

LATERAL EYE MOVEMENTS: PERSONALITY CORRELATES
OF RIGHT AND LEFT MOVERS

A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF ARTS
IN THE GRADUATE SCHOOL OF THE
TEXAS WOMAN'S UNIVERSITY

COLLEGE OF EDUCATION

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DENTON, TEXAS
DECEMBER, 1980

Dedication

This thesis is dedicated in loving memory of my father, Billy D. Beaty, Sr., who has remained in my heart every step of the way.

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Acknowledgements

My heartfelt appreciation and love are extended to Dr. Jane Close Conoley, my committee chairperson, mentor and friend, for her time, friendship and guidance. Appreciation is also expressed to Dr. Dave Marshall and Dr. Iris Amos, members of my committee, for their interest, availability, and assistance.

To my dearest friends, Emily, Judy, Joan, and Elva, my endearing love and affection for being there. To Bill Gumm, my sincerest heartfelt love and appreciation are extended for his ever-questioning mind, and ever-present support and help in putting this thesis together. To Joe Carlisle, where all of this began, my warmest love and thanks. To the women who participated in the study, my warmest thank you. To my remaining family and friends who have always been available for me (and I believe you know who you are) I express my deepest love.

To my brother, Billy D. Beaty, Jr., who unknowingly taught me about strength, and whose presence in my life has been invaluable, I extend my deepest love and affection.

To my mother, Norma Jean Beaty, who has always believed in and supported me, and continually teaches me about love and survival, I extend my greatest and most sincere thanks of all.

Lateral Eye Movements: Personality Correlates of Right and Left Movers

Reflexive lateral eye movements (LEM) are the movements of the eyes that occur when one thinks about a problem, idea or issue. There are two major areas of LEM study. One area of study suggests LEM's occur contralateral to the cerebral hemisphere that specializes in particular tasks. Hemisphere specific studies, those that indicate specific functions for each hemisphere, have shown subject's eyes to reflex to the right to solve verbal reasoning questions and to the left for spatial type problems (Bakan, 1969, 1971; Galin, 1974; Galin & Ornstein, 1972; Gur & Gur, 1975; Kinsbourne, 1972; Kocel, Galin, Ornstein & Merrin, 1972). A second major area of LEM study is personality style of right and left movers. Previous studies in this area indicate that subjects have a preferred (as opposed to hemisphere specific) reflexive eye movement. The preferred LEM's seem to be characteristic for individual subjects who can be categorized as right and left movers (Bakan, 1969, 1971; Day, 1964, 1967, 1968; Duke, 1968; Meskin & Singer, 1974). Correlational research in this area has shown right and left movers differ in

personality style in terms of emotionality, characteristic ways of dealing with anxiety, scientific vs humanistic life orientations and creativity, to name a few of the major findings. The findings will be discussed in greater detail below. In order to account for the association of eye movements and personality style, two theoretical assumptions have to be made. The first is the eye movements are in response to contralateral hemispheric activation. The second is that there is a personality style associated with each hemisphere. The purpose of this study is to examine the personality differences between right and left movers based on preferential eye movement. A brief discussion of hemispheric activation as related to LEM's will be included. Following will be a discussion of personality style as related to eye movements.

Hemispheric Activation

Bogen, DeZure, Tenhouten and Marsh (1972) have found it useful to dichotomize subjects in terms of appositional (gestalt-synthetic) and propositional (logical-analytic) thinking. They make this dichotomy in terms of hemisphere specialization. They indicate further that "the two kinds of cognition implies that one will be more effective than

the other in dealing with certain problems" (p. 49). Their findings lend support to the previously mentioned hemisphere specific studies dealing with the differing functions of each hemisphere.

Studies of EEG activity have been used to determine hemisphere activation in response to specific stimuli. Galin and Ornstein (1972) found from EEG recordings that analytic tasks resulted in more activity over the temporal and parietal lobes of the left hemisphere. More activity occurred over temporal and parietal lobes of the right hemisphere in response to spatial tasks. The results were subsequently supported by Doyle, Galin and Ornstein (1974).

Tucker (1974) also found through EEG studies that the right hemisphere performs best on synthetic and gestalt tasks. The left performs better on analytical tasks. Several other EEG studies have found similar results (Bakan, 1969; Bakan & Svorad, 1969; Day, 1967; Harman & Ray, 1977).

Kinsbourne (1972) has indicated that when one hemisphere is engaged specifically (according to hemisphere specific tasks or processing), head and eye movements will be in the opposite direction or

contralateral to the hemisphere being activated. He found that right handers responded with right eye movement to verbal-analytical questions, and with left eye movement to spatial questions. These findings are consistent with previous and subsequent research in the area (Day, 1964; Duke, 1968; Bakan, 1969; Kinsbourne, 1974; Galin & Ornstein, 1974).

An explanation of the differences between hemisphere specific and preferential reflexing has been offered by Gur (1975). She found, as have others (Galin, 1974; Kocel et al., 1972; Meskin & Singer, 1974), that when an experimenter asked a subject verbal and spatial questions, hemisphere specific reflexing did occur. As Gur pointed out, however, it was only when the experimenter was located behind the subject that hemisphere specific reflexing occurred. In the cases where the experimenter was in front of the subjects, they would reflex, not according to question type, but in an individually characteristic way (preferential movement). In other words, the majority of LEM's would be in one direction regardless of question type. Gur hypothesized that this difference was due to the added

stress of having the experimenter visually present, and when under stress, subjects would engage and fall back on a preferred reflexing style. These findings were consistent with and supported by other research in this area (Day, 1964, 1967, 1968; Duke, 1968; Gur & Gur, 1975).

The assumption is that reflexive eye movements are related to cerebral hemisphere activation. Research has indicated a functional asymmetry of the cerebral hemispheres which specifies different known functions for each (Bakan, 1969, 1971; Bogen, 1969; Bogen & Bogen, 1969; Bogen, DeZure, Tenhouten & Marsh, 1972; Galin, 1974; Galin & Ornstein, 1972; Gazzaniga, 1970; Kinsbourne, 1972, 1974; Tucker, 1974). Bakan (1971) delineated these differences between hemisphere functions in the most comprehensive form to date. He listed the functions of the left hemisphere as verbal, analytic, abstract, rational, digital, objective, active, tense, and propositional. Right hemisphere functions were listed as pre-verbal, synthetic, concrete, emotional, analogic, subjective, passive, relaxed, depressed and appositional.

Personality Style

Studies have found reflexive eye movements to the left result from "stimulation of the oculomotor area of

the cerebral cortex of the right hemisphere, and movement to the right results from stimulation of the oculomotor areas of the left hemisphere" (Bakan, 1971, p. 66).

Numerous other studies have reached similar conclusions (Bakan & Svorad, 1969; Day, 1967; Galin & Ornstein, 1972; Tucker, 1974). Bakan (1971) suggested a person's preferential reflexing could indicate a relative dominance of the contralateral hemisphere in a person's psychological functioning. "Left movers are assumed to have more dominant right hemispheres and right movers are assumed to have more dominant left hemispheres" (Bakan, 1971, p. 66). He further postulated "the personality of the left mover. . . is more likely to reflect the style of right hemisphere functioning; and the personality of the right mover is likely to reflect the style of left hemisphere functioning" (p. 67).

In summary, preferential reflexing, which occurs with the experimenter located in front of the subject, is assumed to indicate a dominance of the hemisphere contralateral to the direction of the eye movements. On the basis of the known functional differences of the hemispheres and current research in the area,

certain personality variables can be associated with right or left movers. Hence, the assumption is not only that dominant hemisphere activation manifests personality characteristics differentially, but also that by observing the LEM's one can assume some personality characteristics which correlate with the specific hemisphere activated.

On the basis of the known differences in function and information processing of the two hemispheres comes numerous assumptions of personality differences based on preferential referencing. It was first observed by Day (1964, 1967, 1968) that right and left movers differed in characteristic ways of dealing with anxiety. He found right movers tended to handle anxiety in an externalized way as opposed to the internal method employed by left movers, who were also found to be more inner attentive, i.e., more aware of feelings of self and others, more introspective. This was consistent with the finding that the left hemisphere (right mover) functions on an objective, analytical, propositional level, whereas the right hemisphere (left mover) was credited with subjective, synthetic and appositional

functions (Bakan, 1971; Bogen & Bogen, 1969).

The functional differences are also supported by Bakan's (1969) studies of hypnotizability and LEM's. Bakan found that left movers were significantly associated with greater hypnotizability, humanistic interests and clearer imagery. Hilgard (1965) described a good hypnotic subject as one who has "rich subjective experiences . . . and one who accepts impulses from within," (p. 342) which again seems consistent with right hemisphere functioning.

A strong and consistent finding in support of personality differences among right and left movers is that left movers have been found to be more humanistic, inner attentive, involved in feelings, internally reflective, and more tender-minded or emotionally sensitive (Ashton & Dwyer, 1975; Bakan, 1969, 1971; Berg, 1977; Day, 1964, 1967, 1968; Meskin & Singer, 1974). A related study by Libby & Yaklevich (1973) found left movers tended to be more nurturant and intrceptive, while right movers seemed to be more externally oriented and practical when issues of emotionality are considered. In a study on the effects

of emotional questions and stress on LEM's, it was found that significantly more left movements occurred in response to emotional or stress-inducing questions (Schwartz, Davidson & Maer, 1975). This study was replicated and subsequently supported, linking right hemisphere involvement in stressful and emotional situations (Tucker, Roth, Arenson & Buckingham, 1977).

Gur and Gur (1975) found differences in characteristic use of defense mechanisms among right and left movers. Left movers were found to score higher in the defense clusters of denial and repression, whereas right movers scored higher on projection and turning against others. It is interesting to note the consistency between left movers being more internally oriented and their use of repression, and the right mover's characteristic external orientation and use of projection as a major defense mechanism. Again, this supported right movers as being more objective and external in basic life orientations, and left movers as more subjective.

The findings that right movers are associated with scientific analytic orientations to problem

solving and in choice of academic major are supported by several studies (Barnat, 1974; Huang & Byrne, 1978; Weiten & Etaugh, 1974). Related are the findings of higher quantitative scores on scholastic aptitude tests for right movers (Bakan, 1969; Harnad, 1972).

Other general findings include psychosomatic symptomology, which has been found to be more prominent in left movers (Bakan, 1969; Gur, 1974; Gur & Gur, 1975). Creativity and imagery have been speculated to be right hemisphere functions and thus should be more indicative of left movers. This has been found in studies by Bakan (1969, 1971), Bogen & Bogen (1969), and Harnad (1972). Smokler (1977) found left movers significantly more often displayed a hysterical personality style, whereas right movers displayed an obsessive personality style.

In summary, it seems that there are certain personality factors associated with right and left movers. These personality variables are consistent with the previously listed functional differences between the hemispheres and it thus seems plausible to make assumptions of personality style based on one's eye movements.

While most researchers have come up with results consistent with the above findings, several studies have reported contrary results. Etaugh (1972) found left movers significantly less affected by feelings, more assertive and shrewd, and more suspicious than right movers. However, in a second study (Etaugh & Rose, 1973) Etaugh did find one significant difference between left and right movers, this being that left movers are more tender-minded. Yet, she reported a "failure to replicate previous findings regarding personality characteristics of right and left movers" (p. 211). In both studies, Etaugh used the Sixteen Personality Factor Questionnaire (16PF) (Catell, Eber, & Tatsuoka, 1970). In light of the conflicting results obtained in the two studies, it appears that testing the personality differences of right and left movers using the 16PF requires further research.

Barnat (1974) also found inconsistent results when he used the Rorschach Test, an embedded figures test, and the Kuder Vocational Preference Record. He did not find an association between right movers and scientific pursuits, or between left movers and humanistic or artistic occupation.

Hiscock (1977) found no differences between right and left movers with respect to imagery, values, interests or choice of academic major. With respect to creativity, Schroeder (1978) found that right movers tended to be more creative as measured by the Torrance Test of Creative Thinking and by teacher ratings. Huang and Byrne (1978) did find that right movers were better at tasks requiring analytic processing but did not find left movers better at tasks requiring integrated or holistic processing.

While the results of most studies in this area have been consistent, the number of inconsistent findings indicates a need for further investigation. The differences in the studies may come from a variety of sources, i.e., eye movement methodologies, limited use of or inappropriate personality instruments. The tests and inventories used to determine the personality styles of right and left movers may not have been the most appropriate ones (Ehrlichman & Weinberger, 1978). Researchers have often selected certain scales from different instruments to measure right and left movers. By selecting only specific scales, it is likely

that the reliability of the measurement and validity of the assumptions were weakened. It is evident that more research is needed in this area, using numerous tests in their entirety--not just scales selected from them. This study will attempt to differentiate between right and left movers on the basis of several personality inventories, administered in their complete form. These inventories, the California Psychological Inventory (CPI), the Sixteen Personality Factor Questionnaire (16PF), and the Edwards Personal Preference Schedule (EPPS), contain scales that are expected to correlate with right and left movers, as well as scales on which no correlation is expected.

It is hypothesized that right eye movement will be positively correlated with personality factors related to left hemisphere involvement. It is also hypothesized that left eye movement will be positively correlated with factors related to right hemisphere activation. More specifically, it is expected that left movers will be associated positively with the CPI Class II scales (Responsibility, Socialization, Self-Control, Tolerance, Good Impression, and Communality),

the 16PF scales of Warmth, Impulsivity, Emotional Sensitivity, Imagination, Guilt Proneness, and Free-floating Anxiety, and the EPPS scales of Deference, Affiliation, Intraception, Succorance, Abasement, and Nurturance. Right movers, on the other hand, are expected to be positively associated with the CPI Class I scales (Dominance, Capacity for Status, Sociability, Social Presence, Self-acceptance, and Sense of Well-being, as well as Achievement via Independence). Right movers are further expected to correlate positively with the 16PF factors of Ego Strength, Dominance, Group Conformity, Suspiciousness, Rebelliousness, Self-Sufficiency, and Compulsivity, and on the EPPS scales of Achievement, Exhibition, Dominance, Autonomy, and Aggression.

The remaining factors of the CPI (Achievement via Conformance, Intellectual Efficiency, Flexibility, and Femininity), the 16PF (Intelligence, Boldness, and Shrewdness), and the EPPS (Order, Change, Endurance, and Heterosexuality) are not expected to be related with right or left movers.

Method

Subjects

Fifty-two right-handed females, 18 years of age and older, from the Texas Woman's University served as subjects. The subjects were volunteers from a human subjects pool consisting of undergraduate psychology students. No further limitations were imposed. Course credit was given for participation.

Instruments

The California Psychological Inventory. The CPI (Gough, 1964) is a non-projective personality inventory developed for use with normal subjects. The 18 scales, which are divided into four classes, measure characteristics of social living and social interaction (Gough, 1964). The scales by class are: Class I, Dominance (Do), Capacity for Status (Cs), Sociability (Sy), Social Presence (Sp), Self-acceptance (Sa), and Sense of Well-being (Wb); Class II, Responsibility (Re), Socialization (So), Self-control (Sc), Tolerance (To), Good Impression (Gi), and Communality (Cm); Class III, Achievement via Conformance (Ac), Achievement via Independence (Ai), and Intellectual Efficiency (Ie); Class IV, Psychological Mindedness (Py), Flexibility (Fx), and Femininity (Fe). This test has been shown to be reliable and valid (Gough, 1964).

The Sixteen Personality Factor Questionnaire. Form A of the 16PF was administered to subjects. This non-projective, self-report test measures 16 broadbased personality traits. It has been found to be reliable with test-retest reliabilities between .76 and .93 (Andrulis, 1977; Cattell, Eber & Tatsuoka, 1970), and direct concept validity ranging from .72 - .96 (Cattell, Eber & Tatsuoka, 1970). This instrument measures Warmth (A), Intelligence (B), Ego Strength (C), Dominance (E), Impulsivity (F), Group Conformity (G), Boldness (H), Tender-mindedness (I), Suspiciousness (L), Imagination (M), Shrewdness (N), Guilt Proneness (O), Rebelliousness (Q1), Self-Sufficiency (Q2), Compulsivity (Q3), and Free-floating Anxiety (Q4).

The Edwards Personal Preference Schedule. The EPPS is a non-projective test measuring 15 independent, normal personality variables (Edwards, 1954). This inventory is designed to minimize the influence of social desirability in responses, even though the test is forced-choice.

The 15 scales on the EPPS are Achievement (ach), Deference (def), Order (ord), Exhibition (exh), Autonomy (aut), Affiliation (aff), Intraception (int),

Succorance (suc), Dominance (dom), Abasement (aba), Nurturance (nur), Change (chg), Endurance (end), Heterosexuality (het), and Aggression (agg).

Reflective Questions

Twenty reflective questions were devised to elicit preferential eye movements. The questions were devised by the author and Gumm (see Note 1) with the intent of having the subject call upon personal experience for answers (which were not to be given verbally). Several questions by Duke (1968) were also used. The majority of questions used to date in studies to elicit LEM's have been of verbal or spatial nature, designed to stimulate a specific hemisphere. Since this is contrary to the nature of this study in which preferential eye movement was desired, personal questions of a reflective nature were used.

Apparatus

In order to measure eye movements, subjects were video recorded from behind a one-way mirror while they thought about answers to 20 reflective questions (See Appendix A). Subjects were brought into a 5' x 6' room that had been draped ceiling to floor with white sheets to provide as homogeneous an environment as

possible. The subject was seated in a chair approximately 3 feet in front of the experimenter, whose chair was approximately 1 foot lower than the subject's. Thus, the subject's head was approximately 1 foot above the experimenter's head. Behind the experimenter was the one-way mirror, which was covered by the sheet except for a slot 4 inches wide that extended vertically for the length of the mirror. From behind the one-way glass a Sony AVC-3250 video camera was positioned so that it shot just above the experimenter's head and level with the subject's eyes. A small indicator light was used and was positioned just inside the camera lens. The light could be seen by the subject through the slot in the sheet, and the onset of this light signaled the presentation of a question to the subject. The light also indicated on the video tape the beginning and ending of the question presentations. The light was controlled by the experimenter by means of a hand-held switch.

Procedure

The personality inventories were administered to the subjects in a counterbalanced order. The tests were given in three group testing situations. Following the

completion of the inventories, subjects were individually scheduled for a fifteen-minute appointment to obtain eye movement data. During this appointment, subjects were seated directly in front of the experimenter in the 5' x 6' room. For the duration of the session, the subject was requested to maintain a forward looking position in order to obtain a good video recording. The experimenter instructed the subject to attend to the signal light as the question was being asked. The subject was further instructed that when the light was turned off upon the completion of the question, she was free to reflect silently upon her answer to the question. This sequence was used for each of the 20 questions. The 20 questions were presented with the first question being randomly chosen for each subject. The subjects were allowed approximately 10 to 15 seconds to think about their answer. At no time was eye contact established between subject and experimenter. This was due to the desire not to influence eye movement direction in any way. The first eye movement observed after the end of the question was scored. The reflective questions were developed to engage each subject's individual personality by requesting information of a personal nature.

Scoring

Each of the personality inventories yielded continuous data in which raw scores were converted into standard scores. The standard scores were used in all of the statistical procedures.

The scoring of the eye movements was based upon the first eye movement upon the end of the question. A scoring system similar to the clock-face system used by previous researchers (Ashton & Dwyer, 1975; Ehrlichmen, Weiner & Baker, 1974; Galin & Ornstein, 1972) was used. An oval figure was vertically divided into four equal sections and then weighted (from left to right sections) -2, -1, +1, +2 (See Figure 1). Thus, with 20 questions, the scores could range from an extreme of -40 to an extreme of +40.

Two raters scored each subject and a single score was obtained for each subject by averaging the two sets of scores. To control for eye movement differences between the right and left eye of the same subject, the eye to be scored was randomly selected. The acetate overlay was then centered over this eye. This was done to make sure the raters were scoring the same eye -- and also scoring the same eye for each question.

Interrater Reliability

Training for eye movement raters consisted of two video taped individuals which were viewed and rated by the raters. Each of the video taped sessions consisted of all 20 questions. An acetate overlay, which consisted of an oval figure divided into four segments (see Figure 1), was placed on the television screen centered over the subject's eye, which had been randomly selected. The raters were instructed to score the first eye movement observed upon the completion of the reading of the question. The scores given for each movement ranged from -2 to +2. Tests of agreement were conducted for each of the scoring sessions for all raters. The interrater reliability coefficient using the Pearson Product Moment Correlation Coefficient was .90.

Statistical Analysis

Raw scores on all 49 personality measures (independent variables) were converted to standard scores. Eye movement measurements (dependent variable) yielded one score for each subject, which ranged from -19.5 to +27. Numerous multiple regression procedures were used to find the personality factors most highly correlated with eye movement direction. The eye movement scores were

regressed upon for all personality factors in a stepwise fashion for all 49 factors as well as each test separately for right and left movers. The Statistical Package for the Social Sciences (Klecka, Nie, & Hull, 1975) was utilized in data analysis.

This statistical analysis is designed to yield those variables which form the best predictor set for a specific criterion (McNeil, Kelly & McNeil, 1975). This procedure subjects the correlation and regression coefficients to tests of significance at the .05 level. Those variables which are significantly related become a part of the predictor set.

Results

It was hypothesized that certain personality factors would be related to direction of lateral eye movement. To obtain personality data, three personality instruments -- 16PF, CPI, EPPS -- were administered to yield a total of 49 scores on different personality factors. An eye movement score was also obtained for each subject by ratings obtained on eye movements in response to 20 reflective questions. A Pearson Product Moment Correlation coefficient of .90 ($p < .001$) was obtained on interrater reliability. All scores for each rater--across questions and subjects--

were used in the analysis. A multiple regression procedure was used to test the hypotheses. Eye movement scores for all subjects were regressed in a stepwise fashion on all 49 personality factors. No significance was found. A multiple regression procedure was also used to predict right and left group membership from the personality variables for each test. Two variables from the CPI, Dominance and Intellectual Efficiency, were found to be significant predictors of group membership (See Table I). On the Dominance scale, as scores increase, eye movement scores decrease. Thus, the higher the score on the Dominance scale, the greater the degree of right movement predicted. High scores on this scale (predicted for right movers) indicate aggressiveness, confidence, pervasiveness, self-reliance and independence. Low scores (predicted for left movers) indicate individuals who are inhibited, indifferent and silent, lacking in self-confidence and unassuming. This result supports the hypothesized direction for this scale.

For the Intellectual Efficiency scale, the higher the scores, the greater degree of left movement. This is a positive relationship -- as scores on this scale increase, LEM scores increase (or become more left). High scorers

(left movers) tend to be efficient, clear thinking individuals, planful, thorough, and alert. They place high value on cognitive and intellectual matters. Low scorers (right movers) tend to be cautious, defensive, and unambitious, yet also conventional and stereotyped in thinking. No directional hypothesis was made for this scale, and does stand contrary to the prediction of no significant relationship to right and left movers. A multiple regression procedure was then used to regress eye movements on personality factors for each test for right and left movers separately. This was done in order to have a smaller predictor set in comparison to the number of subjects (left movers = 37; right movers = 15). Five variables were found to be significantly related to right movers and two were found to be significantly related to left eye movement. An ex-post-facto selective multiple regression procedure yielded two other factors significantly related to right movement. Most of the significant factors were in the hypothesized direction.

Right Lateral Eye Movement

Significant results were found on five personality variables in a multiple regression conducted on right movers for each test. Factor F (Impulsivity) from the

16PF was found to be related significantly to right LEM. Low scores on the F scale indicate the more serious, sober individual, while high scores indicate the more impulsive, enthusiastic, happy-go-lucky individual. The negative constant (See Table II) indicates that the more impulsive one is, the less the degree of right movement is expected. The more sober individual was found to obtain a score indicating a greater degree of right movement -- a more negative score. These results tentatively and indirectly support the hypothesis that factor F would be positively related to left movement. However, these results pertain to right movers only. Of the right movers, those who have the least degree of right movement have a tendency to score higher on the Factor F scale than those who have a greater right movement score.

Two scales from the EPPS, Affiliation and Change, were found to be significantly related to degree of right movement. Again, due to the negative constant, high scores on this scale indicate a lesser degree of right movement (See Table III). Thus, as eye movement scores approach zero (or become more left in direction), the scores on the Affiliation scale increase. High scores on the Affiliation scale indicate one who is loyal to friends,

forms many friendships, would rather be with others, and forms strong attachments to others, all of which would tend to indicate a left mover. Although these results pertain to right movers, it is consistent with the hypothesis predicting high scores on this scale with left movement.

The Change scale was negatively related to right LEM. High scores on the Change scale indicate one who likes new and different things, to travel, meet new people, do new and exciting things. High scores on this scale are related to a lesser degree of right movement. As right eye movement scores became less negative (in a more left direction), scores on the change scale increased. No directional hypothesis was made pertaining to the change scale, yet it was hypothesized not to correlate significantly with right or left movement.

The Socialization and Achievement via Conformance scales from the CPI were found to be significantly related to right eye movement (See Table IV). It was found that higher scores on the Socialization scale predicted a lesser degree of right eye movement. Thus, the less negative the eye movement score (the less right), the higher the scores on the Socialization scale tend to be. Those obtaining

high scores on this scale tended to be serious, honest, obliging, sincere, self-denying and conforming. Again, this is a tentative confirmation of the predicted direction, as high scores on this scale were hypothesized to relate positively with left movement. The less extreme right movement will be related to higher scores on Socialization.

High scores on Achievement via Conformance scale were found to relate to greater degree of right movement. In other words, the more right movement, the higher the scores on this scale were obtained. No directional hypothesis was made on this scale -- as it was hypothesized not to relate significantly to either right or left movers. However, this result is consistent with previous research. The high score on the Achievement via Conformance scale indicates one who is capable, cooperative, organized, responsible, stable and industrious.

In an expost-facto selective analysis of the data, two other personality factors were found to correlate significantly with right eye movement (See Table V). Using a multiple regression procedure, the Flexibility scale from the CPI and Factor B (Intelligence) of the 16PF were found significant.

High scores on the flexibility scale were found to relate positively with right LEM. That is, high scores on this scale were found to relate significantly to greater degrees of right movement. The high scorer on Flexibility tends to be insightful, informal, confident, idealistic, and concerned with personal pleasure. No directional hypothesis was made for this scale.

The Intelligence scale (Factor B) of the 16PF was also found to be significantly related to right LEM. High scores on this scale related to a lesser degree of right movement. That is, as eye movement scores became less negative (as they approach zero), scores on Intelligence increased. High scores on this scale tend to indicate higher mental capacity, insightful, intellectually adaptable individuals, perseverance and higher morale. No directional hypothesis was made on this scale, as Intelligence was not expected to relate to right or left LEM. This result is consistent with the previous finding of the CPI Intellectual Efficiency scale wherein left movers were positively related and right movers were negatively correlated to Intellectual Efficiency.

In summary, right LEM was found to be related negatively to Intellectual Efficiency, Impulsivity,

Affiliation, Change, Socialization, and Intelligence.

Right LEM was found positively related to Dominance, Achievement via Conformance, and Flexibility.

Left Lateral Eye Movement

Two personality factors, the Achievement scale from the EPPS and the Suspiciousness scale (Factor L) of the 16PF, were found to significantly relate to left LEM (See Table VI).

The higher the score on Achievement, the less the degree of left movement found. As scores on Achievement increase, eye movement scores become less left in degree -- the score approaches zero. This is in the predicted direction, as right movement was predicted to relate positively with Achievement. High scores on this scale indicate one who tries to do his best, to be successful, to solve problems, to accomplish something of great significance. Again, while these results apply to left movers, the direction of the hypothesis has been supported.

Factor L (Suspiciousness) of the 16PF also relates negatively with left eye movement. The less the degree of left movement, the greater the score on Suspiciousness was found. High scores on this scale indicate suspicious, jealous, dogmatic, tyrannical individuals, while low scores

indicate trusting, accepting, permissive individuals. This is in the predicted direction. The more left movement, the less suspicious and dogmatic one would be. This result stands contrary to that of Etaugh (1972) who found left movers to be more suspicious.

In summary, left LEM was found negatively related to Dominance, Achievement and Suspiciousness, and positively related to Intellectual Efficiency.

Discussion

The results of this study tend to support the hypothesis that right and left movers differ in terms of personality. It is difficult to determine, however, if these differences are related to hemispheric functioning. The results support the majority of LEM studies in that right movement was found to be related to Dominance and Suspiciousness and left movement related to Impulsiveness, Sociability and Affiliation. In terms of the known functional differences of the hemispheres, these results seem consistent with personality factors that would be expected. That is, right LEM tended to indicate left hemisphere functioning and left LEM tended to indicate right hemisphere functioning. There were, however, several factors that were related to LEM that were not predicted.

Left movers were found significantly related in a positive direction to the CPI Intellectual Efficiency and 16PF Intelligence scales. In relation to hemispheric functioning, this would not be expected. Thus, it seems that more research is necessary to determine how the intelligence factor relates to eye movement and speculated hemispheric differences. Another unexpected finding was the positive relationship between right LEM and Achievement via Conformance (CPI). While this factor seems consistent with left hemispheric functioning, it was not predicted in this study, although positive association was hypothesized and obtained for the EPPS Achievement scale.

Also unpredicted was the positive relationship between Flexibility and right LEM and the negative relationship of right LEM and Change. Due to the large number of personality variables available for comparing right and left movers it seems logical that new, previously unrelated factors would be found. It seems that further research is necessary on these variables to determine the nature and degree of relationship.

Several factors were also predicted to relate positively to right or left movement which did not. All but one (Socialization) of the CPI Class II scales

were not related to left movement. All but Dominance of the CPI Class I scales were found unrelated to right eye movement. While in both cases, the hypotheses were generally unsupported, the two scales that were found related (Socialization for left LEM and Dominance for right LEM) were major personality factors in terms of previously supported hemispheric differences.

These results contribute to the literature in several ways. First, several personality instruments were used and analyzed in their entirety. A more complete psychological picture was thus available on each subject. The integrity of the test was maintained in that scales were not abstracted from the tests for analysis, as has been done in the past. By using three different tests, much more information was available for use in comparisons of right and left movers. This included scales in which significance was expected and in which no significance was expected. Due to this procedure, several new variables were found related to LEM (i.e., Intelligence, Flexibility, Achievement via Conformance and Change).

Second, by using specially designed reflective questions, designed to elicit preferential eye movement, the problem of hemisphere specific (i.e. verbal vs.

spatial) questions was avoided. However, since these questions were designed to be of a personal opinion nature, it may be that right hemisphere involvement was greater than left. It could also explain the greater number of left movers as compared to right movers in this study.

In terms of supporting previous research, this study seems to support the majority of consistent findings (Ashton & Dwyer, 1975; Bakan, 1969, 1971; Berg, 1977; Day, 1964, 1967, 1968; Meskin & Singer, 1974). The finding that greater degree of left movement was positively related to the Trust scale (16PF) and right movement related to Suspiciousness is contrary to the findings of Etaugh (1972), yet consistent with the majority of other LEM studies previously cited.

The relationship of the Intelligence factor to hemispheric dominance and the growing body of cerebral lateralization literature needs further exploration. This result has not been previously found and could yield further information about the differences between the hemispheres.

From the results of this as well as previous studies, one can assume that there are indeed basic personality differences among right and left movers. Eye movements

can be seen as a valid method of quick, basic personality assessment -- yet not a comprehensive one. Certainly the area of personality assessment cannot be summed into one method. However, it is useful to obtain and use any or all methods that appear related to personality assessment. Lateral eye movement research has certainly been shown to relate at least basically to personality. It would be interesting to assess therapeutic techniques and their effectiveness with right and left movers. It would seem that on the basis of the information now available on LEM, a therapist could gear his/her response style to that of the client and gain rapport and therapeutic change more rapidly (Grinder & Bandler, 1976). For example, perhaps by knowing and observing the clients preferred eye movement, a therapist could choose a style of therapy geared toward the preferred hemisphere. If an individual is right hemispheric oriented (left mover) a metaphorical style of therapy may be used to tap the pre-verbal, subjective nature of right hemisphere functioning. For left hemisphere orientation (right mover) a therapist might choose to use a more cognitive style of therapy.

The study reported here has some heuristic value. As more information becomes available on hemispheric differences and LEM, research dealing with LEM and learning

styles, dyadic relationships, problem solving, communication styles and therapeutic intervention becomes a viable possibility.

The limitations of the present study relate to subject population and scoring difficulties. This study, included only female subjects which limits its generalizability considerably. In addition, there were more left movers than would be expected (37 left movers and 15 right movers) thus potentially influencing the statistical analysis. The preponderance of left movers is consistent with societal expectations toward women as being more emotional and feeling oriented. The range of scores may have been artificially truncated due to the single sex sample. This would make relationships among variables difficult to determine.

In terms of scoring, while interrater reliability was high ($r = .90$), there was some question about exactly what constituted the first eye movement. Whether it was the first momentary hesitation in movement or the end position of eye movement motion. It seems that in this study, some raters had been scoring the end-of-motion position and some the first hesitation in movement. It seems that research is necessary to determine if there

is a difference between the two, and if so, to what degree it affects research on LEM. It seems that this study needs to be replicated using a male and female sample and raters who are scoring the same first eye movement.

In summary, the results of this study indicate personality differences between right and left movers. These differences are generally in agreement with the previous research of LEM and hemispheric functioning. While other factors are likely to be related to hemispheric activation and to direction of lateral eye movements, a relationship does seem to exist between the two that yields pertinent information regarding basic personality structure as measured by widely used personality inventories. Thus, it is possible to predict certain personality variables on the basis of known or observed preferential lateral eye movements. These can thus be related to the known functions of the hemispheres and a preference of one over the other. While the results of the data collected to date are strong and for the most part consistent, it is also evident that the study of LEM and cerebral lateralization is far from complete.

Studies are needed which include males in the controlled and thoroughly tested method as used in this study. Perhaps studies to develop new, or clarify previous eye movement methodologies would prove helpful. Also indicated are studies in which previously unresearched personality variables are studied, as well as the up and down direction of eye movement.

TABLE I

CPI Intellectual Efficiency and Dominance Scales
as Predictors of Right or Left LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Intellectual Efficiency	.012	0.38398	0.00479	6.862**	4.03**
Dominance	-.012	-0.30930	0.00582	4.452*	
(Constant)	.79				
<hr/>					
Note: Multiple <u>R</u>			0.37568		
<u>R</u> square			0.14114		
Adjusted <u>R</u> squared			0.10608		
Standard Error			0.43252		
Degrees of freedom			2, 49		

*p<.05

**p<.025

TABLE II

The 16PF Factor F (Impulsivity) as Related to Right LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Impulsivity	1.77	0.54993	0.74542	5.636*	5.636*
(Constant)	-21.34				
<hr/>					
Note:	Multiple <u>R</u>		0.54993		
	<u>R</u> square		0.30242		
	Adjusted <u>R</u> squared		0.24876		
	Standard Error		5.66389		
	Degrees of freedom		1, 13		

*p<.05

TABLE III

The EPPS Scales of Affiliation and Change
as Related to Right LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Affiliation	.37	0.77403	0.11301	10.805**	6.41*
Change	.40	0.68932	0.13725	8.570*	
(Constant)	-51.43				
<hr/>					
Note: Multiple <u>R</u>			0.71864		
<u>R</u> square			0.51645		
Adjusted <u>R</u> squared			0.43586		
Standard Error			4.90817		
Degrees of freedom			2, 12		

* $p < .025$

** $p < .001$

TABLE IV

The CPI Scales Socialization and Achievement via Conformance
as Related to Right LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Socialization	.64	0.82840	0.22919	7.819**	4.21*
Achievement via Conformance	-.43	-0.72355	0.17675	5.965*	
(Constant)	-23.23				

Note: Multiple <u>R</u>	0.64231
<u>R</u> square	0.41256
Adjusted <u>R</u> squared	0.31466
Standard Error	5.40979
Degrees of freedom	2, 12

*p<.05

**p<.025

TABLE V

The CPI Flexibility Scale and the 16PF Intelligence
(Factor B) Scale as Related to Right LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Flexilility	-.34	-0.51394	0.14132	5.849*	5.15**
Intelligence	1.72	0.48979	0.74685	5.312*	
(Constant)	-4.16				
<hr/>					
Note: Multiple <u>R</u>			0.67963		
<u>R</u> square			0.46190		
Adjusted <u>R</u> squared			0.37222		
Standard Error			5.17762		
Degrees of freedom			2, 12		

*p<.05

**p<.025

TABLE VI

The EPPS Achievement Scale and the 16PF Suspiciousness
Scale (Factor L) as Related to Left LEM

Variable	B	Beta	Standard Error B	<u>F</u>	Total Equation <u>F</u>
Achievement	-.27	-.32436	0.12433	4.562*	4.71**
Suspiciousness	-1.23	-.32174	0.57831	4.489*	
(Constant)	34.37				
<hr/>					
Note: Multiple <u>R</u>			0.46609		
<u>R</u> square			0.21724		
Adjusted <u>R</u> squared			0.17120		
Standard Error			6.88821		
Degrees of freedom			2, 34		

* $p < .05$

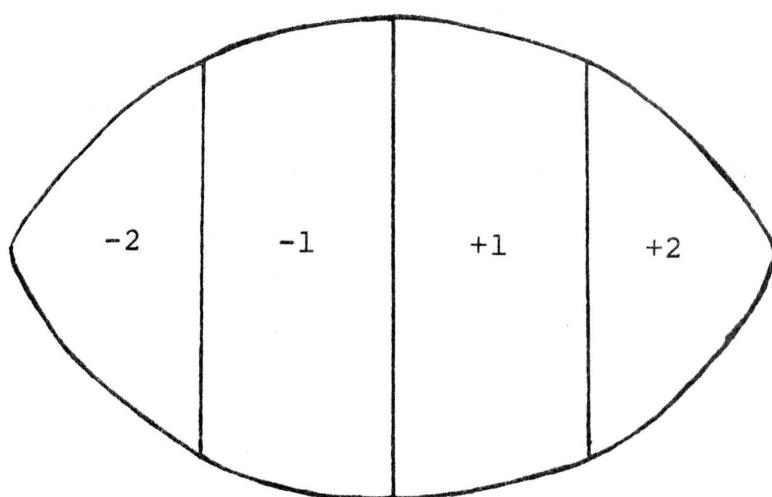
** $p < .025$

Figure Caption

Figure 1. Illustration of modified clock face scheme

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Figure 1



Appendix A
Reflective Questions

Reflective Questions

1. What qualities do you think a solid relationship consists of?
2. Think about a time you knew you were loved by another person.
3. Think about a time when you knew you were trusted by another person.
4. If you could go back to your childhood, what is one thing you would do differently?
5. What do you think is the primary function of the Women's Movement?
6. Think about a time when you felt embarrassed.
7. A person dreams he attends the Metropolitan Opera dressed in rags. What do you think this dream means?
(Duke, 1968)
8. Where do you go to find peace of mind?
9. What three qualities do you think most women seek in prospective husbands? (Duke, 1968)
10. What three qualities do you think most men seek in prospective wives? (Duke, 1968)
11. If you were elected president, what would be your first act to solve the problems of this country?

Reflective Questions (cont)

12. Think about a time when you felt hurt.
13. Think about a time when you felt understood by another person.
14. What is your idea of an enjoyable evening?
15. In what way do you now interact differently with your parents than you did as an adolescent?
16. As you grow older, what issue have you found it most difficult to adjust to?
17. In what way do you resolve stress or conflict?
18. What do you believe is your strongest personal asset?
19. Think about a time when you felt successful.
20. With what thoughts are you preoccupied most?

Reference Notes

1. Gumm, W. B. Personal communication, March, 1980.

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