, Color, Shading, Movement, Pathognomic Verbalization, Integration, Human, Animal, Penetration, Popular) (see Table 21).

CHAPTER V

RESULTS

A 42 X 42 final correlation matrix was constructed. An alpha level of 0.05 was chosen as the significance level. The value for r at the .05 level of significance for a one-tailed test with $N = 89$ is 26.

Testing of Major Hypotheses

Hypothesis 1

FI as a measure of "adaptive regression" does not display significant correlations at the 0.05 level with the Visual secondary creativity ($r = .21, p > .05$), Visual primary creativity ($r = .09, p > .05$), Alternate Uses secondary creativity ($r = .08, p > .05$), Alternate Uses primary creativity ($r = .15, p > .05$), Modified Bennett Test secondary creativity ($r = .07, p > .05$), and Modified Bennett Test primary creativity ($r = .02, p > .05$) creativity scores. Furthermore, FI does not display any significant correlations at the 0.05 level with the remaining creativity scores that were included in this matrix, although the correlation between FI and the Visual uniquely novel score ($r = .24$) tended towards significance.

FII may be understood as a measure of "adaptive regression" with the additional constraint of being in the

context of a uniquely novel response. FII also does not display significant correlations with the Visual secondary creativity ($r = .21, p > .05$), Visual primary creativity ($r = .09, p > .05$), Alternate Uses secondary creativity ($r = .07, p > .05$), Alternate Uses primary creativity ($r = .15, p > .05$), Modified Bennett Test secondary creativity ($r = .06, p > .05$) and Modified Bennett Test primary creativity ($r = .02, p > .05$) creativity scores. It too does not display any significant correlations at the 0.05 level with the remaining creativity scores that were included in this matrix. The correlation between FII and the Visual uniquely novel score tends towards significance ($r = .24$) but this tendency is not repeated in the scores of the Verbal uniquely novel responses (Alternate Uses uniquely novel, $r = .03, p > .05$; Modified Bennett Test uniquely novel, $r = -.02, p > .05$). Since the HIT is a visual stimulus and heavily relies upon one's capacity for a "visual creativity," these results are not surprising.

The correlations of the individual variables of the HIT, i.e., Movement, Integration, Human, Popular, Form Definiteness, Anxiety, Hostility, and Pathognomic Verbalization with the secondary creativity, fluency, primary creativity, uniquely novel, unusually novel, and response length scores on the verbal and visual creativity tasks reveal no significant correlations other than a significant but low correlation between Human and the Visual uniquely

novel score ($r = .29, p < .05$). This low but significant correlation also appears in the correlation between FIII, the measure of "maladaptive regression," and the Visual uniquely novel score ($r = .26, p < .05$), and it is the only significant correlation between FIII and the creativity scores. None of the component variables of FIII (Movement, Hostility, Anxiety, Pathognomic Verbalization) reveal a significant correlation with the Visual uniquely novel score. These significant, albeit low, correlations may be viewed as reflecting two sides of "creativity," i.e., its adaptive and maladaptive components; seeing a human percept in the inkblots, whether the percept involves movement or not, requires a certain degree of healthy fantasy activity while a uniquely novel response is often associated with and derives out of pathological, primary process thinking.

It seems worthwhile to mention that the absence of significant correlations at the .05 level when so many figures are examined is remarkable, in that chance error would be expected to give one significant correlation out of 20.

Hypothesis 2

Based on the definition of consistency of reflective eye movements as a 55% or more uni-directional eye movement in one quadrant, in response to the 20 reflective eye movement questions, a limited consistency was found. Out of a population of 89 subjects, 20 subjects displayed a

consistent right eye movement, 44 subjects displayed a consistent left eye movement, 10 subjects displayed a consistent up eye movement, and 4 subjects displayed a consistent down eye movement. Analyses of variance were computed using these subjects' Visual primary creativity and secondary creativity scores, Alternate Uses primary creativity and secondary creativity scores, and Modified Bennett Test primary creativity and secondary creativity scores. None of the F ratios reached significance at the .05 alpha level, indicating that there were no significant differences among the subjects who displayed consistent right, left, up, or down reflective eye movements on their creativity summary scores (Table 17).

The 42 X 42 final correlation matrix reveals that among all subjects a preference for a left, up, down, or right reflective eye movement is not significantly correlated with high Visual secondary creativity and primary creativity scores, high Alternate Uses secondary creativity and primary creativity scores, and high Modified Bennett Test secondary creativity and primary creativity scores, with the exception of a significant and negative correlation between a preference for an up reflective eye movement and high scores on the Alternate Uses secondary creativity variable (Table 18). The significant negative correlation between a preference for an up reflective eye movement and a high Alternate Uses secondary creativity score might be dismissed

as an accident of finding a single significant value when so many correlations are examined or might be tentatively interpreted as consistent with the hypothesis that the right brain hemisphere is associated with primary process-like, non-verbal functioning and that the direction of eye movement is contralateral to the stimulated hemisphere. In light of the overriding non-significant correlations, it alone cannot provide a convincing argument for support of the hypothesis.

Hypothesis 3

Analyses of variance were computed on the FI, FII composite variables and the Movement, Integration, Human, Popular, Form Definiteness, Anxiety, and Hostility variables of the HIT, Form A for those subjects who displayed consistent uni-directional reflective eye movements. None of the F ratios reached significance at the .05 alpha level, indicating that there were no significant differences among the subjects who displayed consistent right, left, up, or down eye movements on their ability for "adaptive regression" (Table 19).

Table 20 displays the obtained correlations between the composite FI and FII variables and preferred direction of reflective eye movement, and between the Movement, Integration, Human, Popular, Form Definiteness variables and the preferred direction of eye movement. The Anxiety and Hostility variables are included in the Table as they are considered as possible components of "adaptive regression."

Using the formula for the Pearson Product Moment correlation coefficient, all of the obtained correlations are not significant at the .05 alpha level, indicating that there were no significant differences among the subjects who displayed a preference for right, left, up or down reflective eye movements on their ability for "adaptive regression."

Hypothesis 4

A 17 X 17 partial correlation matrix was constructed as described above (see p.120). None of the correlations among the direction of reflective eye movement, the presence of a stare response and the selected HIT, Form B variables reached significance at the .05 alpha level, as determined by the Pearson Product Moment correlation coefficient (Table 21). This suggests that at this point, on the basis of this method, no support can be given to the hypothesis that a specific direction of reflective eye movement is associated with the production of adaptively regressive or fantasy material regardless of the individual's preferred direction of reflective eye movement.

Testing of Secondary Hypotheses

Hypothesis 1

The intercorrelations among the preferred direction of eye movement and choice of major were computed as part of the 42 X 42 final correlation matrix. It will be remembered

that a choice of a "soft" major was coded as 0 and a choice of a "hard" major was coded as 1. None of the correlations reached significance at the .05 alpha level as determined by the Pearson Product Moment correlation coefficient. The correlation between a preferred left reflective eye movement and choice of major was $r = -.11$, $p > .05$; the correlation between a preferred up reflective eye movement and choice of major was $r = -.10$, $p > .05$; the correlation between a preferred right reflective eye movement and choice of major was $r = .20$, $p > .05$; and the correlation between a preferred down reflective eye movement and choice of major was $r = -.01$, $p > .05$. Therefore, it appears that the relationship hypothesized by Bakan (1969) between a preferred left reflective eye movement and the choice of a "soft" college major was not replicated or supported by the current analysis. The hypothesized relationship between a preferred up reflective eye movement and the choice of a "soft" college major was also not supported.

Hypothesis 2

The Visual sub-part of Sheehan's Shortened Form of the Bett's QMI was included as a separate variable in the 42 X 42 final correlation matrix. Also, a linear combination of the Auditory, Cutaneous, Kinesthetic, Gustatory, and Olfactory sub-parts was formed and included as one variable in the final correlation matrix. The intercorrelations among the preferred direction of eye movement and the

reporting of more vivid visual imagery did not reach significance at the .05 alpha level, as determined by the Pearson Product Moment correlation coefficient (Table 22). Therefore, the relationship hypothesized by Bakan (1969) between a preferred left reflective eye movement and the reporting of more vivid visual imagery was not supported in this analysis nor was the hypothesized relationship between a preferred up reflective eye movement and the reporting of more vivid visual imagery supported. Table 22 also shows that the intercorrelations among the preferred direction of eye movement and the reporting of more vivid imagery in other modalities did not reach significance at the .05 alpha level. The hypothesis that a preferred left or up reflective eye movement is associated with the reporting of more vivid imagery in other modalities was also not supported.

The Relative Absence of Creative Responses in the Sample Population

The overwhelming lack of support of the major and secondary hypotheses may be related to the dirth of creative responses (high adaptive regression and high creativity scores) in the sample population. Table 23 shows the mean number of responses for the variables that comprise the operational definition of adaptive regression (Movement, Integration, Human, Popular, Form Definiteness) and for the scores on the four creativity tasks. It can be seen that the mean number of responses for certain of these variables is very small, indicating a limited variability and a limited range of responses.

CHAPTER VI

DISCUSSION

A number of theoretically and methodologically important issues have been examined in the previous sections of the dissertation. While the major issues have been stated in the form of hypotheses, a few ancillary questions have been raised. Additionally, certain unexpected correlations emerged and these, as well as the ancillary questions and the results of the hypotheses will be discussed below.

The absence of significant correlations among the HIT, Form A scores that comprise the "adaptive regression" variable, the creativity scores, and the direction of reflective eye movement might reflect a limited range of responses in the adaptive regression and/or creativity scores, lack of conceptual connections, limited construct validity of the individual measures, and/or a lack of sophistication in the measurement tool. Table 23 displays the mean number of responses for the variables that constitute the operational definition of adaptive regression (Movement, Integration, Human, Popular, Form Definiteness) and for the scores on the four creativity tasks. It can be seen that the mean number of responses for some of these variables is very small, suggesting a limited variability

and a limited range of responses. Unfortunately, too, the nonsignificant results do not resolve the issue of construct validity of the individual measures and the contradictions that are reflected in the literature remain unresolved. However, the reliabilities and internal consistencies of the individual measures may provide insight into the adequacy of a particular measure.

The Adequacy of the HIT as a Measure of
"Adaptive Regression"

In the case of the HIT, Form A, both the reliability and internal consistency of the test are good, as reflected in the similarity between the factors isolated by Holtzman et al. (1961) and the pattern of intercorrelations among variables that emerged in this experiment. It seems, therefore, that while the HIT may be regarded as a reliable tool, the interpretation of the Movement responses and Factor I variables as revealing fantasy activity or "adaptive regression" was not confirmed in the data found here.

Megargee (1966) had reported that Response Length may be an important variable of Holtzman et al.'s Factor I. Table 11 shows the correlations that emerged in this experiment among Response Length and the Factor I variables on the HIT, Form A. The significant correlations between Response Length and Movement ($r = .44$, $p < .01$), and Response Length and Popular ($r = .31$, $p < .05$) appear to

support Megargee's findings and suggest that Response Length on the HIT should be considered as an important addition to the scoring system. While the interpretation of the Factor I variables as reflecting a highly complex and differentiated response still remains in doubt, it is interesting to speculate that this possibly more differentiated response might require a longer, more wordy, verbal response.

The Creativity Battery

While discussing the issue of the validity of the individual tools in relation to the non-significant results, it was suggested that examining the reliabilities and internal consistencies of the individual measures might aid in determining which measures need improvement, thereby providing suggestions for future research. It will be remembered that the common novel, surprise stimulation, and divergent synthesis variables on all 4 creativity tasks showed low internal consistency (Table 5), and, that therefore, the primary creativity and secondary creativity summary scores were affected by this lack of internal consistency. In turn, this lack of internal consistency appears to have been affected by the composition of the experimental population. Both of the judges of the creativity tasks spontaneously and independently remarked upon the sparsity of genuinely surprising or synthetic responses.

It is suggested that before a revision of the creativity scoring criteria be undertaken, the creativity battery should be administered to and scored on a population whose "creativity" is evident from its creative productions, i.e., artists, sculptures, writers, etc. The fact that the uniquely novel, unusually novel, non-triviality, appropriateness and fluency scores show good reliability and internal consistency suggests that the scores have a usefulness and that with a "creative" population both the primary creativity and secondary creativity scores might show a better internal consistency and reliability and their validity might better be investigated. However, the nonsignificant correlations of the variables composing the definition of "adaptive regression" with the uniquely novel, unusually novel and fluency creativity variables (i.e., those that have good reliability) show that again the present research does not support the theoretical connections supposedly involved.

The Distinction between Visual and Verbal Creativity Scores

The possibility of an individual being "creative" in one particular modality and not in another led to the inclusion of both verbal and visual tasks in the creativity battery. The analyses of intercorrelations between and across tasks (see p.106) revealed interesting patterns that support the inclusion of visual and verbal tasks in any

creativity battery. No consistent pattern of intercorrelations emerged when the two verbal tasks were separately correlated with the two visual tasks (Table 7) although the significantly positive but low correlations that did emerge might suggest a tendency for individuals to be judged creative across different modalities. That is, those individuals who approach their world in a "creative" way may be expected to produce responses judged to be creative irrespective of the particular modality. However, the pattern of intercorrelations also indicates that within a particular modality, e.g., the verbal modality, there are strong discrepancies in judged creativity (Table 9) so that the demands of a particular task appear to have an effect upon the individuals judged creativity. The two visual tasks show high significant positive intercorrelations, possibly because their demands upon the subject were essentially similar. At this point, the issue remains unresolved of whether creativity is an overriding characterological personality characteristic or a specific response to a stimulating task in a particular modality.

Intelligence and Creativity Scores

The relationship between scores on an intelligence test and scores on a creativity test was superficially investigated by analysing the intercorrelations among the Thorndike Vocabulary Test, G-T, Forms 1 and 2 and the

scores on each of the creativity tasks (Table 24). The intercorrelations were determined by the Pearson Product Moment correlation coefficient as part of the 42 X 42 final correlation matrix. All of the intercorrelations are non-significant except for the correlations between the Vocabulary Test and the Alternate Uses secondary creativity ($r = .30$, $p < .05$) and between the Vocabulary Test and the Modified Bennett Test secondary creativity ($r = .38$, $p < .01$). These significantly positive but low results are in line with the results of Getzels and Jackson (1962) and contrast with those of Wallach and Kogan (1965) and Barron (1957). It is interesting to note that none of the visual creativity scores show a significant correlation with the Vocabulary Test and that the significant correlations occur with the particular verbal creativity scores that measure a type of thinking that may be considered to be under secondary process control and, therefore, more convergent than divergent. The pattern of intercorrelations, then, suggests that more rigorous research is needed on this issue and that in the case of the verbal creativity tasks, as Getzel and Jackson (1962) have remarked, a certain amount of verbal intelligence is needed in order to be creative but verbal intelligence and verbal creativity are not one and the same.

The Extension of Price's Creativity Scoring System
to the Visual Creativity Tasks and the AU

Price's (1971) scoring system for creativity was initially developed using only the Modified Bennett Test as a measure of creativity. In this dissertation, his system was extended and tried on another verbal task, Alternate Uses, as well as on the two visual tasks. The high interrater reliability on the Alternate Uses, Pattern Meanings and Line Meanings tasks (see p. 93) and the adequate internal consistency of the tasks (Table 5) suggest that Price's system is a viable one that can be easily taught and used with different creativity measures.

The Influence of Response Length in
the Creativity Battery

Table 25 displays the correlations among the Visual Response Length, Alternate Uses response length and Modified Bennett Test response length scores and the remaining creativity scores. The correlations were determined by the Pearson Product Moment correlation coefficient as part of the 42 X 42 final correlation matrix. One interesting pattern that emerges is the consistently negative correlations between the response length and fluency scores within each task. The correlation between Visual response length and Visual fluency is negatively significant ($r = -.26$, $p < .05$) as is the correlation between Modified Bennett Test response length and Modified

Bennett Test fluency ($r = -.41, p < .01$). The correlation between Alternate Uses response length and Alternate Uses fluency tends toward significance but does not reach significance ($r = -.22, p < .05$). The creativity tests were not timed but it was found that approximately five minutes for each item of each test were sufficient for all subjects. It is suggested, then, that those subjects who found that they had many different ideas tended to write brief answers while those subjects who had few ideas used the same amount of time to elaborate upon one idea. Additionally, as the subjects were students, it is suggested that they might have felt compelled to fill up the page with writing, much as some students feel during test-taking, so that a subject who found herself only able to come up with one idea might have elaborated upon that idea more than usual. This attitude might have exaggerated the negative relationship between response length and fluency, a relationship that might not be found outside of a student population.

The significant positive correlation between Alternate Uses, response length and Visual response length ($r = .42, p < .01$) appears to reflect the nature of the responses demanded by these tasks as opposed to the Modified Bennett Test. The Modified Bennett Test tended to elicit longer responses from all subjects while the Visual and Alternate Uses tasks were answered with briefly worded lists of

responses.

The significant negative correlation between Modified Bennett Test response length and Modified Bennett Test unusually novel ($r = -.40, p < .01$) is the only significant correlation between response length and uniquely novel scores on all the creativity tests. If it is not discarded as an accident of selection, the negative correlation indicates that those subjects who respond with long answers do not tend to give uniquely novel responses. This correlation may also reflect the earlier suggestion that those subjects who are flooded with many ideas give briefer responses in their attempt to write down all their ideas.

Handedness

In prior research on reflective eye movements, the right or left handedness of the subject was considered an important variable. Right-handed subjects, who comprise approximately 89% of the general population, 99% of the time are found to have the left hemisphere dominant for verbal functioning (Levy, 1974). Left handed subjects, who comprise approximately 11% of the general population, reveal a less complete lateralization of the brain hemispheres, and 56% of the time are found to have left language dominance and 44% right language dominance (Levy, 1974). It was thought that an attempt to control for handedness be included so as not to confound the

interpretation of results. Although the reporting of preferred writing hand is a superficial and incomplete measure of handedness, the extreme length of the testing battery argued for the inclusion of a simple and quick method.

The right or left handedness of the subject was coded (0 and 1, respectively) and included as a variable in the 42 X 42 final correlation matrix. The results agree with those of Etaugh (1972) as they reveal no significant correlations between handedness and a preferred right direction of reflective eye movement ($r = -.20, p > .05$), handedness and a preferred left direction of eye movement ($r = .01, p > .05$), handedness and a preferred up direction of eye movement ($r = .01, p > .05$), and handedness and a preferred down direction of eye movement ($r = -.13, p > .05$). Therefore, in discussing the results on the reflective eye movement data below, no distinction is made between right and left handed subjects.

Handedness was significantly and negatively correlated with high scores on the Vocabulary Test ($r = -.31, p < .05$) and with high scores on the Modified Bennett Test secondary creativity variable ($r = -.27, p < .05$). This indicates that right-handed subjects tended to score higher than left-handed subjects on the Vocabulary Test and the Modified Bennett Test secondary creativity variable. Both the Vocabulary Test and the Modified Bennett Test are verbal

tasks and the secondary creativity score as well as the Vocabulary Test reflects secondary process thinking.

Reflective Eye Movements

The theory of an association between a left reflective eye movement and "creativity" is based upon a double-dominance model of hemispheric functioning in which the left brain hemisphere is considered to be dominant for analytic, verbal functions and the right brain hemisphere is considered to be dominant for aesthetic, non-verbal functions. The direction of horizontal reflective eye movements is thought to be contralateral to the hemisphere that has been activated. Additionally, some investigators have reported a tendency for up reflective eye movements to be found in a "creative," artistic population (Galín & Ornstein, 1972) and in response to questions that require essentially non-verbal processing (Kinsbourne, 1972).

The failure to find significant correlations in this experiment between the direction of reflective eye movement and the creativity and adaptive repression scores does not necessarily mean that the above model must be discarded. One weakness of this experiment was the inability to directly record which hemisphere of the brain was being stimulated at a particular time; EEG equipment was not available and, therefore, for practical reasons, the experimental design did not include its use. For future

experimentation in this area, however, it seems essential that EEG recordings be made while scoring for direction of reflective eye movements. Furthermore, while the results of the major and secondary hypotheses yield only minimal information relating to the double-dominance model, an examination of the data on the reliability of reflective eye movements across procedures and the analysis of the frequency of occurrence of either right, left, up or down eye movements in response to verbal and spatial questions might result in an increased understanding of the model. It should also be noted that the questions used to elicit reflective eye movements might not have tapped the reflective state which was initially postulated to be essential.

Reliability of Reflective Eye Movements

Out of the original 91 subjects who responded to the sets of 10 Verbal and 10 Spatial questions, 78 displayed consistent uni-directional reflective eye movements. It seems, therefore, that at least within one testing session, in a face-to-face situation, consistent uni-directional reflective eye movements can be evoked, with these uni-directional eye movements possibly indicating the individual's reliance upon a particular brain hemisphere in his psychological functioning. Furthermore, among subjects who displayed a preferred direction of eye movement, the

intercorrelations between their preferred direction of eye movement on Verbal and Spatial questions administered in one session were positive, significant and strong enough so as to argue for the inclusion of only the total percentage scores in the final correlation matrix (see Table 16, and p.117).

The intercorrelations between the individual's preferred direction of eye movement on the Verbal and Spatial questions and the HIT, Form B were analyzed in a 15 X 15 correlation matrix for the 86 subjects who completed the whole battery of tests. The scoring of eye movements in response to the HIT, Form B took place in the same session as the scoring of eye movements to the Verbal and Spatial sets of questions. All the intercorrelations between a preferred right direction of eye movement, a preferred left direction of eye movement, a preferred up direction of eye movement and a preferred down direction of eye movement on the Verbal and Spatial questions and the HIT, Form B reached positive significance at the .05 or .01 alpha levels except for the correlation between a preferred down direction of eye movement on the HIT, Form B and the Verbal set of questions (Table 26). This aberrant non-significant correlation is puzzling and may in some way be affected by the dissimilarity between the two tasks. The overriding positive significant correlations seemingly add further support to the contention that individuals reliably display

a preferred direction of reflective eye movements within one testing session.

The Effect of Verbal and Spatial Questions on
Direction of Reflective Eye Movements

Right-Left Eye Movements

Using the Verbal (V) - Spatial (S) difference scores, t-tests for correlated means (Ferguson, 1966) were computed on the right and left reflective eye movement data in order to determine if a particular type of question was associated with a specific direction of reflective eye movement. No significant differences were found between the verbal and spatial questions in relation to the number of right reflective eye movements that they elicited ($t(88) = .89$, $p > .05$). This finding contrasts with the reported results of Kinsbourne's (1972) and Kocel et al.'s (1972) research, but it is in line with the results reported by Ehrlichman et al. (1973). Furthermore, a significant difference was found between the verbal and spatial questions in relation to the number of left reflective eye movements that they elicited, with the verbal questions being associated with a left reflective eye movement ($t(88) = 2.84$, $p < .01$). Again, this finding agrees with that reported by Ehrlichman et al. (1973). Ehrlichman et al. interpreted their findings as being inconsistent with the theory of cerebral asymmetry and the hypothesized association between reflective eye movements, hemisphere activation, and contralateral control.

They suggest that their data support the interpretation of ipsilateral control of lateral eye movements. The findings in this experiment also support the interpretation of ipsilateral control of reflective eye movements.

The agreement between the findings of this experiment and Ehrlichman et al.'s results and the disagreement of both of these studies with Kocel et al.'s and Kinsbourne's results might be related to procedural differences. The verbal questions used in this research were adapted from Ehrlichman et al. and were composed of interpretation of proverbs and word definitions. Kocel et al.'s verbal questions tended to call for numerical calculations and rote knowledge of the characteristics of English. There were no differences in the experimental situation as all researchers used a face-to-face experimental situation. Ehrlichman et al. suggest that subject differences in terms of field-dependence and field-independence might be an important variable in horizontal reflective eye movements. While this particular question was not addressed, this experiment does take into account subject differences in terms of scores on a creativity battery. The nonsignificant correlations between a preferred direction of eye movement and scores on the creativity battery suggest that, in this experiment, differences between subjects on creativity scores do not account for the differences in horizontal reflective eye movements on verbal and spatial questions.

It should also be noted that Galin and Ornstein's (1972) criticisms of Ehrlichman et al.'s use of the centroid analysis of the data and its influence upon the obscuring of differences on the horizontal eye movement dimension do not apply as the centroid analysis was not used and a modified version of Galin and Ornstein's and Ehrlichman et al.'s scoring systems was adopted.

Up-Down Eye Movements

Using the Verbal (V) - Spatial (S) scores, t-test for correlated means (Ferguson, 1966) were also computed on the up and down reflective eye movement data in order to determine if a particular type of question was associated with an up or down direction of reflective eye movement. Significant differences were found between the verbal and spatial questions in relation to both the number of up and the number of down reflective eye movements that they elicited. Spatial as opposed to verbal questions elicited significantly more up eye movements ($t(88) = 4.96, p < .01$) and verbal as opposed to spatial questions elicited significantly more down eye movements ($t(88) = 2.08, p < .05$). These findings agree with the results of Ehrlichman et al.'s (1973) and Galin and Ornstein's (1972) results for the vertical dimension of reflective eye movements.

The question arises as to whether vertical reflective eye movements can be incorporated into a theory of cerebral

asymmetry, hemispheric activation, and contralateral control. Research on the oculomotor system (Bender, 1964) indicates that bilateral stimulation is necessary for vertical eye movements to occur. The current stage of neuro-anatomical research indicates, therefore, that the vertical eye movements cannot accurately be incorporated into a theory of contralateral control of reflective eye movements. The associations between verbal questions and downward eye movements and spatial questions and upward eye movements stand as an unexplained experimental fact. Ehrlichman et al. suggest that the vertical reflective eye movements may be totally unrelated to hemispheric dominance but may be associated with affective states and social factors. These associations deserve to be investigated in future research.

Stares

At t-test on correlated means (Ferguson, 1966) was computed for the number of stares evoked by verbal and spatial questions. The results indicated that the verbal questions elicited significantly more stares than the spatial questions ($t(85) = 4.48, p < .01$). This finding contrasts with Ehrlichman et al.'s and Galin and Ornstein's results where spatial questions were found to elicit significantly more stares. Ehrlichman et al. remark that the nature of the relationship between stares and reflective

eye movements is unclear and the contradictory current findings appear to lend added support to this statement. These findings also do not offer evidence for Galin and Ornstein's explanation of stares as reflecting bilateral activation. With the status of stares still in question, it seems logical to compute the percentage scores for the direction of reflective eye movements based on the total number of scorable movements and not based on the total number of scorable trials, as Galin and Ornstein suggested.

The presence of stares was also recorded while the subjects responded to the HIT, Form B. The intercorrelations among long initial stares (LS), short initial stares (SS), stares (S) and a preferred right, left, up or down direction of eye movement were analyzed as part of a 12 X 12 correlation matrix. The correlations between the stare response and long initial stares and the stare response and short initial stares reach significance at the .01 alpha level (Table 27). This appears to indicate that individuals who tend to give stare responses will also tend to display initial stares before shifting their eyes. Furthermore, the only significant correlation between preferred direction of eye movement and the presence of either a long initial stare, short initial stare or stare was between a right eye movement and a long initial stare ($r = .31$, $p < .05$). The correlation between a right eye movement and stare also strongly tends toward significance

($r = .25$, $p > .05$). If one believes that the left hemisphere is dominant for verbal functions, these findings echo the association found between verbal questions and the presence of stares reported above.

Additionally, individual t-tests were computed on the number of stares evoked by the verbal questions as compared to the HIT, Form B and the number of stares evoked by the spatial questions as compared to the HIT, Form B. The results indicate that the verbal questions elicited significantly more stares than the HIT, Form B ($t(85) = 2.39$, $p < .05$) while no significant difference was found between the spatial and HIT, Form B in relation to the number of stares evoked ($t(85) = 1.64$, $p > .05$). The HIT, Form B is an essentially visual task so that these latter results again reflect the stronger tendency for verbal functioning to be associated with stare responses.

Suggestions for Future Research

Throughout the previous sections a number of unanswered questions and conflicting findings have been reported and these provide the direction for future research. It was suggested that the nonsignificant results of the testing of the hypotheses might be related to the choice of subjects and the relatively few differentiated responses that they produced. This paucity of differentiated, divergent responses had a definite effect upon the reliability of

the creativity summary scores. First, then, it is suggested that the current experiment be replicated using two groups, one of which presumably displays an original approach to the world, i.e., artists, writers, etc. and the second of which presumably displays a more conventional approach, i.e., non-artists, etc. Second, in order to better test the hypothesized relationship between hemispheric activation, cerebral asymmetry and contralateral control of reflective eye movements, it is suggested that EEG recordings be made while the subject is responding to a creativity battery and that the direction of reflective eye movement be scored simultaneously. In this way, a more precise and accurate picture of the above hypothesized relationship might be achieved.

Furthermore, the issues of the effect of verbal and spatial questions upon the direction of reflective eye movements and the status of stares remain in doubt. Even with the same sets of questions, such as used in Ehrlichman et al.'s studies and in this research, conflicting findings have resulted. It seems, therefore, that additional research needs to be done along the lines suggested by Ehrlichman et al., i.e., conducting experiments using different sets of verbal and spatial questions in similar experimental situations and conducting research into subject differences and its relation to direction of reflective eye movements.

Third, the extension of Price's scoring system to include other verbal creativity tasks and visual creativity tasks proved to be a viable idea. The usefulness and limitations of his system should be delineated by further research. Additionally, it seems that the response length variable should be included as an important part of any scoring system of creative responses. Fourth, the results of this experiment pointed to a possible relationship between intelligence and creativity. The measurement of intelligence was a crude one and further studies should be done using a more extensive intelligence battery.

CHAPTER VII

CONCLUSION

Based on the nonsignificant results of this experiment, which involved an essentially non-creative sample, no support can be given to the hypotheses that the production of Holtzman Movement responses are related to the production of "creative" responses as determined by the presence of higher scores on a creativity battery. Furthermore, no support can be given to the hypothesis that a particular direction of reflective eye movement is associated with higher scores on a creativity battery, or with the production of fantasy material. The model of cerebral asymmetry, hemispheric activation, and contralateral control of reflective eye movements has not been validated by this research. At this point, it seems premature to regard the direction of reflective eye movements as indicative of particular cognitive processes or personality characteristics.

APPENDIX A
THE STANDARDIZED GROUP METHOD OF ADMINISTRATION
FOR THE HIT

Description: In its present standardized form, the group method involves several modifications in the instructions and procedures employed for the individually administered version of the HIT. The administration of the group method consists of the following procedure:

1. The directions on the front of the special group booklet are read aloud to the subjects while they are reading them silently.

"You will be shown a series of inkblots, each of which will be projected on the screen before you for one minute. Using your imagination, write down in the space provided a description of the first thing the blot looks like or reminds you of."

"Include in your description the particular characteristics or qualities of the inkblot which are important in determining your responses--i.e., what about the blot made it look that way? Give as complete an answer as you can in the time available."

"None of these inkblots has been deliberately drawn to look like anything in particular. No two people see exactly the same things in a series of inkblots like these.

There are no right or wrong answers."

2. Trial inkblot X is projected on the screen.

The examiner states that a common response to this inkblot is a "bat or winged creature." He outlines on the screen the area of the inkblot used in this response (W, omitting the ds on each side), points out the various parts (head, wings, tail) of the "bat," and briefly mentions the role of form in determining this response. The examiner then explains that such a response might be written as "bat because of the form" in the space provided, outlining the appropriate area on the accompanying diagram. Next, the examiner says that another response to this inkblot is "pool of oil," which serves to illustrate the use of color and shading rather than form as determinants. Finally, the examiner states that still another response to this inkblot is a "steer's head," outlines the area used (center D), and discusses the roles of form, color, and shading in determining it.

Card Y is then projected on the screen, and the examiner points out a common response, "human figure," and mentions the role of form in determining the response. Using the same area, he then cites another common response, "skeleton," and points out the role of form and shading as determinants. Finally, the examiner states that still another response to this inkblot is "blood," thus providing an opportunity to illustrate a response with color alone

as the primary determinant.

3. The initial instructions are repeated (paraphrased), and the subjects are asked if they have any questions.

4. In accordance with a prearranged schedule during the test series, the subjects are occasionally reminded of important aspects of the instructions. Eight inkblots scattered through the series are verbally reinforced as indicated below.

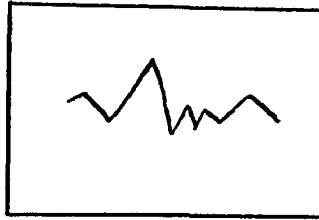
<u>Card Number</u>	<u>Verbal Reinforcement</u>
2	"Write out as complete a description as you can in the time and space available."
3	"Just let your imagination run, and put down what the inkblot suggests to you--what you see in it."
6	"This is another one of those blots where you'll have to be careful in outlining that part of the area which you use."
8	"Write out as best you can what characteristics of the inkblot were deciding factors in your response."
9	"Be sure to draw a line around that part of the blot that suggested your response."
14	"We're particularly interested in knowing what aspects of the inkblots influenced your response."
19	Same as for Card 9.
24	Same as for Card 2.

5. Inkblots 1, 2, and 3 are each exposed for 120 seconds; 4, 5, and 6 for 100 seconds; 7, 8, and 9 for 90 seconds; and the remaining thirty-six inkblots are each exposed for 75 seconds.

APPENDIX B
INSTRUCTIONS TO THE SUBJECTS FOR THE
LINE MEANINGS TEST

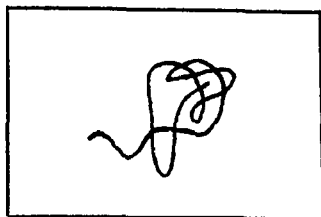
On each of these pages will appear a continuous line of a particular sort. I would like you to list all the different things you can think of that each complete line might suggest. You can turn the line around any way you like. Do not hesitate to write down whatever things you can think of, as long as they are possible things that the line might suggest.

Line Meanings



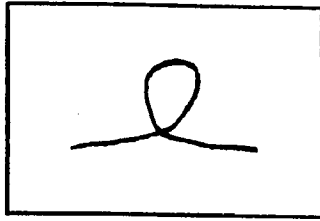
1

1. _____
2. _____
3. _____
4. _____
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6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____



3

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8. _____
9. _____
10. _____
11. _____
12. _____



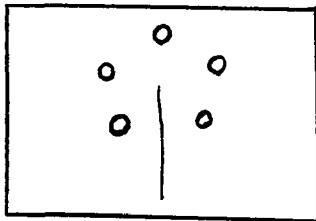
7

1. _____
2. _____
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10. _____
11. _____
12. _____

APPENDIX C
INSTRUCTIONS TO THE SUBJECTS FOR THE
PATTERN MEANINGS TEST

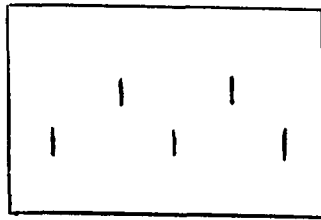
On each of these pages will appear a pattern of a particular sort. I would like you to list all the different things you can think of that each complete pattern might suggest. You can turn the pattern around any way you like. Do not hesitate to write down whatever things you can think of, as long as they are possible things that the pattern might suggest.

Pattern Meanings



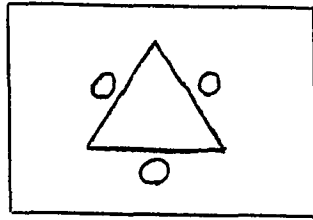
1

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____
- 7. _____
- 8. _____
- 9. _____
- 10. _____
- 11. _____
- 12. _____



5

1. _____
2. _____
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7. _____
8. _____
9. _____
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11. _____
12. _____



7

1. _____
2. _____
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4. _____
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12. _____

APPENDIX D
MODIFIED BENNETT TEST ITEMS

Item D: All vegetation on the earth has slowly changed until it is now predominantly red rather than green in color. What have been the consequences of this development?

Item E: During the course of several centuries the sense of touch in humans has developed to the point that objects can be felt at a distance, i.e., actual contact with the body is not required to produce the sensation of touch. What have been the consequences?

Item F: What would be the consequences of every color having a distinct smell?

Modified Bennett Test

Item D:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Item E:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Item F:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

APPENDIX E
INSTRUCTIONS FOR THE UNREGULATED CONDITION
OF THE MODIFIED BENNETT TEST

I'm going to give you a list of some imaginary situations, and I'll ask you to list the consequences or results which might follow each of these. However, before I do this, let me describe a type of person which I'd like you to imagine yourself being when you read these hypothetical situations.

The type of person which I have in mind is a clever, unconventional "loner" who typically has novel thoughts and fanciful, yet acute perceptions that may startle other people. She is inclined to point to the contradictions which she sees in human experience, and her ideas attack conventional ways of thinking and perceiving; her thoughts literally force others to view reality in new and different ways. She has a good sense of humor and is not reluctant to engage in "far out" speculation; in fact she enjoys fantastic ideas.

Now, suppose that this clever, unconventional person is giving a list of consequences that might result from each of the imaginary situations which you will be reading. Remember, she's not supposed to give causes, but just a list of the results. What would her list be?

You will be given 3 minutes for each situation to give the consequences which this person might think of, and I'll tell you when the time is up. Any questions?

APPENDIX F

VERBAL QUESTIONS: REFLECTIVE EYE MOVEMENTS

1. What word is this the definition of: FAIR AND IMPARTIAL ADMINISTRATION OF LAWS.
2. Briefly, what is the meaning of this proverb: DON'T SWAP HORSES IN MID-STREAM.
3. What is the definition of the word CHARITY.
4. Briefly, what is the meaning of this proverb: WHEN THE CAT'S AWAY THE MICE WILL PLAY.
5. What word is this the definition of: A TALL FLOWER WITH YELLOW PETALS AROUND A LARGE, DARK CENTER.
6. What is the definition of the word LICORICE.
7. Briefly, what is the meaning of this proverb: STRIKE WHILE THE IRON IS HOT.
8. What word is this the definition of: A LARGE SPOTTED ANIMAL WITH A LONG NECK.
9. What is the definition of the word STRENGTH.
10. Briefly, what is the meaning of this proverb: WORDS SHOULD BE WEIGHED AND NOT COUNTED.
11. What word is this the definition of: GOVERNMENT BY ONE MAN RULE.
12. What is the definition of the word PENCIL.
13. Briefly, what is the meaning of this proverb: A BIRD IN THE HAND IS WORTH TWO IN THE NEST.
14. What word is this the definition of: A DAIRY PRODUCT OFTEN EATEN BY PEOPLE ON DIETS.
15. What is the definition of the word PARADE.
16. Briefly, what is the meaning of this proverb: A ROLLING STONE GATHERS NO MOSS.
17. What word is this the definition of: A LONG YELLOW FRUIT.

18. What is the definition of the word ENORMOUS.
19. Briefly, what is the meaning of this proverb: TOO MANY COOKS SPOIL THE BROTH.
20. What word is this the definition of: A PLANT USED IN THE MAKING OF PAPER.
21. What is the definition of the word FABRIC.
22. Briefly, what is the meaning of this proverb: LET SLEEPING DOGS LIE.
23. What word is this the definition of: A NARROW CYLINDER WITH LENSES AT BOTH ENDS.
24. What is the definition of the word BREAKFAST.
25. Briefly, what is the meaning of this proverb: PEOPLE WHO LIVE IN GLASS HOUSES SHOULD NOT THROW STONES.
26. What word is this the definition of: A RULE WHICH GUIDES CONDUCT.
27. What is the definition of the word SLICE.
28. Briefly, what is the meaning of this proverb: IF YOU CAN'T BITE DON'T SHOW YOUR TEETH.
29. What word is this the definition of: SUCCESS IN ANY CONTEST INVOLVING THE DEFEAT OF AN OPPONENT.
30. What is the definition of the word BOOK.

APPENDIX G

SPATIAL QUESTIONS: REFLECTIVE EYE MOVEMENTS

1. Describe the route by which you came to school today.
2. In pictures of Napoleon, which hand does he hold in his coat.
3. How many angles are there in the Red Cross symbol.
4. Describe what the Statue of Liberty looks like.
5. Tell me how many windows there are in your house or apartment.
6. Describe what a cat looks like.
7. If a person is facing the rising sun, where is south with respect to him.
8. Describe what a policeman's uniform looks like.
9. If you are the minister at a wedding, on which side of you does the bride stand.
10. Tell me how many doorknobs there are in your house or apartment.
11. How many rows of keys are there on a typewriter.
12. Describe what Richard Nixon's face looks like.
13. Describe what a dog looks like.
14. In which direction does Abraham Lincoln face on a penny.
15. How many right angles are there in a printed capital E.
16. If you are sitting up in your bed, which part of your house or apartment is to your right.
17. Describe what a telephone looks like.
18. What direction of the compass does your front door of your house or apartment face.

19. Which way does Jefferson face on a nickel.
20. Describe how you would go from the kitchen to the front door of your house or apartment.
21. If you draw a line from each of the upper two corners of a square to the mid-point of the bottom line of the square, what three figures result.
22. Describe what Santa Claus' outfit looks like.
23. Which way does George Washington face on a quarter.
24. Describe what a camel looks like.
25. Describe what Mayor Lindsay's face looks like.
26. How many holes are there in a telephone dial.
27. If you cut a paper cylinder length-wise and then lay it out flat what shape is the resulting figure.
28. Describe what the Empire State Building looks like.
29. Describe what a camel looks like.
30. Describe what a fireman's uniform looks like.

VERBAL QUESTIONS

NAME _____

- | | |
|-----|-----|
| 1. | 16. |
| 2. | 17. |
| 3. | 18. |
| 4. | 19. |
| 5. | 20. |
| 6. | 21. |
| 7. | 22. |
| 8. | 23. |
| 9. | 24. |
| 10. | 25. |
| 11. | 26. |
| 12. | 27. |
| 13. | 28. |
| 14. | 29. |
| 15. | 30. |
-
-

SPATIAL QUESTIONS

- | | |
|-----|-----|
| 1. | 16. |
| 2. | 17. |
| 3. | 18. |
| 4. | 19. |
| 5. | 20. |
| 6. | 21. |
| 7. | 22. |
| 8. | 23. |
| 9. | 24. |
| 10. | 25. |
| 11. | 26. |
| 12. | 27. |
| 13. | 28. |
| 14. | 29. |
| 15. | 30. |

Table 1

Frequencies of Response Categories Contained within Novelty Categories for Modified Bennett

Test (MBT), Line Meanings (LM), Pattern Meanings (PM), and Alternate Uses (AU) Items

Novelty Rating	MBT D*	MBT E	MBT F	LM 1*	LM 2	LM 3	PM 1	PM 2	PM 3	AU 1	AU 2	AU 3	AU 4	AU 5	AU 6
6	2-1	2-1	2-1	3-1	3-1	4-1	3-1	3-1	3-1	3-1	3-1	2-1	3-1	2-1	2-1
5	4-3	4-3	3	7-4	7-4	8-5	7-4	7-4	7-4	9-4	8-5	4-3	8-4	5-3	5-3
4	6-5	6-5	7-5	14-8	12-8	15-9	17-8	12-8	14-9	16-10	17-11	7-5	16-9	9-6	12-6
3	9-7	8-7	18-15	61-36	29-16	32-18	38-19	22-18	26-22	39-24	44-26	20-10	46-20	15-12	18-16
2	13-12	12	26	93	53	90	71	27	48	56	59	24	65	38	38

*Item numbers (i.e., sub-parts of the tasks).

Table 2
 Interrater Reliability of the Modified Bennett Test (MBT),
 Pattern Meanings, (PM) Line Meanings (LM), and
 Alternate Uses (AU) Scoring^{*}

Criterion Scale	MBT Contingency Coefficient	PM Contingency Coefficient	LM Contingency Coefficient	AU Contingency Coefficient
Novelty	0.66	0.70	0.70	0.69
Non-triviality	0.59	0.64	0.65	0.66
Appropriateness	0.63	0.54	0.65	0.57
Surprise-Stimulation	0.49	0.61	0.52	-
Divergent-Synthesis	-	-	0.57	-

^{*}All of the resultant values are significant at $p < .01$ level.

Table 3
Interrater Consistency For Two Scorers on the
Holtzman Inkblot Technique, Form A*

Variable	Interrater Frequency of Agreement
Rejection	1.00
Location	.99
Space	.99
Form Definiteness	.93
Form Appropriateness	.92
Color	.99
Shading	.99
Movement	.96
Pathognomic Verbalization	.98
Integration	.99
Human	.99
Animal	.99
Anatomy	.99
Sex	.99
Abstract	.99
Anxiety	.97
Hostility	.98
Barrier	.99
Penetration	.99
Balance	.99
Popular	1.00
Response Length	1.00

*All resultant values are significant at $p < .01$ level.

Table 4
 Pearson Product Moment Correlations of Interrater
 Consistency for Two Scorers on the Holtzman
 Inkblot Technique, Form B

Variable	Interrater Correlation (r)
Rejection	1.00
Location	.99*
Space	.99*
Form Definiteness	.97*
Form Appropriateness	.90*
Color	.98*
Shading	.97*
Movement	.97*
Pathognomic Verbalization	.86*
Integration	.94*
Human	.98*
Animal	.99*
Anatomy	.97*
Sex	1.00
Abstract	.76*
Anxiety	.95*
Hostility	.94*
Barrier	.95*
Penetration	.94*
Balance	-.01
Popular	.98*
Response Length	1.00

*Significant of $p < .01$ level.

Table 5

Internal Consistency of Eight Item Scores to Measure Creativity: Coefficient Alpha for the Modified Bennett Test (MBT), Alternate Uses (AU), Pattern Meanings (PM), and Line Meanings (LM)

Item Scores*	MBT		AU		PM		LM
	3 Items	2 Items	6 Items	4 Items	3 Items	2 Items	3 Items
UN	.34		.18		.50		.57
NN	.40		.54		.56		.46
CN	-		-.04	-.05	.27	.35	.35
NT	.81		.73		.77		.77
AP	.81		.70		.79		.77
SS	.13		.11	.12	.24		-.06
DS	-.02	-.02	-		-.05		-.05
F	.82		.64		.78		.80

*Uniquely novel (UN), unusually novel (NN), common novel (CN), non-triviality (NT), appropriateness (AP), surprise stimulation (SS), divergent synthesis (DS), fluency (F).

Table 6

Pearson Product Moment Correlations Among Non-Triviality (NT), Appropriateness (AP),
 Secondary Creativity (SC), and Fluency (F) Within Each of the Four Creativity
 Tests: Pattern Meanings (PM), Line Meanings (LM), Alternate Uses (AU),
 and Modified Bennett Test (MBT) (N = 89)*

	PM, NT	PM, AP	LM, NT	LM, AP	AU, NT	AU, AP	MBT, NT	MBT, AP
PM, NT		.97						
PM, SC	.95	.87						
PM, F	.96	.99						
LM, NT				.97				
LM, SC			.94	.87				
LM, F			.96	.98				
AU, NT						.89		
AU, SC					.93	.73		
AU, F					.77	.95		
MBT, NT								.93
MBT, SC							.87	.73
MBT, F							.86	.95

*All resultant values are significant at $p < .01$ level.

Table 7

Pearson Product Moment Correlations between the Pattern Meanings (PM) and Line Meanings (LM) and Alternate Uses (AU) and Modified Bennett Test (MBT) on Specific Creativity Scores (N = 89)

Verbal Tasks	Visual Tasks	
	PM	LM
AU		
NN	.18	.35**
UN	.27*	.17
PC	-.06	-.06
SC	.45**	.51**
F	.38**	.36**
RL	.40**	.31*
MBT		
NN	.38**	.16
UN	.07	.19
PC	-.07	-.08
SC	.25	.45**
F	.30*	.28*
RL	.02	.20

* Significant at $p < .05$.

** Significant at $p < .01$.

Table 8
 Pearson Product Moment Correlations between Alternate
 Uses (AU) and Modified Bennett Test (MBT) on
 Specific Creativity Scores (N = 89)

MBT	AU
NN	-.02
UN	.04
PC	-.03
SC	.43 ^{**}
F	.34 [*]
RL	.25

* Significant at $p < .05$.

** Significant at $p < .01$.

Table 9
Pearson Product Moment Correlations between Pattern
Meanings (PM) and Line Meanings (LM) on Specific
Creativity Scores (N = 89)

LM	PM
NN	.49**
UN	.53**
PC	.24
SC	.62**
F	.73**
RL	.45**

**Significant at $p < .01$.

Table 10

Pearson Product Moment Correlations Among Movement (M), Integration (I), Human (H), Popular (P), Form Definiteness (FD), Barrier (B), Hostility (Hs), Anxiety (Ax), Pathognomic Verbalization (V) Variables on the HIT, Form A (N = 89)

Variables	M	I	H	P	FD	Br	Hs	Ax	V
M		.52**	.67**	.49**	.58**	.22	.51**	.64**	.37**
I	.52**		.53**	.53**	.43**	.27*	.40**	.37**	.26*
H	.67**	.53**		.47**	.71**	.31*	.43**	.50**	.26*
P	.49**	.53**	.47**		.49**	.21	.31*	.22	.05
FD	.58**	.43**	.71**	.49**		.36**	.28*	.32*	.18
Br	.22	.27*	.31*	.21	.36**		.14	.14	-.04
Hs	.51**	.40**	.43**	.30*	.28*	.14		.84**	.32*
Ax	.64**	.37**	.50**	.22	.32*	.14	.84**		.43**
V	.37**	.26*	.26*	.05	.18	-.04	.32*	.43**	

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 11

Pearson Product Moment Correlations Among Movement (M), Human (H), Integration (I), Popular (P), Form Definiteness (FD), Barrier (Br), Hostility (Hs), Anxiety (Ax), Pathognomic Verbalization (V) on the HIT, Form A and the Remaining Variables of the HIT, Form A (N = 89)

Variables	M	I	H	P	FD	Br	Hs	Ax	V
R	-.29*	-.16	-.28*	-.13	-.20	-.33*	-.07	-.14	-.00
L	-.18	-.23	.02	-.28*	-.04	.03	-.16	-.14	-.33*
S	-.32*	-.28*	-.19	-.25	-.22	.12	-.23	-.27*	-.21
FA	.02	.19	.01	.34*	.00	-.20	.12	-.05	-.18
C	-.13	-.16	-.29*	-.19	-.40**	-.02	.06	-.05	-.06
Sh	-.04	-.01	-.01	.09	.02	-.05	-.14	-.18	-.16
A	.17	.10	-.16	-.01	.21	.06	.03	.01	.11
At	-.33*	-.29*	-.36**	-.23	-.14	-.09	-.11	-.23	-.18
Sx	.08	.10	.27*	-.02	.06	.06	.29*	.26*	.07
Ab	.25	.01	.06	.07	-.01	-.01	.33*	.36**	.22
Pn	.14	.03	.04	.05	.04	.20	.25	.29*	.28*
B	-.04	-.02	.03	-.13	.04	.07	.11	.09	.12
RL	.37**	.45**	.24	.31*	.22	.23	.21	.23	.16

*Significant at $p \leq .05$.

**Significant at $p \leq .01$.

Table 12

Pearson Product Moment Correlations Among Movement (M), Integration (I), Human (H), Popular (P), Form Definiteness (FD), Barrier (Br), Hostility (Hs), Anxiety (Ax), Pathognomic Verbalization (V) Variables on the HIT, Form B and the Remaining Variables of the HIT, Form B (N = 86)

Variables	M	I	H	P	FD	Br	Hs	Ax	V
R	-.20	-.01	-.14	-.12	-.14	-.06	-.11	-.25	-.17
L	.06	-.02	.18	.06	.45**	.04	.07	.04	-.41**
S	-.05	-.05	-.02	.14	.07	.14	-.07	.06	-.13
FA	.46**	.31*	.29*	.42**	.40**	.09	.34*	.42**	-.04
C	.21	-.12	-.17	.22	-.24	-.06	.15	.31*	.01
Sh	-.01	-.25	-.16	-.09	-.22	-.09	-.06	.01	-.14
A	-.02	.05	-.10	-.17	.39**	.11	.10	.04	-.09
At	-.12	-.20	-.28*	-.13	-.16	-.03	-.09	.17	-.01
Sx	.18	.00	-.10	.11	-.00	.15	.32*	.37**	.04
Ab	.25	.11	.13	.24	-.01	.07	.37**	.36**	.22
Pn	.33*	-.03	-.11	.18	-.13	.06	.25	.34*	.17
B	.10	.17	.19	.10	.05	.11	.03	.08	.16
RL	.46**	.47**	.21	.03	.05	.28*	.34*	.50**	.42**

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 13

Pearson Product Moment Correlations Among Movement (M), Integration (I), Human (H), Popular (P), Form Definiteness (FD), Barrier (Br), Hostility (Hs), Anxiety (Ax), Pathognomic Verbalization (V) Variables on the HIT, Form B (N = 86)

Variables	M	I	H	P	FD	Br	Hs	Ax	V
M		.52**	.54**	.41**	.33*	-.01	.54**	.65**	.21
I	.52**		.65**	.03	.44**	.20	.33*	.23	.27*
H	.54**	.66**		.23	.59**	.11	.27*	.20	.17
P	.41**	.03	.23		.23	.15	.28*	.36**	.12
FD	.33*	.44**	.59**	.23		.18	.33*	.22	.01
Br	-.01	.20	.11	.15	.18		.06	.16	.18
Hs	.54**	.33*	.27*	.28*	.33*	.06		.69**	.21
Ax	.65**	.23	.20	.36**	.22	.16	.69**		.17
V	.21	.27*	.17	.12	.01	.18	.21	.17	

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 14

Pearson Product Moment Correlations Among Specific HIT Form A and Form B Variables (N = 88)

HIT, Form A																						
HIT, Form B	R	L	S	FD	C	FA	Sh	M	V	I	H	A	At	Sx	Ab	Ax	Hs	Br	Pn	B	P	RL
R	.26*																					
L		.49**																				
S			.22																			
FD				.46**																		
C					.47**																	
FA						.26																
Sh							.42**															
M								.55**														
V									.51**													
I										.41**												
H											.58**											
A												.48**										
At													.44**									
Sx														.58**								
Ab															.31*							
Ax																.35*						
Hs																	.32*					
Br																		.11				
Pn																			.28*			
B																						-.03
P																						.09
RL																						.53**

*Significant at $p < .05$.**Significant at $p < .01$.

Table 15

Pearson Product Moment Correlations Among the Seven Sub-parts and Between the
Sub-parts and the Total Score on Sheehan's Shortened Form of the
Bett's QMI (N = 91)

Sub-parts	Visual	Auditory	Cutaneous	Kinaesthetic	Gustatory	Olfactory	Organic	Total
Visual		.32*	.16	.23	.15	.21	.16	.45**
Auditory	.32*		.45**	.42**	.49**	.52**	.23	.75**
Cutaneous	.16	.45**		.51**	.57**	.42**	.12	.71**
Kinaesthetic	.23	.42**	.51**		.42**	.44**	.27*	.70**
Gustatory	.15	.49**	.57**	.42**		.59**	.23	.76**
Olfactory	.21	.52**	.42**	.44**	.59**		.29*	.78**
Organic	.16	.23	.12	.27*	.23	.29*		.47**

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 16

Pearson Product Moment Correlations Among Scores of the Direction of Reflective Eye Movements in Response to Verbal and Spatial Sets of Questions (N = 91)

	Verbal								Spatial								Random
	$\frac{\%R-L}{\%R+L}$	$\frac{\%U-D}{\%U+D}$	$\frac{\%R}{\%total}$	$\frac{\%L}{\%total}$	$\frac{\%U}{\%total}$	$\frac{\%D}{\%total}$	# stares	# no contact	$\frac{\%R-L}{\%R+L}$	$\frac{\%U-D}{\%U+D}$	$\frac{\%R}{\%total}$	$\frac{\%L}{\%total}$	$\frac{\%U}{\%total}$	$\frac{\%D}{\%total}$	# stares	# no contact	
Verbal																	
$\frac{\%R}{\%total}$	.85**	.12		-.69**	-.13	-.27*	-.06	.03	.66**	.25	.71**	-.48**	-.10	-.17	.07	-.10	-.14
$\frac{\%L}{\%total}$	-.87**	-.19	-.69**		-.35*	-.23	.01	-.05	-.61**	-.08	-.44**	.59**	-.19	-.06	-.14	-.01	.13
$\frac{\%U}{\%total}$	.10	.57**	-.13	-.35*		-.22	.06	.10	.15	.34*	-.15	-.37**	.71**	-.13	.09	.01	.02
$\frac{\%D}{\%total}$	.02	-.42**	-.27*	-.23	-.22		.02	-.06	-.16	-.57**	-.20	.15	-.23	.49**	.04	.17	-.01
Spatial																	
$\frac{\%R-L}{\%R+L}$	.71**	.15	.66**	-.61**	.15	-.16	-.10	.03		.32*	.79**	-.79**	.16	-.13	.07	-.02	-.19
$\frac{\%U-D}{\%U+D}$	.15	.62**	.25	-.08	.34*	-.57**	.02	.01	.32*		.22	-.32*	.44**	-.51**	.06	-.12	-.03
$\frac{\%R}{\%total}$	.55**	-.07	.71**	-.44**	-.15	-.20	-.15	.02	.79**	.22		-.60**	-.27*	-.18	-.00	-.04	-.39**
$\frac{\%L}{\%total}$	-.54**	-.20	-.48**	.59**	-.37**	.15	.08	-.14	-.79**	-.32*	-.60**		-.48**	-.16	-.01	.04	.19
$\frac{\%U}{\%total}$	.05	.50**	-.10	-.19	.71**	-.23	.12	.05	.16	.44**	-.27*	-.48**		-.18	.06	-.01	.07
$\frac{\%D}{\%total}$	-.01	-.30*	-.17	-.06	-.13	.49**	-.09	.16	-.13	-.51**	-.18	-.16	-.18		-.07	.01	.06

Table 16--Continued

	Verbal								Spatial								Random
	$\frac{\%R-L}{\%R+L}$	$\frac{\%U-D}{\%U+D}$	$\frac{\%R}{\%total}$	$\frac{\%L}{\%total}$	$\frac{\%U}{\%total}$	$\frac{\%D}{\%total}$	# stares	# no contact	$\frac{\%R-L}{\%R+L}$	$\frac{\%U-D}{\%U+D}$	$\frac{\%R}{\%total}$	$\frac{\%L}{\%total}$	$\frac{\%U}{\%total}$	$\frac{\%D}{\%total}$	# stares	# no contact	
Spatial (Cont'd)																	
# stares	.12	.07	.02	-.14	.09	.04	.19	-.03	.07	.06	-.00	-.01	.06	-.07		-.14	.06
# no contact	-.09	-.06	-.10	-.01	.01	.17	-.13	.01	-.02	-.12	-.04	.04	-.01	.01	-.14		.12
Total																	
$\frac{\%R-L}{\%R+L}$	.93**	.15	.82**	-.80**	.13	-.07	-.06	.03	.92**	.25	.73**	-.72**	.12	-.07	.10	-.06	-.13
$\frac{\%U-D}{\%U+D}$	.15	.81**	.22	-.12	.43**	-.56**	-.03	.05	.26*	.92**	.11	-.28*	.49**	-.44**	.09	-.08	.05
$\frac{\%R}{\%total}$	.76**	.03	.92**	-.61**	-.15	-.26*	-.11	.03	.78**	.25	.92**	-.58**	-.20	-.19	.03	-.08	-.24
$\frac{\%L}{\%total}$	-.79**	-.22	-.66**	.89**	-.41**	-.05	.05	-.11	-.79**	-.23	-.59**	.89**	-.38**	-.12	-.09	.02	.18
$\frac{\%U}{\%total}$	.08	.57**	-.12	-.28*	.90**	-.24	.10	.08	.17	.43**	-.24	-.47**	.95**	-.17	.08	-.00	.05
$\frac{\%D}{\%total}$	.01	-.43**	-.26*	-.18	-.21	.90**	-.03	.05	-.17	-.63**	-.22	.02	-.24	.82**	-.01	.11	.02
# stares	.04	.01	-.03	-.04	.08	.03	.94**	-.18	-.07	.04	-.13	.06	.13	-.10	.50**	-.16	.16
# no contact	-.05	-.03	-.06	-.04	.07	.09	-.22	.65**	-.00	-.08	-.02	-.06	.03	.11	-.13	.77**	.11
Random	-.06	.11	-.14	.13	.02	-.01	.15	.02	-.19	-.03	-.30*	.19	.07	.06	.06	.12	

* Significant at $p < .05$.** Significant at $p < .01$.

Table 17

Analyses of Variance of the Visual Primary Creativity (PC) and Secondary Creativity (SC) Scores, Alternate Uses (AU) Primary Creativity (PC) and Secondary Creativity (SC) Scores, and Modified Bennett Test (MBT) Primary Creativity (PC) and Secondary Creativity (SC) Scores for Those Subjects Who Displayed Consistent Reflective Eye Movements

	Sum of Squares Between Groups	Sum of Squares Within Groups	Mean Square Between Groups	Mean Square Within Groups	F 3/74
Visual PC	2	70	245	238	1.05
Visual SC	424	12,627	141	170	0.83
AU PC	*	*	*	*	*
AU SC	193	2,309	64	31	2.06
MBT PC	*	*	*	*	*
MBT SC	54	2,181	18	29	0.61

*Not computed because of 0 frequency of responses in 6 cells.

Table 18

Pearson Product Moment Correlations Among Preferred Direction of Reflective Eye Movements and Visual Secondary Creativity (SC) and Primary Creativity (SC) Scores, Alternate Uses (AU) Secondary Creativity (SC) and Primary Creativity (PC) Scores, and Modified Bennett Test (MBT) Secondary Creativity (SC) and Primary Creativity (PC) Scores (N = 89)

Scores	% <u>L</u> total	% <u>U</u> total	% <u>R</u> total	% <u>D</u> total
Visual SC	.05	-.15	.01	.11
Visual PC	-.15	.20	-.01	.03
AU SC	.01	-.28*	.11	.19
AU PC	.13	-.06	-.09	.01
MBT SC	-.10	-.16	.11	.24
MBT PC	-.14	-.01	-.15	.15

*Significant at $p < .05$.

Table 19

Analyses of Variance of the FI, FII Composite Variables and the Movement (M),
 Integration (I), Human (H), Popular (P), Form Definiteness (FD),
 Anxiety (Ax), Hostility (Hs) Variables of the HIT, Form A for
 Those Subjects Who Displayed Consistent Reflective
 Eye Movements

	Sum of Squares Between Groups	Sum of Squares Within Groups	Mean Square Between Groups	Mean Square Within Groups	F 3/74
FI	428	112,745	142	1,523	0.09
FII	466	103,301	155	1,395	0.11
M	722	17,636	240	238	1.01
I	19	721	6	9	0.68
H	32	8,775	10	118	0.09
P	46	617	15	8	1.88
FD	89	14,674	29	198	0.15
Ax	54	3,615	18	48	0.37
Hs	17	2,079	5	28	0.20

Table 20

Pearson Product Moment Correlations Between the Preferred Direction of Reflective Eye Movements and FI, FII, Movement (M), Integration (I), Human (H), Popular (P), Form Definiteness (FD), Anxiety (Ax), Hostility (Hs) Variables on the HIT, Form A (N = 89)

Variables	$\frac{R}{\%total}$	$\frac{L}{\%total}$	$\frac{U}{\%total}$	$\frac{D}{\%total}$
M	.01	.12	-.13	-.08
I	-.11	.17	-.14	.08
H	.05	-.02	-.05	.02
P	-.19	.19	-.12	.18
FD	.01	-.04	.01	.05
FI	.00	.06	-.08	.01
FII	.02	.04	-.08	-.00
Ax	.10	.03	-.12	-.08
Hs	.04	.06	-.13	-.01

Table 21

Pearson Product Moment Correlations Among the Direction of Reflective Eye Movements, the Presence of Stare Responses and the Rejection (R), Form Definiteness (FD), Form Appropriateness (FA), Color (C), Shading (Sh), Movement (M), Pathognomic Verbalization (V), Integration (I), Human (H), Animal (A), Penetration (Pn), and Popular (P) Variables of the HIT, Form B (N = 86)

Variables	$\frac{\%}{\text{total}} \text{ R}$	$\frac{\%}{\text{total}} \text{ L}$	$\frac{\%}{\text{total}} \text{ U}$	$\frac{\%}{\text{total}} \text{ D}$	Stare
R	-.03	-.01	-.02	-.03	.14
FD	.01	.05	-.02	-.04	.00
FA	.01	.02	-.00	-.03	.02
C	.05	-.05	.01	-.00	-.04
Sh	-.04	.03	-.01	.04	-.02
M	-.03	-.02	-.01	.04	.01
V	.01	.02	.02	-.03	-.01
I	.04	.03	-.02	-.02	-.05
H	.04	.04	-.06	-.02	-.04
A	-.02	.06	.02	-.04	.00
Pn	.00	.07	-.03	-.04	.01
P	-.01	.04	-.03	-.02	.05

Table 22

Pearson Product Moment Correlations Among the Preferred
 Direction of Reflective Eye Movements and the
 Reporting of Vivid Imagery, Measured by
 Sheehan's Shortened Form of the Bett's
 QMI (N = 89)

Variables	$\frac{R}{\text{total}}$	$\frac{L}{\text{total}}$	$\frac{D}{\text{total}}$	$\frac{U}{\text{total}}$
QMI V	.01	-.01	.09	-.06
QMI A+C+K+G+O	-.13	.18	-.03	-.05

Table 23

Mean Number of Responses for the Movement (M), Integration (I), Human (H), Popular (P), and Form Definiteness (FD) Variables of the HIT, Form A and for Scores on the Creativity Tasks: Visual, Alternate Uses (AU), and Modified Bennett Test (MBT) (N = 89)

Variables	Mean Number of Responses
M	41.6
I	6.5
H	29.3
P	8.7
FD	88.7
Visual SC	21.9
Visual PC	.5
Visual F	25.8
Visual UN	5.1
Visual NN	7.3
AU SC	11.8
AU PC	.1
AU F	16.8
AU UN	1.9
AU NN	4.1
MBT SC	8.7
MBT PC	.1
MBT F	9.1
MBT UN	4.8
MBT NN	2.6

Table 24
 Pearson Product Moment Correlations Between Thorndike's
 Vocabulary Test, G-T, Forms 1 and 2 and the Creativity
 Scores Secondary Creativity (SC), Fluency (F),
 Primary Creativity (PC), Uniquely Novel (UN),
 Unusually Novel (NN) and Response Length
 (RL) for the Visual and
 Verbal Tasks (N = 89)

Variables	Vocabulary Test
Visual SC	.09
Visual F	-.03
Visual PC	.16
Visual UN	-.08
Visual NN	.05
Visual RL	.08
AU SC	.30*
AU F	.14
AU PC	.04
AU, UN	.10
AU NN	.07
AU RL	.05
MBT SC	.38**
MBT F	.09
MBT PC	-.01
MBT UN	-.03
MBT NN	.14
MBT RL	.08

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 25
 Pearson Product Moment Correlations Among Visual Response
 Length (RL), Alternate Uses Response Length (AU RL),
 and Modified Bennett Test Response Length (MBT RL)
 and the Secondary Creativity (SC), Fluency (F),
 Primary Creativity (PC), Uniquely Novel (UN),
 Unusually Novel (NN) Creativity Scores
 (N = 89)

Variables	Visual RL	AU RL	MBT RL
Visual SC	-.22	-.04	-.02
Visual F	-.26	-.01	-.01
Visual PC	.05	.03	.02
Visual UN	-.18	.01	-.03
Visual NN	-.21	.04	-.00
Visual RL		.42**	.13
AU SC	-.11	-.03	.05
AU F	-.19	-.22	.05
AU PC	-.02	-.10	-.02
AU UN	-.16	-.08	.11
AU NN	-.16	-.15	.11
AU RL	.42**		.25
MBT SC	.07	.05	-.19
MBT F	-.07	-.07	-.41**
MBT PC	-.05	-.08	-.10
MBT UN	-.19	-.16	-.40**
MBT NN	.06	-.03	-.25
MBT RL	.13	.25	

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 26

Pearson Product Moment Correlations Between the Preferred Direction of Reflective Eye Movements on Verbal and Spatial Questions and on the HIT, Form B (N = 86)

Variables	HIT $\frac{\%R}{\%total}$	HIT $\frac{\%L}{\%total}$	HIT $\frac{\%U}{\%total}$	HIT $\frac{\%D}{\%total}$
Verbal $\frac{\%R}{\%total}$	.28*	-.22	-.10	.10
Verbal $\frac{\%L}{\%total}$	-.20	.35**	-.23	-.11
Verbal $\frac{\%U}{\%total}$	.14	-.27*	.66**	-.15
Verbal $\frac{\%D}{\%total}$	-.22	.01	-.11	.17
Spatial $\frac{\%R}{\%total}$	.34**	-.14	-.06	-.03
Spatial $\frac{\%L}{\%total}$	-.30*	.31**	-.32*	.03
Spatial $\frac{\%U}{\%total}$	.10	-.13	.51**	-.19
Spatial $\frac{\%D}{\%total}$	-.20	-.18	-.07	.32*

*Significant at $p < .05$.

**Significant at $p < .01$.

Table 27

Pearson Product Moment Correlations Among the Long
Initial Stare (LS), Short Initial Stare (SS),
and Stare (S) Responses and a Preferred
Direction of Eye Movement on the HIT,
Form B (N = 86)

Scores	LS	SS	S
$\frac{R}{\%total}$	.31*	-.01	.26
$\frac{L}{\%total}$	-.01	-.15	-.15
$\frac{U}{\%total}$	.03	.23	.07
$\frac{D}{\%total}$	-.18	.03	-.04
LS		.19	.45**
SS	.19		.36*
S	.45**	.36**	

*Significant at $p < .05$.

**Significant at $p < .01$.

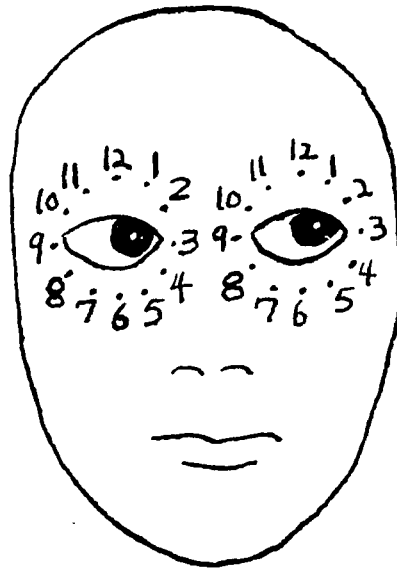


Figure 1. Illustration of clock-face scheme. The subject is looking at position '2', a leftward and upward reflective eye movement (adopted from Ehrlichman et al., 1973).

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