

A STUDY RELATING PREDOMINANT
DIRECTION OF CONJUGATE-LATERAL-EYE
MOVEMENT TO VARIOUS ASPECTS OF PERSONALITY

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Chapter 1

INTRODUCTION

Perhaps the most awesome frontier left for man to conquer, is that of his own mind. Little by little, man is progressing into what has been the dark and unknown depths of the human brain.

One key discovery in this area, only recently making its full impact upon our culture, is the knowledge that the human brain functions not entirely as a whole, but to a certain extent as two independent halves. "...each hemisphere seems to have its own separate and private sensations: its own perceptions, its own concepts and its own impulses to act, with related volitional, cognitive and learning experiences." (Sperry 1968)

Evidence from several sources has established that the left hemisphere is specialized in the following functions:

- analytic thinking and logic.
- reasoning through division or partition of phenomenon.
- the processing of information sequentially.
- verbal activity and linguistic thought.
- the use of words as opposed to the possession of words.
- intellectual ability.
- temporally organized successive events.

While the right hemisphere is specialized in the following functions:

- visual spatial tasks

- simultaneous and primary spatial groups.
- understanding of music and art forms.
- diffuse processing of information.
- simultaneous grasp of related but differing phenomena.
- integration of material in a simultaneous fashion.
- reasoning through integration and consideration of the totality of a phenomena. (Ornstein 1973)

Even with this added awareness that there are two distinctly different methods of thought available to each of us, we in the Western world have long clung to the traditional, logical mode of thought to the exclusion and indeed, near strangulation of the other existing intuitive mode of thought. Our culture does not stress the aconceptual, present-oriented, intuitive mode of thought, associated with the arts, religion and music; but rather puts a premium on verbal and intellectual ability.

However, there are indications that this lopsided preoccupation of one mode of thought over the other, is now on the downswing, and that a more dualistic conception of two equally dominant types of thought is gaining prominence. The intuitive mode of thought, too long ignored, is now building acceptance as a separate, but uniquely superior component in certain aspects of functioning. Three factors have been listed as contributing to this new philosophy: 1) First of all, the recent surge of interest in the traditional Eastern philosophies, Sufism, Zen, Yoga, and Transcendental Meditation. 2) Secondly, the impact of the drug culture which has as an underlying premise, always held experience and intuitive knowledge in

the highest regard, and 3) thirdly, the rising acceptance of the field of para-psychology as a respectable and professional area of inquiry within the field of psychology.

Statement of the Problem

This study was designed to investigate the use of a simple eye movement phenomenon as a possible indicant of hemispheric dominance within an individual subject.

The subjects were classified on the basis of a left or right direction of the conjugate-lateral-eye movement, (CLEM) and statistically compared on the basis of certain known personality variables. These personality variables were measured through the use of the following tests:

- (a) tendencies of vocational preference as measured by Holland's Vocational Preference Inventory (VPI).
- (b) the relative prominence of basic interests or motives in personality as measured by Allport, Vernon, and Lindsey's Study of Values (SOV).

Importance of the Study

In general this study is of value in merely emphasizing and promoting the acceptance of the theory of hemispheric duality.

Robert Ornstein, (1973) author of The Psychology of Consciousness points out, that one of the major tasks facing psychologists is to study the two complementary modes of thought and reach an understanding of the use and applications of each in our culture.

Secondly, if we can isolate the physiological correlates of each mode of thought, we then have the basis from which to begin the

teaching, and ultimately the individual control of our consciousness along these lines. The awareness that a tendency to favor one or the other mode of thought, may be easily detectable, is a step in that direction. In fact, the philosophy of biofeedback begins with the premise that man can isolate the physical components of even the most subjective phenomenon, such as a relaxed frontalis muscle, for example, or a steady alpha state, or increased blood flow in the hand, it is then possible, if our technological knowledge permits, to design the equipment that will measure and inform an individual when these conditions are meant. Thus we ultimately facilitate our own subjective experiencing of a feeling that has before been beyond our conscious grasp.

If indeed these characteristics of left and right brain thinking have been established as will be demonstrated through reviewing the literature what remains is the need to find an easy method of determining which hemisphere is the dominant influence in a given individual. In addition it would be advantageous if such a methodology were available to individuals without the benefit of expensive equipment. This study is an attempt to outline and establish just such a method and to determine its adequacy in revealing nueral information.

Description of the Phenomenon

The phenomenon consists of a lateral eye movement, that occurs voluntarily, though usually unconsciously, when a subject is apparently deep in thought, and wishes to eliminate visual stimuli that might interfere with his train of thought. This lateral eye movement

response is associated with the transition from external to internal direction of attention (Day 1964) and can easily be observed by asking the subject a question which requires some degree of reflective thought.

Given the hemispheric localization of function outlined in the above paragraphs, it is a plausible theory that the right or left direction of lateral eye movement is a function of the dominance of the opposite lateral hemisphere of the brain, since motor and sensory fibres from the left hand side of the body go to the right cerebral hemisphere while those from the right go to the left hemisphere. It is experimentally verified that if the left side of the brain is electrically stimulated, the eyes move to the right, if the right side is stimulated the eyes move to the left. Thus left-movers are assumed to have more dominant right hemispheres and right-movers are assumed to have more dominant left hemispheres, and the personality of a left-mover (dominant right hemisphere) is more likely to reflect the style of right-hemispheric thinking, the personality of right-movers (dominant left hemisphere) is more likely to reflect the style of left-hemispheric thinking.

It is the function of this paper to help determine whether this simple phenomenon may provide a reliable and easily observable correlate of individual difference in attention and other internal process.

Limitations of the Study

This study has the following limitations: (a) it embodies only a small sampling of the population, (b) only limited areas of personality was explored, (c) the study was dependent upon the validity of the testing methods used.

Chapter 2

REVIEW OF THE LITERATURE

Writings and studies preceding the present one, have come from three major areas. First of all, the first published work in the western world, to deal with this duality came gradually as theorists began perceiving the brain in terms of dual hemispheres. A second area of research developed in which these vague earlier ideas of the nature of cerebral organization were tested, and then verified or rejected on the basis of information derived from surgical or accidental traumatic cases which lent themselves to the concepts under investigation. Thirdly, a more recent area of research endeavor has developed which has to do more specifically with the lateral eye movement phenomenon and its behavioral correlates.

Theoretical Beginnings of Hemispheric Duality

Theories proclaiming the duality of the brain were late in coming to the world of western medicine; however, as early as 1865 began the belief that the left part of the brain was concerned with verbal expression, and as one theorist of that time stated "if the faculty of expression resides in one hemisphere, there is no absurdity in raising the question as to whether perception--its corresponding opposite--may not reside in the other." (Jackson 1958) Yet, in spite of these first realizations, the belief continued for many years that the right side of the brain played a more secondary

role for the organism. It is just in fairly recent times that the "double dominance" theory of cognitive ability is gaining prominence.

The early 1930's saw the beginnings of the "other side of the brain" being given a second glance as to its relative importance to the individual, in its possession of a separate but perhaps equally intricate function. In studies with aphasic and non-aphasic patients, Weisenburg and McBride (1935) stated that "purposeful thinking could exist without language but it must be visual or kinesthetic." A major tool was developed in 1941 when Wechsler assembled a battery of tests divided into six subtests of verbal intelligence and five subtests of nonverbal or performance intelligence. This made it possible for other authors to substantiate the duality.

Foremost psychologists such as Pavlov and Freud have referred to the same duality in cognition. Spearman (1932) theorized three cognitive factors which may be conceptualized also according to the same dichotomy. 1) spatial, 2) verbal, and one which could be thought of as a combination between the two, 3) general intelligence.

Research in Physiology Verifying the Theory

These theorists working as, or in conjunction with, physiological researchers slowly began to tap the hidden information about the brain. Some of the most illuminating studies have been carried out on individuals who have lesions in certain known locations of the brain. If the patient is rendered less able to carry out a given mental function after the occurrence of the lesion, it can then be inferred that the damaged area is involved in the performance of that function.

Critchley (1953) substantiated findings working with eleven

patients who had sustained damage to the right side of the brain. He observed that they were seriously impaired in those skills requiring spatial thought.

Using a larger sample size of 415 patients, Hacaen (1962) determined that the right side of the brain is instrumental in the recognition of faces, recognition of colors, and appreciation of space.

Costa and Vaughn (1962) studied epileptics who had undergone brain surgery and therefore had more exactly mapped boundaries for their lesions. Each patient was given the WAIS Block Design Test and the Mill-Hill Vocabulary test. Results of the experiment indicated that patients with right lesions did better on the vocabulary test and those with left hemispheric lesions performed better on the WAIS performance test.

In 1926 Henschen determined that patients with damage to the left side of the brain can sometimes sing words although they are incapable of speaking them.

Another area of valuable research has been in studying those unique cases in which the corpus callosum, the nerve pathway that connects the two brains, has been surgically cut apart, leaving two completely independent brains. Thus, no ideational or sensory-motor information can be transferred from one hemisphere to the other. Bogen (1969) determined that writing is controlled by the right hand or left hemisphere, and the drawing ability was retained by the left hand or right hemisphere.

Trevarthen (1962) and Gazzaniga and Young (1967) have accumulated data that suggests that the two hemisphere are capable of working not only independently but simultaneously as well.

Experimenting with monkeys who had severed corpus callosums, they found that the animals could solve independent problems with each hand simultaneously.

Research on Conjugate Lateral Eye Movement

In 1927, Bramwell first suggested that the eye may have some non-visual, as well as visual functions. He noted that students when involved in deep thinking stare at the ceiling or some other nonstimulating surface. (Bakan 1971)

In some of the first experimentation designed to better understand the CLEM phenomenon, Day of the Veterans Administration Hospital in Downey Illinois was able to discern four primary ways of focusing attention:

- 1) Passive internalized--awareness of feelings or internal states.
- 2) Active internalized--awareness of intended action or self-expression.
- 3) Passive externalized--awareness of the meaning of someone else's behavior.
- 4) Active externalized--awareness of acting for another person or attending actively to his feelings. (Day 1964)

The CLEM movement, Day concluded, is characteristic of an individual when he shifts his attention from passive to active mode.

In the same study, Day summarizes a list of facts which relate to further research concerning the phenomenon.

- 1) The movement is characteristic in direction, for the same subject each time he is observed.
- 2) The movement is reduced or abolished when anxiety is high as when an abruptly embarrassing question is asked.
- 3) The movement seems to occur in schizophrenics only while they are not symptomatic.

- 4) The direction of the CLEM for a S who silently asks himself a stimulus question, is dependent upon whether he is attending actively or passively at the time.
- 5) Under secure conditions of interpersonal trust, and security, the movement is increased in extent and slower to occur.
- 6) The movement does not occur at all when very simple questions of fact are asked.
- 7) The onset of the phenomenon coincides with the development of the ability for delayed recall in children at about the age of three.
- 8) With the schizophrenic subject and movement is much less inhibited when anxiety is reduced, and the subject is reacting less narcissistically.
- 9) From a starting orientation of a passive external mode of attention, right-movers as opposed to left-movers tend to conceive of anxiety as a panic feeling with an externalized perception of cause. The left-movers report the anxiety as tension, as in an internally perceived impulse.

An additional and very important point that Day makes in the same piece of research, is that the altering of one's mode of examining or perceiving self, reduces anxiety. (Day 1964)

Research by the same author a few years later further substantiated the idea that the right-mover describes anxiety as a more diffuse sensation, a feeling of "fear in search of an object." (Day 1967)

The left-mover describes his anxiety more as tension or arousal, a "loss of control of impulses." (Day 1967)

Duke (1968) in an attempt to document some of Day's clinically based observations, verified with fifty-three male and female subjects, many of Day's findings, as well as discovering some additional findings.

Those findings supported with this research are as follows:

- 1) CLEM is reduced when a person is anxious.

- 2) The phenomenon disappears among schizophrenics.
- 3) Strong rapport increases the movement.
- 4) The phenomenon does not appear until age 3.

Findings Duke brought to light in this series of studies were as follows:

- 1) Males more consistently than females turn in one direction only.
- 2) Eye dominance is independent of phenomenon.
- 3) Reflective stimulus questions evoke much higher percentages of CLEM than factual stimulus questions.
- 4) Day found an average of 86% of CLEM in one direction per individual. (Duke 1968)

Bakan of Stanford University further differentiated characteristics of the opposing direction lookers. In 1969 he found that left CLEM subjects displayed greater hypnotic susceptibility, more humanistic interest tendency, clearer imagery, greater use of pre-verbal activities, more alpha EEG activity, and poorer mathematic ability. Bakan closely paralleled Duke's finding that 85% of the CLEM for one individual is in one direction consistently. (Bakan 1969)

Bakan and Shotland (1969) used the Stroop Color-Word Test as a tool to determine basic differences between left and right lookers. They concluded that right-lookers functioned better at tasks requiring visual attention. The study also hypothesized that left-to-right reading is easier for right movers.

Chapter 3

METHODOLOGY

This chapter describes the subjects, the data collection procedure, the measuring instruments, and the statistical methods used to test the basic hypothesis.

Subjects

Subjects were thirty-eight (38) male students enrolled in the Educational Psychology I course offered in the College of Education at Kansas State University. The experimental data of three of the subjects was eliminated from the study, in one case due to a failure to correctly follow the directions of the Study of Values (SOV) test, and in the other two cases, due to the lack of at least three eye movements in a predominant direction. The remaining thirty-five (35) students ranged in age from 20 to 25 years, and were generally planning careers in the teaching field.

Three regularly scheduled class periods of Educational Psychology Classes were used in the study. Students were asked to complete the "Biographical Data Sheet" listed in the Appendix, the Study of Values test and the Vocational Preference Inventory.

Administration of the CLEM test

After each S completed the questionnaire, and standardized personality and vocational instruments, he was led individually out

of the testing room, and seated in a wooden arm-desk type chair, directly facing a researcher seated in a similar chair. The experimenter immediately read the following instructions to the S:

"Sit up straight in your chair with your feet flat on the floor, your head up, eyes open, and shoulders squarely facing me. Try to remain in this position as I ask you these questions."

Questions designed to stimulate lateral eye movement were as follows:

- (1) How do you spell Cincinnati?
- (2) Multiply 12 by 13.
- (3) How many letters are there in the word "Anthropology."
- (4) Tell me an English word that starts with 'L' and ends with 'C'.
- (5) How many letters are there in the word "Washington"?

S's answers to the questions were of no particular interest to the experimenter, but the predominant direction of the lateral eye movement immediately following the question was recorded for each question. At no time during the experimental procedure was the eye movement phenomenon mentioned to the S's, so it is assumed that their major focus of attention remained upon the answers to the stimulus questions themselves. A criteria of at least three movements in one lateral direction was used to classify a subject into either the right- or left- looker group.

Vocational Preference Inventory (VPI)

The VPI was developed by John Holland under the assumption that the choice of an occupation is an expressive act which reflects a person's motivation, knowledge, personality, and ability. It functions

primarily as a personality assessment tool and secondarily as an occupational interest inventory.

The inventory yields a range of eleven characteristics, six of which were used in this study to parallel the six values of the Allport, Vernon, and Lindsey Study of Values test. They are as follows: Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic.

This is a desirable test for the purposes of this study for several reasons; (a) It is short and easy to administer, (b) it provides occupational data, (c) the dimensions correspond to those of interest inventories, and (d) it is a personality test.

Intercorrelations and cluster analysis aided the VPI through six stages of revision until reaching the present form in which the scales are homogeneous and independent.

The reliability and validity of the inventory relies upon the human tendency to stereotype occupations and occupational titles, and the fact that these stereotypes are consistent and reliable.

The conceptual definitions of the six scales utilized in this study, as defined by the VPI Manual, are as follows:

(1) Realistic: This scale represents the following cluster of variables: realism, practicality, masculinity, and conventionality.

(2) Intellectual: The Intellectual scale measures the following cluster of variables which include intellectuality, intelligence, unsociableness, scientism, and rationality.

(3) Conventional: The conventional scale represents much of the meaning implied in the concept, conventionalism: conformity,

a whole-hearted uncritical acceptance of cultural values and attitudes, and a living in the eyes of others with its emphasis on excessive self-control. The latter emphasis reveals a related pattern of adjustment which may develop almost necessarily from the need to conform--the obsessive, orderly concern with rules and regulations for living and those qualities usually associated with obsessive persons--worrying, doubting, ordering.

(4) Social: The social scale appears to measure a cluster of variables which are largely contained in the analytic label, "oral receptive," that is, sociability, femininity, passivity, and problem solving by means of feeling rather than thinking, and dependency. A related but less central conception implied by the empirical and clinical definitions is superego as expressed in maturity, social responsibility, and the introjection of moral standards and religious values.

(5) Enterprising: This scale has been called enterprising since this label encompasses the traits commonly associated with this scale: dominance, risk taking, sociability, and enthusiasm.

(6) Artistic: The artistic scale appears to tap a cluster of traits which are typical of "artistic" persons: artistic interest, anxiety and immaturity, expressiveness, originality, unconventionality, erratic effort and behavior.

(7) Self-Control: The Self-Control Scale supposedly measures what is generally meant by self-control and several variables or qualities which are often associated with over-control of impulses, namely, hypochondriasis, fear of physically dangerous activities, repression, denial, and passivity.

(8) Masculinity Scale: This scale measures a masculinity femininity cluster of variables including choice of occupational roles, identification with males and females, conflicts about these identifications and some personal traits usually associated with masculinity.

(9) Status: The Status Scale measures the subject's concern for prestige and power and it also measures the subject's self-esteem.

(10) Infrequency: The Infrequency Scale appears to tap a cluster of positively correlated traits, attitudes, aspirations, and deficiencies--self-deprecation, incompetency, socially undesirable traits, and a history of personal and vocational failure. By virtue of its scoring key--liking unpopular and disliking popular occupations--the Infrequency Scale is also a Social Desirability Scale, although it was modeled after the MMPI F Scale. Briefly, the correlates of the Infrequency Scale form a continuum ranging from social, vocational, and intellectual deviancy, to normalcy and high achievement, aspiration, and effective functioning. In a broad sense, this heterogeneous validity scale can be characterized as a personal effectiveness scale with high scores indicative of incompetency and low scores indicative of personal effectiveness.

(11) Although the Acquiescence Scale is related at a low level of correlation to the following cluster of variables--sociability, dominance, dependence, impulsivity, cheerfulness, self-confidence, range of interest, conventionalism, and frankness--its primary value is to detect dissimulation and extreme response biases which often go undetected in forced--choice and true-false formats.

Reliability

The third and sixth revisions of the VPI were administered to samples of over 12,000 students and adults in order to establish the internal consistency of the test.

The Homogeneity coefficients range from .52 to .94 with those scales used in this study ranging from moderate to high homogeneity of content.

The retest reliability coefficients were determined for student and adult samples over 6 week, 3-4 month, 1 year, and 4 year intervals. The standard error of measurement for the coefficients over the briefer intervals ranged from 1 to 5 raw score points indicating moderate to high reliability. In contrast, the 4 year testing retest reliability revealed lower reliability coefficients that may possibly be due to an inadequacy in the test over long time periods.

Validity

Considerable effort has gone into the establishment of the validity of the VPI. Researchers have determined both the construct and predictive validity of the test, while substantiating and revising the inventory at the same time.

The relation of the VPI to many other inventories and scales was obtained to learn if scales in the VPI were correlated with scales measuring similar constructs: California Personality Inventory, Minnesota Multiphasic Personality Inventory, Sixteen Personality Factor Questionnaire, National Merit Student survey, and Barron's Independence of Judgement Originality, and Complexity-Simplicity. Generally the observed relationships lend support to the construct

validity and meaning attributed to the VPI scales. More detailed specific correlations can be obtained from the VPI Manual (Holland 1965).

The VPI was also administered to a wide range of educational, occupational, and hospitalized groups to establish if the VPI described these groups in ways consistent with common psychological knowledge. High scores seem to be related to appropriate employment status and various fields of study. In psychiatric samples, it was determined that the VPI can differentiate between psychotic and nonpsychotic patients. (Holland 1958).

In the educational field, it was found that several of the VPI scales could be used to assess college environments. It was possible to predict what students would say about their college merely by performing a census of major fields.

Self reports and ratings of self on traits which the various scales are assumed to measure was another method of establishing the validity of the VPI. VPI scales have been intercorrelated with a student's self ratings of personal traits and abilities, his life goals and values, his coping behavior and competencies, and his self characterization in an adjective checklist. (Holland 1962, 1963, 1964).

In additional studies utilizing external criteria, outcomes in important social areas were correlated or examined for their relationships to various external criteria, supervisory ratings and job satisfactions for a sample of supervisors and subordinates.

In a study of predictive validity, the VPI has been found to be predictive of choice of major field and vocation over one and two year intervals for students of high aptitude. (Holland 1962)

Selected VPI scales are predictive of academic and extra-curricular achievements for one- to three- year intervals. These predictions are generally inefficient though they are statistically significant.

These findings lead to the establishment of relatively high validity for the meanings attributed to the VPI scales.

Study of Values Test (SOV)

The Study of Values test was developed by Gordon Allport, Phillip Vernon, and Gardner Lindzey in 1931 and then revised in 1951. The test measures the relative importance of six major values modeled after Edward Spranger's classification of Types of Men. It is an individual or group, self-administering test that can be taken in approximately 20 minutes, although there is no time limit stipulation.

The test differentiates between the following 6 different types of men:

(1) Theoretical: Emphasizing discovery of truth observation and reasoning. This type of man is not particularly concerned with beauty or the utility of objects but is an intellectualist, scientist or philosopher who utilizes empirical, critical, and rational modes of thought. His knowledge is constantly being ordered and systematized.

(2) Economic: The primary emphasis here is on that which is useful. Typified by the practical American business man, this type of man believes that education should be practical and that unapplied knowledge is wasteful. Originally concerned with satisfaction of bodily needs and basic self-preservation, this value has expanded to the practical affairs of the business world.

(3) Aesthetic: This value places the emphasis upon form and harmony. Life is a procession of events and each event is enjoyed for its own sake, for its innate grace, symmetry, or fitness. This type of man is generally individualistic, self-sufficient, and most directly opposed to the theoretical locus of life. This individual may conclude that beauty is more valuable than truth or may consider truth to be identical with beauty.

(4) Social: The basic driving force is love of people. Study of Values measures the altruistic or philanthropic aspect of love. The socially oriented person is likely to find the aesthetic, theoretical, and economic orientations as cold and inhuman. General characteristics are kindness, sympathetic motivations and unselfishness.

(5) Power: This individual would value personal power and influence above all else. He is likely to be a leader in any competitive field, not necessarily politics.

(6) Religious: Unity is the key in this type of man. He is interested in comprehending the cosmos as a whole: understanding the totality of the universe. Two subtypes may be found in this type. The individual may withdraw from life into a meditation and self-denial state, or may find his religious experience in active participation with life, or may alternate between the two.

It should be pointed out that the "Study of Values" test measures the relative, as opposed to absolute strength, of each of the six values. A high score on one value can be obtained only by reducing correspondingly the scores on one or more of the other values.

Reliability:

The split-half reliability of the test was determined from the scores of 100 subjects, subjected to the Spearman product-moment correlations. The correlations ranged from a low of .84 to a high of .95, with a mean reliability coefficient of .90.

In addition an item analysis disclosed a positive correlation for each item with the total score for the particular value it was designed to measure, significant for each at the .01 level of confidence. Thus, both the split-half reliability and the item analysis indicate that the measures the values consistently.

Validity:

The most impressive validation done with regard to this test has been external validation by examining the scores of specific groups whose characteristics are common psychological knowledge.

Persons in various occupations: Engineering, business, medicine, education, personnel and guidance, Air Force officers, art and design students, and religious personnel all differed in values as might be commonly expected, and they did so to a sufficient degree and direction to lend credibility to the validity of the VPI.

Forms of indirect validation have further established the validity. College education of a special type changes value profiles in the expected direction. (Newcomb 1943), high personal values correlate with rapid perception of value related words (Postman-Bruner-McGinnes 1948), and the profiles of married couples are similar (Schooley 1936).

Statistical Analysis.

A one-way analysis of variance, as described by Edwards (1969: 140-151) was employed to compare the differences between the two sample groups on each of the six SOV scales, as well as each of the 12 VPI subscales. In addition the humanistic and realistic bi-polar clusters of both the vocational and value instruments were subjected to the same one-way analysis of variance test.

Hypothesis to be Tested

The focus of this study was directed toward the following null hypotheses: the alternative hypotheses served as the research hypothesis:

Hypothesis 1. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Realistic.

Hypothesis 2. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Intellectual.

Hypothesis 3. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Social.

Hypothesis 4. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Conventional.

Hypothesis 5. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Enterprising.

Hypothesis 6. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Artistic.

Hypothesis 7. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Self-Control.

Hypothesis 8. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Masculinity.

Hypothesis 9. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Status.

Hypothesis 10. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Infrequency.

Hypothesis 11. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Acquiescence.

Hypothesis 12. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values scale of Theoretical.

Hypothesis 13. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values scale of Aesthetic.

Hypothesis 14. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values scale of Economic.

Hypothesis 15. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values scale of Political.

Hypothesis 16. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values scale of Social.

Hypothesis 17. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values humanistic bi-polar cluster of Aesthetic, Social, and Religious.

Hypothesis 18. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the Study of Values realistic bi-polar cluster of Theoretical, Economic, and Political.

Hypothesis 19. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI humanistic bi-polar cluster consisting of Artistic, Social, and Intellectual scales.

Hypothesis 20. There is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI humanistic bi-polar cluster consisting of Enterprising, Conventional, and Realistic scales.

Chapter 4

PRESENTATION AND ANALYSIS OF DATA

A one-way analysis of variance as described by Edwards (1969) was conducted on the VPI and SOV scales for both the right-lookers (left hemispheric dominant) and the left-lookers experimental groups (right hemispheric dominant). The means and standard deviations of each of the scores on all scales are listed in Table 1, and the derived F ratios are listed in Table 2 for the VPI and Table 3 for the SOV.

The first hypothesis concerning the differences between left and right CLEM movers on the scale of Realistic of the VPI yielded an F ratio of 0.0041 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.17$). As a result of this finding, the null hypothesis that there is no significant statistical difference between persons exhibiting predominantly right CLEM and persons exhibiting predominantly left CLEM on the VPI scale of Realistic was retained.

Comparison of mean differences on the VPI scale of Intellectual was investigated, and the result was an F ratio of 0.2879. This analysis was not statistically significant at the .05 level of significance ($F_{.05,1,33} < 4.17$). The null hypothesis that there is no significant statistical difference between left and right CLEM lookers on the VPI scale of Intellectual was retained.

The VPI scale of Social yielded an F ratio of 0.0586 which was

Table 1
Measures of Central Tendency and Variability

Scales VPI	Left CLEM		Right CLEM	
	\bar{x}	SD	\bar{x}	SD
Realistic	5.25	4.46	5.16	4.06
Intellectual	6.56	4.95	5.68	4.71
Social	6.88	4.19	7.21	3.99
Conventional	2.75	3.24	1.89	2.33
Enterprising	4.44	3.39	3.58	3.55
Artistic	6.88	4.60	6.00	5.42
Self-Control	6.81	4.18	7.21	3.66
Masculinity	7.50	2.68	7.37	2.19
Status	8.38	2.53	8.16	2.39
Infrequency	4.69	2.30	5.37	2.93
Acquiescence	15.25	5.34	13.79	5.67
VPI Humanistic Cluster	122.41	12.30	123.47	13.81
VPI Realistic Cluster	117.59	12.30	116.53	13.81

Scales SOV				
Theoretical	41.69	5.38	37.76	6.89
Aesthetic	39.69	10.20	39.50	9.31
Economic	35.78	7.62	37.89	7.28
Political	40.13	7.43	38.76	8.41
Social	42.66	6.98	44.21	5.14
Religious	40.06	8.31	41.87	9.31
SOV Humanistic Cluster	20.95	9.11	19.48	12.57
SOV Realistic Cluster	4.25	3.15	4.32	2.17

Table 2
Analysis of Variance Between Groups Among
Means From the VPI Scales

Scales	SS	MS	df	F
Realistic	0.0737	0.0737	1	0.0041
Intellectual	6.7000	6.7000	1	0.2879
Social	0.9778	0.9778	1	0.0586
Conventional	6.3534	6.3534	1	0.8229
Enterprising	6.4023	6.4023	1	0.5301
Artistic	6.6501	6.6501	1	0.2595
Self-Control	1.3760	1.3760	1	0.0902
Masculinity	0.1504	0.1504	1	0.02855
Status	0.4094	0.4094	1	0.0681
Infrequency	4.0271	4.0271	1	0.5683
Acquiescence	18.5273	18.5273	1	0.6077
Humanistic Cluster	18.6836	18.6836	1	0.1508
Realistic Cluster	0.0376	0.0376	1	0.0044

Table 3
 Analysis of Variance of Means Between
 Groups From the SOV Scales

Scale	SS	MS	df	F
Theoretical	133.7695	133.7695	1	3.4217
Aesthetic	38.8042	38.8047	1	0.7021
Economic	0.3125	0.3125	1	0.0033
Social	21.000	21.000	1	0.5748
Political	16.1133	16.1133	1	0.2530
Religious	28.3359	28.3359		0.3605
Humanistic Cluster	9.8750	9.8750	1	0.0571
Realistic Cluster	9.8750	9.8750	1	0.0571

not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant difference between left and right CLEM on the VPI scale of Social was retained.

Investigation of the Conventional scale of the VPI yielded an F ratio of 0.8229 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). The null hypothesis that there is no significant statistical difference between left and right CLEM on the VPI scale of Conventional was retained.

The Enterprising scale of the VPI yielded an F ratio of 0.5301 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant statistical difference between persons exhibiting predominantly right CLEM and left CLEM on the VPI scale of Enterprising was retained.

The VPI scale of Artistic was examined and the resulting F score was 0.2595 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). Therefore the null hypothesis that there is no significant difference between left and right CLEM on the VPI scale of Artistic was retained.

The VPI scale of Self-Control yielded an F ratio of 0.0902 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant difference between left and right CLEM on the VPI scale of Self Control was retained.

The hypothesis concerning the difference between left and right CLEM on the scale of Masculinity of the VPI yielded an F ratio of

0.2855. This analysis was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). The null hypothesis that there is no significant statistical difference between left and right CLEM lookers on the VPI scale of Masculinity was retained.

The VPI scale of Status yielded an F ratio of 0.681 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant difference between left and right CLEM on the VPI scale of Status was retained.

Investigation of the Infrequency scale of the VPI yielded an F ratio of 0.5683 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). The null hypothesis that there is no significant statistical difference between left and right CLEM on the VPI scale of Infrequency was retained.

The Acquiescence scale of the VPI yielded an F ratio of 0.6077 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant statistical difference between persons exhibiting predominantly right CLEM and on the VPI scale of Acquiescence was retained.

The Study of Values scale of Theoretical was investigated for the F ratio of 3.4217 which was not statistically significant at the 0.05 level of significance ($F_{.05,1,33} < 4.14$). The null hypothesis that there is no significant difference between left and right CLEM on the SOV scale of Theoretical was retained.

The Study of Values scales of Economic yielded an F ratio of 0.7021 which was not statistically significant at the 0.05 level of

significance ($F_{.05,1,33} < 4.14$). The null hypothesis that there is no significant difference between left and right CLEM on the SOV scale of Economic, as a result of this test, was retained.

The Aesthetic scale of the SOV was compared for the experimental groups yielding an F ratio of 0.0033 which was not statistically significant at the 0.05 level ($F_{.05,1,33} < 4.14$). As a result of this finding, the null hypothesis that there is no significant difference between left and right CLEM on the SOV scale of Aesthetic was retained.

The SOV scale of Social yielded an F ratio of 0.5748 which was not statistically significant at the 0.05 level of significance. The null hypothesis that there is no significant difference between persons exhibiting left and right CLEM on the SOV scale of Social was retained.

The Political scale of the Study of Values was investigated and the resulting F score was 0.2530 which was not significant at the .05 level of significance. As a result of this finding, the null hypothesis that the two groups would differ on this scale was retained.

The Religious scale of the Allport, Vernon, and Lindsay test was investigated and yielded an F ratio of 0.3605 which was not statistically significant at the 0.05 level of significance. As a result of this finding, the null hypothesis that there is no significant difference between left and right CLEM exhibitors on the SOV scale of Religious was retained.

The hypothesis that there is no significant statistical difference with regard to the bi-polar cluster of the Aesthetic, Social, and Religious scales of the SOV was investigated and provided an F ratio of 0.0571 which is not significant at the 0.05 level. As a

result of this finding, the null hypothesis concerning the difference between right and left CLEM on the SOV scale of Aesthetic, was retained.

The hypothesis concerning the opposing bi-polar cluster of the SOV was also examined. The combined scales of Theoretical Economic, the Political brought an F ratio of 0.0571. As a result of the F ratio the null hypothesis concerning this more realistic cluster was retained.

The humanistic bi-polar cluster of the VPI, consisting of the Artistic, Social, and Intellectual scales was investigated for differences between the two experimental groups, and an F ratio of 0.1508 was found. This is not significant at the .05 level of significance, so the null hypothesis was retained.

The realistic bi-polar cluster of the Vocational Preference Inventory, consisting of the Enterprising, Conventional, and Realistic scales was also examined revealing an F ratio of 0.044 which is not significant at the .05 level. As a result of this ratio, this hypothesis too, was retained.

Chapter 5

DISCUSSION AND SUMMARY

The statistical results of this experiment as explained in the preceding chapter, failed to establish any significant differences between the two experimental groups on any of the personality or vocational variables on the basis of lateral eye movement direction. While the exact reasons for these statistical findings can never be explicitly verified, there are several possible explanations for the experimental results obtained from the thirty-five experimental subjects.

The most direct interpretation of the results lends credibility to the suggestion that possibly the CLEM phenomenon does not bear the capacity to differentiate between types of thinking as has been indicated in earlier studies. While there remains a substantial number of studies which support the validity of the CLEM as an indicant of a specific type of neural activity, the results from the present study point to the need for increased care and deliberateness in further studies with the phenomenon as well as illuminating the need for more conclusive evidence of factors which affect its occurrence.

A second interpretation of the results concerns the possibility that the testing instruments used were not particularly sensitive to, nor discriminatory toward either of the two modes of thought that supposedly originate within the respective hemispheres. It is possible

that these tools were simply inefficient in distinguishing between groups of subjects on the basis of type of thought. However the extensive validation and reliability testing done on the instruments as outlined and summarized in Chapter 3, as well as the subjective comparison of the eleven various VPI scales, and the six Study of Value scales with the descriptions, characteristics, and qualities of the left-lookers and right-lookers in previous studies by Bakan, Duke, and Day, leads to the conclusion that this possibility seems highly unlikely. It remains the opinion of the researcher that the instruments should have served their purpose in differentiating with adequate sensitivity the bimodal forms of thought.

The size of the sample of subjects is another factor that may possibly have had a bearing on the non-significant results found in the study, however an informal comparison of the sample size of thirty-five with the number of subjects in previous studies mentioned in Chapter 2, lead us to the conclusion that the sample size should have been of sufficient quantity to register a significant difference between the groups, had it clearly existed.

The homogeneous composition of the Educational Psychology class may have been another factor contributing to the results. The nature of the personality types within the group may have been too similar to show any radical differences in philosophical orientation. Informal comparison of the S's value and vocational subscales to national norms, there becomes apparent a trend in the direction of a more humanistic orientation. The social, religious, and artistic values in most cases were several points above the national average, while the realistic area comprised of the theoretical, economic, and political

scales fell several points below the national average.

The consistency factor discovered by Bakan (1969) and Duke (1968) may have served to confound the results in the present study. Eye movements of subjects in a predominant direction were found by Bakan (1969) and Duke (1968) to be eighty-six and eighty-five per cent of the time respectively, in a constant direction. Since many of the S's were classified into one or the other experimental group on the basis of three CLEM's to one particular side on each of three stimulus questions, though they had perhaps made definite movements to the opposite side on the two other questions, it is possible that the fifteen and sixteen per cent of error, may have added "noise" to the refined totals.

Studies by Duke (1968) have demonstrated that an important factor to be reckoned with is the nature of the stimulus question. Questions which require left hemispheric types of thinking are more likely to stimulate right CLEM, and questions designed to stimulate right hemispheric thinking are more likely to bring about left CLEM in the subject. Reflective as opposed to factual questions are more likely to stimulate the occurrence of the phenomenon at all. The stimulus questions used in the present study are more typical of the left hemispheric oriented thinking than the right hemispheric thinking. This factor may have contributed to further blur the distinction between the sharp definition of the two research groups with a minimum of experimental error.

Day (1964) has also mentioned that the relationship between the experimenter and the CLEM subject may be an important variable. In this study admittedly little time was taken to establish rapport at

all. In the same research study Day also establishes a clear correlation between degree of anxiety and the CLEM phenomenon. In fact, Day concludes that, "The movement is reduced or abolished when anxiety is high, as when an abruptly embarrassing question is asked." He found that the phenomenon disappears completely in schizophrenics when a high level of anxiety is present. It seems plausible that this may have been a significant influential factor in the present study. Many of the subjects appeared nervous at being led out of the room, to be privately asked some questions, and they were not afforded their customary nervous outlets of nail biting, fidgeting, smoking, etc. because of the instructions given them to sit up straight and squarely face the experimenter. There was observed by the experimenters some nervous laughter and puzzled expressions as the students apparently struggled to make sense out of this rather baffling experimental procedure and departure from their usual classroom routine. In addition, since prolonged eye contact is a very powerful, and at times even an aggressive interpersonal behavior, it is possible that the direct, almost continuous eye contact exhibited by the researcher in order to register the lateral eye movement of the S, may have tended to increase the anxiety level of the subject.

In the past chapter, several possible explanations of the results have been presented, some, with more far reaching ramifications than others.

In light of the results obtained in this study, it would seem that researchers concerned with CLEM experimentation should take a closer look at the relationship between groups of people catagorized on the basis of lateral eye movement direction.

The data from these thirty-five subjects would indicate a theoretical reappraisal of the possible correlates of the CLEM direction phenomenon. Perhaps the results of this experiment increase the necessity of a critical empirical eye in the interpretation of the experimental results of the studies exploring hemispheric dominance. Investigation of experimental conditions, and an active search for possible additional variables in the procedures used, seems to be in order for those studies done previously.

In any case, this study illustrates that our knowledge of the possible existence of the CLEM phenomenon as well as the variables and factors influencing it, is certainly far from complete.

It is hoped that this experimental study will suggest a clearer conception of what experimental measures are needed and will provide an impetus for such further research.

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APPENDIX

BIOGRAPHICAL DATA

NAME _____

AGE _____

_____ MALE _____ FEMALE

_____ RIGHT-HANDED _____ LEFT-HANDED

MAJOR AREA OF TEACHING _____

IF ELEMENTARY WHICH OF THE FOLLOWING AREAS DO YOU PREFER:

_____ MATH-SCIENCE

_____ READING, SOCIAL SCIENCE

HAVE YOU EVER BEEN TREATED BY A PHYSICIAN FOR BRAIN DAMAGE,
SEVERE HEADACHES, OR LOSS OF MEMORY? _____

A STUDY RELATING PREDOMINANT
DIRECTION OF CONJUGATE-LATERAL-EYE
MOVEMENT TO VARIOUS ASPECTS OF PERSONALITY

by

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ABSTRACT

This study investigated the possibility of a lateral-eye-movement response serving as an indicant of hemispheric dominance of the human brain. S's were classified on the basis of predominant direction of the lateral eye movement, to the left or right. A statistical test of significance failed to detect any difference between the scores of the two groups on any scale of the Allport, Vernon, & Lindsey Study of Values test or Holland's Vocational Preference Inventory. The study casts doubt on the use of the phenomena as an indicant of hemispheric brain dominance and demonstrates a need for a more definite and thorough investigation of the conjugate-lateral-eye-movement-response.