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Perceptual Styles of Left- and Right-Lookers

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PERCEPTUAL STYLES OF LEFT- AND RIGHT-LOOKERS

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This Dissertation submitted by Joann C. Russell in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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TABLE OF CONTENTS

LIST OF TABLES

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ABSTRACT

The left and right hemispheres have unique modes of processing data: the former verbal-analytic, the latter spatial-holistic. Dominant direction of lateral eye movement on answering reflective questions has been interpreted as indicating differential contralateral hemispheric activation and, by inference, predominant reliance on one or the other mode.

This study tested the hypothesis that neurological organization of the brain underlies and unifies individual perceptual, cognitive, and personality style differences. Right-lookers were expected to be more obsessive-compulsive and to obtain a predicted pattern of test scores congruent with left hemispheric characteristics, while left-lookers were expected to be more hysteroid and to obtain a contrasting pattern of scores. Predictions regarding sex differences were also made.

Forty-three right-handed undergraduate psychology students from the University of North Dakota, Grand Forks, North Dakota, were solicted from subjects screened for dominant direction of lateral eye movement in a related study: 11 male left-lookers, 9 male right-lookers, 12 female left-lookers, 11 female right-lookers (percentage

of unilateral eye movements, 63-100%). Subjects (compensated $10.00 each) were tested individually, completing the Hysteroid:Obsessoid Questionnaire, the Rorschach Inkblot Test (following Exner's Comprehensive System guidelines), with pre- and post-administrations of the State Anxiety Inventory.

A 2x2 factorial design was utilized with independent variables 'sex' and 'direction of lateral eye movement.' An Analysis of Variance on 53 variables yielded a significant interaction on 5, with trends on 3, and significant main effects on 11, with trends on 10. A Multivariate Analysis of Variance on 4 variables yielded no overall group effect. Factor Analysis of 53 variables produced 13 factors, accounting for 86% of the variance. A Discriminant Function Analysis of these factors produced no overall effect for the independent variables or their interaction; the Analysis of Variance portion of this procedure indicated a trend on one factor.

No clear patterns in test scores emerged, some results were unpredicted or contrary to expectation, and sex differences appeared important. It was concluded that critical Rorschach scoring issues need to be resolved, that sample population characteristics may be implicated, and that use of the lateral eye movement phenomenon to determine hemispheric dominance may be inadequate.

CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

Psychology as a science has over the years devoted itself to analysis of behavioral, cognitive, and perceptual aspects of human beings. Both nomothetic and idiographic modes of research have contributed to a growing accumulation of critical and fascinating--but often disparate--facts concerning human functioning in these areas of investigation. While many component elements of these separate systems of human functioning have been identified, the behavioral, cognitive, and perceptual systems themselves remain loosely linked. Humans have been fragmented--taken apart to see what makes them "tick" psychologically. Now psychology's task is to re-integrate them into fully functioning organisms. Synthesis must follow analysis in order for psychology, as a science, to achieve its ultimate goal. As Von Bertalanffy (1952, p. 70) put it, "Science is not a mere accumulation of facts: facts become knowledge only when incorporated into a conceptual system." A meaningful integration of research findings from the separate areas and experimental testing of resultant implications for human psychological functioning are needed.

Humans are highly organized creatures. On every level from concrete physiological underpinnings to observable behavior, abstract cognitive functioning, and those sometimes indefinable characteristics which coalesce into personality, the progression from discrete component elements to a meaningfully integrated whole is apparent. Diverse types of cells, each a miraculous system within itself, unite to form the skin, hair, teeth, bone, nervous tissue, organ systems, and so forth, which when organized into interdependent relationships with each other produce that higher level, self-sustaining physiological system which constitutes the biological human. Extension and flexion of individual muscles--propelling, retracting, supporting, and otherwise governing movement within the environment--combine into distinct behavioral sequences recognized as specific variants of routines such as eating, sleeping, working, playing, and interacting with others or the environment. Separate, random thoughts, images, and perceptions become strung together, evolving into configurations as complex as mathematical logic, language, musical compositions, and artistic creations. At yet a higher level of organization, these separate, complicated systems unite in different ways and proportions within individuals. Thus is created the unique combination of physiological characteristics, behavioral patterns, and cognitive/perceptual skills which when expressed in conjunction with

each other contribute to the personality of the individual. The human being, as an intact, fully functioning organism represents a profoundly complex system in which physiology, behavior, cognition, and personality are unified.

While individual differences in patterns of organization have been found in each of these sub-areas, the relationships between them within the larger pattern of the individual are as yet incompletely understood. How cognitive, perceptual, and personality styles interrelate and function harmoniously together at this higher level of organization is a question of growing interest and challenge to researchers. It would be consistent with the organization and integration evident in the lower level patterns for them to converge in some meaningful way at this higher level of organization.

One meaningful convergence of lower-order systems to create higher-order phenomena may be the integration of the specialized cognitive capacities of the left and right cerebral hemispheres. Identified patterns of perception, cognition, and personality may align themselves within individuals in relation to the neurological organization of the brain. Such a view of brain laterality suggests that cognitive, perceptual, and personality styles are closely intertwined; that is, that an interdependence exists between these functions. It further suggests that emotional style, in particular, and cognitive functioning

are intimately and meaningfully related. Tucker (1981) offers support for such a relationship in his review of the literature on lateral brain function as related to emotional experience and behavior, suggesting that the cognitive/perceptual capacities of the left and right hemispheres contribute, each in its own unique way, to the conceptualization of emotion. According to this view, each cerebral hemisphere may be expected to combine its emotional and cognitive contributions to the total individual in a certain theoretically understandable way.

In the following sections a review of several areas of research pertinent to this proposition will be presented. First, the literature bearing on brain asymmetry as demonstrated physiologically as well as in the cognitive/perceptual, personality, and some behavioral areas, will be examined. Second, the literature on conjugate lateral eye movements will be addressed. This phenomenon was utilized as an indicator of differential hemispheric function in this study. Third, two distinct personality styles will be described, the obsessive-compulsive and the hysteric personalities. The Hysteroid-Obsessoid Questionnaire has been developed to assess the relative contribution of these two tendencies to the total personality (Foulds, Caine, Adams, & Owen 1965; Caine & Hope 1967). This measure was utilized in the current research. Fourth, certain cognitive/perceptual styles will be examined as these relate to the construct of the integrated individual.

Finally, the Rorschach Inkblot Test (Rorschach 1921/1942), as a projective measure which taps all of the areas of primary interest here (cognitive/perceptual, emotion, personality) will be considered. This instrument is hypothesized to reflect overall psychological patterns which might emerge across the cognitive/perceptual, emotional, and personality areas in a sample of persons who appear to differ in laterality preference. The method of Rorschach administration and scoring chosen to be used in this study will be described.

Cerebral Hemispheric Specialization and Lateral Dominance

Specialization of the right and left cerebral hemispheres for separate functions appears to be an integral factor in the psychological organization of the human species. Certain personality features, as well as specific perceptual and cognitive abilities have been found to differ between the two hemispheres. The conjugate lateral eye movement phenomenon as an index of hemispheric activation suggests, further, that individuals differ in predominant use of one or the other hemisphere. Thus, individual cognitive, perceptual, and personality styles have been hypothesized to vary in accord with the person's preferred direction of lateral eye movement. In the following review, areas of investigation which have contributed to our knowledge of functional brain asymmetry will be surveyed. The nature of this asymmetry will be described

in reference to the cognitive, perceptual, and personality characteristics associated with each hemisphere.

Brain Asymmetry: Introduction

Asymmetry of the brain refers to the differential neurological organization of the two cerebral hemispheres, such that certain functions reside in the left half of the brain while other functions reside in the right half. Each hemisphere exerts primary control over the contralateral side of the body. A demonstrated preference for use of the right (or the left) hand, foot, eye, etc., reflects a dominance of the left (or the right) half of the brain for that particular motor function. Indeed, handedness was one of the first clues to brain asymmetry. This lateralized behavioral dominance became linked to the actual neurological organization of the brain when specific dysfunctions were observed to follow certain types of brain damage (Geschwind 1975). Certain cognitive and perceptual abilities have been found to reside in one or the other hemisphere, as well. Individual differences in brain organization give rise to unique patterns of dominances. Cerebral dominance refers to the greater, or in some cases the exclusive, control of a given hemisphere over specific motor/mental functions. The majority of people are left hemisphere dominant, with right-handedness and language functions localized in the left hemisphere and a smaller

proportion of people are left-handed and less consistent in localization of language functions (Branch, Milner, & Rasmussen 1964; Benton 1962; Ornstein 1973; Galaburda, LeMay, Kemper, & Geschwind 1978; Penfield and Roberts 1959). Most of these latter individuals are more likely than right-handers to show reverse asymmetry and to have language localized in the right hemisphere (Galaburda et al. 1978). In the rarer case of cross dominance, where lateralization is mixed (such as right hemisphere dominance for handedness and eyedness with left hemisphere dominance for footedness and language, or other irregular patterns), the functioning level of the individual has been found, in comparison, to be less stable and less effective (Palmer 1963; Birkett 1978; Kovac 1972; Kovac & Brezina 1973; Horkovic 1973; Weiten & Etaugh 1974c).

The two halves of the cerebrum, the left and the right hemispheres, are connected by various nerve bundles, primarily that of the corpus callosum, which permit the transfer and integration of information between them. The role of these neuronal connections, indeed the significance of the existence of two hemispheres, has become truly appreciated only recently. As early as the mid-1800s it had been noticed through autopsy that a human being could live and function with only one intact hemisphere (Wigan 1844). This startling discovery led Wigan to believe that people must normally be of two minds, having two brains

(hemispheres). This view, however, was not generally adopted. Until the 1930s neurologists concentrated on studying the left hemisphere, which they considered to be the dominant one due to its obvious involvement in handedness, verbal expression, and comprehension. Damage to the left half of the brain clearly disrupted these functions, while damage to the right hemisphere and even right hemispherectomy resulted in little observable deficit (Krynauw 1950; French, Johnson, Brown, & Van Bergen 1955; Gardner, Karnosh, Christopher, & Gardner 1955; Obrador 1964; Ueki 1966; Rowe 1957). The right was hence considered the non-dominant or minor hemisphere, and unimportant. When, in the 1950s, standardized testing and improved research techniques permitted a closer scrutiny of this mute half of the brain, hints of its real significance began to appear. The division of functions became apparent as damage to the right hemisphere was shown to result in disturbed spatial thinking, loss of appreciation for spatial relationships and spatial orientation in one's environment. The right hemisphere was also demonstrated to be involved in a range of non-verbal/non-spatial functions, including recognition of faces and of melodies. Consequently, it came to be termed the non-verbal, rather than the non-dominant or minor, hemisphere.

Many of the cognitive/perceptual characteristics of the two hemispheres became well established as a result of extensive research performed during the 1960s and

1970s. A wide range of physiological, cognitive, and perceptual techniques were utilized in addressing the cerebral dominance question. We turn now to an overview of these areas of investigation.

Research on Hemispheric Specialization

Effect of Brain Lesions. Functioning of patients with brain lesions, lobectomies, or hemispherectomies has been compared with that of patients with corresponding damage to the opposite hemisphere. Brain lesions to the left hemisphere have been found to result in symptoms of aphasia, alexia, object and image agnosia, ideatory and ideomotor apraxia, while lesions to the right hemisphere result in unilateral asomatognosia and spatial agnosia (Hecaen 1962). Ideation in patients with brain lesions was examined by Hall, Hall, and Lavoie (1968) using the Rorschach Inkblot Test. Examination of seven Rorschach variables showed that patients who had lesions to the left hemisphere (with ideational but not language impairment) were conscious of their loss and said as much. They gave few responses, utilizing pure form determinants of the blots a great deal and these were frequently of poor quality. Their responses were described as limited, arid, and unimaginative and their approach to the task was correct, self-critical, undeviating, and unspontaneous (Hall, Hall, & Lavoie 1968). In contrast, patients with lesions to the

right hemisphere gave more responses, were uncritical of their productions, used many different determinants, and perceptually organized their responses. They were imaginative and expansive in their productions, and also used poor form quality. Undisciplined thinking was reflected in their lack of selective attention and their inappropriate combinations.

Thus, left hemispheric pathology led to a limited and constricted record with expressions of perplexity and lack of ability, and rejection of cards. Right hemispheric pathology corresponded with an expansive and uncritically innovative approach to the cards, and little perplexity or rejection. Hall et al. concluded that ideation requires an intact brain and suggested that in the normal brain the left hemisphere may serve an evaluative, critical function with the right being more innovative.

Emotional behavior has also been linked to side of brain lesion. Goldstein (1939) first noticed that left hemisphere damaged patients often exhibited a catastrophic reaction. Various other researchers have observed an indifference reaction in right hemisphere damaged persons (Hecaen 1962, pp. 215-52; Denny-Brown, Meyer, & Horenstein 1952; Dobrokhotova & Braghina 1974). Gainotti (1972) evaluated 80 right and 80 left lesioned patients with a neuropsychological exam and clinical ratings and found significant differences between the groups. Left lesioned

patients displayed a catastrophic reaction. They appeared anxious, were restless, hyperemotional, and exhibited vegetative signs. They were prone to burst suddenly into tears, with anxiety reactions, aggressiveness and irritability. They swore, displaced anxiety and anger onto extraneous events, and sharply refused to continue with the exam. Although they appeared depressed and desolate, they tended to boast (somewhat anxiously) of past performance as a means of compensating for present incapacity. Gainotti observed that these patients anticipated failure and emphasized their failures throughout the evaluation, then made excuses to justify them. In cases of left hemisphere damage, aphasic patients were noted to demonstrate a stronger catastrophic reaction than did non-aphasics.

In contrast, right lesioned patients in Gainotti's sample ignored, minimized, or denied their illness. They were indifferent towards failure, joked, appeared euphoric and ironical, and were either unconscious of their hemiplegia or attributed it to something minor. They tended to create stories implying activities beyond their current capacity and expressed delusions about affected body parts which were experienced as unattached or as belonging to someone else. Some, on the other hand, expressed hatred of the paralyzed limbs in a melodramatic or sarcastic manner.

Gainotti suggested on the basis of these findings that the left hemisphere processes sensory data through conceptual elaboration by means of language and that the right hemisphere processes data in a more primitive way which retains its immediateness and rich affective value. The left hemisphere was seen as important to intellectual functioning, and the right to emotional processes.

Personality variables as reflected in the MMPI have been found to differ between right and left lesioned patients (Dikmen & Reitan 1974; Black 1975). Black found that left hemisphere lesioned patients showed significant elevations on scales 8, 2, and 3, suggesting depression, anxiety, agitation, and confusion, while right lesioned patients produced a composite profile entirely within normal limits. This latter finding was contrary to expectation and possibly due to failure of the test instrument (a self-report scale) to tap the particular symptoms previously noted to occur in this group.

Lezak (Note 1) has explored the behavioral characteristics of right hemisphere damaged persons in the area of configurational processing. She found defects in organizing, inattention, illogicality, with impaired initiative, planning difficulty, and dependency. As a result of right hemisphere deficit, the left hemisphere apparently handled all data in its own fashion--linearly--whether appropriate or not to the type of data involved. Configurational

effects were not considered. Perceptual, cognitive, and emotional-social behavior were consequently adversely affected. Typically, these persons had flat affect, were emotionally insensitive, sometimes underwent sudden mood changes, and were "all talk and no do." They put details together in a logically absurd manner, did not filter out inappropriate responses, showed poor judgment and irrational thought. They could not put puzzles together, grasp jokes, understand social situations, or provide missing prepositions in sentences.

Psychological differences have also been noted between left and right temporal lobe epileptics. In an ambiguous problem-solving situation (Matching Familiar Figures Test) left temporal lobe epileptics were found to be more reflective and right temporal lobe epileptics more impulsive (McIntyre, Pritchard, & Lombroso 1976). The former were less able to label affective situations, while the latter were more like controls in this respect. Normals scored in the moderate range, which again suggests the equi-important roles of both hemispheres to normal brain function.

Nemec (1978) investigated the effect of verbal versus perceptual background interference as hemiplegics performed verbal and perceptual tasks. He found significant performance decrement in brain damaged subjects compared with normals. Further, the decrement was greater in left

hemiplegics for verbal interference on the verbal task and in right hemiplegics for perceptual interference on perceptual tasks, suggesting interference across modes. Galin (1974a) has noted that use of an inappropriate mode/cognitive style for a task may interfere with performance. Thus, using the analytic, left hemispheric mode for a drawing task results in correct production of elements but loss of the overall gestalt (elements are inappropriately related to each other), while using the holistic, right hemispheric mode for a reading or arithmetic computation task (where sequential processing is required) may result in deficient performance. Hence, in the Nemec study hemiplegics attempting to use their nondamaged hemisphere for a task more suited to the mode of functioning of the other half of the brain, were unsuccessful. The fact that performance was impaired on the task suited to the non-damaged hemisphere as well indicates the contribution normally made by each hemisphere to the other.

The Split-Brain Studies. Splitting the brain by severing the corpus callosum and other cerebral commisures effectively eliminates all communication between the two hemispheres. Myers and Sperry were two instrumental investigators in this area (Myers & Sperry 1953; Myers 1956; Myers & Sperry 1958; Sperry 1961a; Sperry 1961b; Myers 1965). Their technique came to be used with human epileptic patients. In an attempt to control unusually severe

convulsive disorders, by preventing the spread of seizures from a focus in one hemisphere to the other hemisphere, these connecting nerve bundles were severed. The cerebral commisurotomy cases proved to be an invaluable source of data on the specific functional characteristics of the two hemispheres, each of which was left independently conscious and able to carry out the cognitive processing for which it specialized. With testing and interviewing techniques adapted to the unique capabilities of each hemisphere, it is possible to directly tap these abilities and to identify the limitations and particular modes of operation characterizing each half of the brain. Special tests were developed that took advantage of the disconnected right hemisphere's inability to express itself verbally (Gazzaniga 1967; Hecaen 1962; Galin 1974a; Bogen 1969a; Bogen & Bogen 1969; Sperry 1961a; Ornstein 1973). Because sensory and motor nerves cross from one side of the body to the opposite side of the brain, and each half of the visual field is similarly represented contralaterally, split-brain patients can verbally describe, or answer questions about, objects held in their right (but not left) hands and about pictures tachistoscopically presented to their right (but not left) visual fields. When using only the right hemisphere under such conditions, Gazzaniga's patients demonstrated their understanding nonverbally, for example, by using the left hand (connected

to the right hemisphere) to pick out an object, or one meaningfully related to it, from others while blindfolded. Pictures presented to the right hemisphere elicit emotional responses (Galin 1974a). It has been noted that the separated hemispheres may attempt to assist each other in problem solving, the left offering verbal responses and the right spatial re-orientations, etc. (Galin 1974a; Sperry, Zaidel & Zaidel 1979). However, since they cannot communicate directly with each other, and each lacks the other's unique awareness, these well-intentioned but blind efforts may become poorly coordinated. For example, the left hemisphere, not knowing what the left hand is holding, may confabulate a response. Sperry et al. propose that sub-cortical communication to the left hemisphere of the right hemisphere's emotional reaction may assist the former in guessing at the solution, when information relative to the problem is known only by the right half of the brain.

Bogen (1969b), one of the primary investigators in the split-brain area, has provided a fascinating and provocative account of findings with commisurotomy patients. He dubs right hemispheric thinking "appositional" in contrast to the "propositional" thought of the left hemisphere, which approaches data in a logical and analytical fashion. The right hemisphere's intuitive, synthetic approach to data was found to be essential to certain

tasks, such as copying of geometric designs. Bogen's split-brain patients could not copy with the right hand because that hand was controlled by the left hemisphere. Cursive writing, however, requires left hemisphere input and split-brain patients could not write with the left hand because that hand was controlled by the right hemisphere (Bogen 1969a). Bogen and Bogen (1969) point out the advantage to human survival of having two independently operating hemispheres, each using a distinct mode of thought, since the probability of successful problem solving is thereby increased. The flexibility and creativity of the brain as a whole is enhanced, although, as Bogen notes, this arrangement also gives rise to instability and conflict when different solutions are simultaneously arrived at by the two halves. In the intact brain, the cerebral commisures provide interhemispheric communication, permitting integration of verbal and non-verbal thought. Clearly, effective functioning requires both modes of thought in union.

Galin (1974a, 1974b) has suggested that individuals with an intact brain might function as though the hemispheres were surgically disconnected if neuronal transmission across the corpus callosum were inhibited. Conditions leading to such a functional disconnection, he suggests, might include the simultaneous reception of conflicting verbal and non-verbal messages. Each hemisphere, processing the experience in its characteristic manner, focuses

on different aspects--such as words of affection versus rejecting facial expression. They are likely to arrive at different preferred responses to the situation, such as approach versus avoidance of the other person. The intensity of this conflict, he suggests, may result in each half of the brain tuning out information normally available from the other side. Similar results might follow from the special areas of competence of one hemisphere being poorly translated into the language of the other. The possibility of a functional disconnection of the hemispheres has drawn the attention of researchers to normal and psychopathologically disturbed persons as objects of study in terms of hemispheric specialization and cerebral dominance. The most developmentally advanced level of cognitive functioning integrates the two complementary right and left hemispheric styles. Creative thinking depends, Galin notes, on the development of both the rational-analytic and the intuitive-holistic modes, along with the ability to inhibit either mode in order to approach a task in the most appropriate fashion.

As noted earlier, the left hemisphere generally assumes control over overt behavior. The aspects of experience to which the right hemisphere is uniquely attuned may be preserved, however, and subtly influence perception of subsequent experiences (Galin 1974a). This theory is reminiscent of Freud's conscious and unconscious levels

of awareness. Dimond (1978) proposed a general consciousness circuit between the hemispheres which he believes might unify mental activity in normal individuals, having found total commisurotomy patients to have loss of awareness of one point of contact and some location error as well, when subjected to double simultaneous physical stimulation.

Studies Utilizing Intracarotid Sodium Amytal. Injection of Sodium Amytal into one of the carotid arteries temporarily anesthetizes the ipsilateral hemisphere, effecting a complete but reversible paralysis. The technique was initially used by Wada in 1949 in investigations of the spread of epileptic discharge between the hemispheres. It was later used to determine lateralization of speech dominance before brain surgery. When injected to the hemisphere dominant for language, speech became impaired. Wada and Rasmussen (1960) found that when the non-dominant hemisphere was injected patients remained able to count and to name objects correctly. Terzian (1964) examined the behavioral and EEG effects of this technique in studies of hemispheric specialization. He identified a variety of neurological symptoms which appeared independent of cerebral dominance: contralateral flaccid hemiplegia and facial paralysis, Babinski sign, sensory inattention of person and extrapersonal space on the affected side, contralateral hemianopia, contralateral anosognosia and

hemiasomatognosia, spiral patterning of blue, red, and violet seen by the ipsilateral eye, and slow sinusoidal and polyrhythmic EEG activity. Other symptoms were found to be dependent on hemispheric specialization. Injection of the dominant hemisphere resulted in language disturbances (both receptive and expressive aphasia) and in a characteristic depressive-catastrophic emotional reaction. Injection of the non-dominant hemisphere brought a euphoric-maniacal emotional reaction and no disturbance of language function. Thus, in the first instance, as the patient began to regain speech he expressed dispair, guilt, a sense of nothingness, of indignity, and worry over the future. In the latter case, he expressed no apprehension, smiled, laughed, and demonstrated liveliness and a sense of well being.

EEG Studies. Electroencephalography has been used to explore the relationship between brain activity and various aspects of consciousness (Liske, Hughes, & Stowe 1967). To determine whether there is selective activation/suppression of the hemispheres, Ornstein and Galin (1974) looked at EEGs of either hemisphere while normal subjects worked at verbal and spatial cognitive tasks. Alpha activity (indicative of reduced brain processing) was found to be much greater over the right hemisphere than over the left during writing (presumably a left hemisphere

task). This pattern reversed for the spatial task (arrangement of blocks to match a design). Liske et al. tested groups of lawyers and artists (sculptors and ceramicists) for preferential use of the verbal-analytic left hemispheric mode versus the spatial-holistic right hemispheric mode across tasks. Lawyers were expected to rely more on the left and artists more on the right hemisphere, regardless of task. Left versus right involvement in verbal versus spatial processing was again demonstrated, but the expected difference between vocational groups was not found. On closer examination, however, the extent of EEG alpha change within each hemisphere with the task did distinguish the groups. The lawyers showed greater left hemisphere change with the task than did the artists. Both groups showed smaller, comparable changes in right hemisphere alpha with the task. This suggests greater differentiation of function on the part of the lawyers compared with the artists, in that the former showed greater flexibility and were more able to inhibit or enhance processing of the left hemisphere. Bennett and Trinder (1977), in a study designed to determine the nature of cognitive processing during meditation also found the percentage of alpha to be significantly different over the two hemispheres for spatial and analytical tasks. While alpha activity was equally distributed over the two hemispheres for both meditation and relaxation subjects, the meditators

showed greater asymmetry on both analytical and spatial tasks than did controls. That is, although meditators demonstrated more left hemispheric activity for analytical tasks and more right hemispheric activity for spatial tasks, the meditators as a group did not evidence the expected predominance of right hemisphere alpha.

Bakan (Note 2) has integrated findings on dreaming, REM sleep, and the right hemisphere. He notes that EEG recordings taken during sleep show increased right hemisphere activity during the REM stage when dreaming occurs. REM sleep is accompanied by, among other things, low voltage fast EEG, increased autonomic activity, and vivid imagery, a right hemisphere function. Injury to the posterior part of the brain and commisurotomy have both been reported to result in loss of visual memory, imagery, and dreams (Humphrey & Zangwill 1951). Bakan notes that commisurotomy patients deny dreaming. Because their dreams are not transmitted across the corpus callosum to the left hemisphere, they are not available for translation into words. In awake subjects, Bakan notes, greater left hemisphere activity is apparent in the EEG record, congruent with our conscious awareness of thought as rational, propositional, and linguistic. Non-REM sleep is accompanied by a slow wave EEG and some thought, on the order of left hemispheric functioning. Bakan also observes that REM type mentation, with its dream-like

quality, may spill over into non-REM thought-like mentation. He suggests that schizophrenia likely involves such a malfunctioning, with right hemispheric spillover into waking thought and consequent disruptive effects on behavior. For schizophrenics, REM periods may not be discrete as in normals. Instead, both hemispheres may run simultaneously (that is, neither being inhibited to permit predominance by the other). It has been noted that deprivation of REM sleep in normal persons results in more movement responses on the Rorschach (Bakan Note 2). This suggests a connection between right hemisphere functioning, REM sleep, and imagery (particularly body imagery, such as kinesthetic movement and fantasy as occur in dreams). Bakan concludes that a common primitive quality characterizes dreaming, REM sleep, and right hemisphere functioning.

Cognitive Perceptual Studies. Cognitive/perceptual research has utilized dichotic listening and tachistoscopic techniques, as well as field dependence measures, to explore laterality within the auditory and visual systems (Kimura 1966, 1973, 1967; White 1969; Fontenot & Benton 1972; Del & Fontenot 1973; Birkett 1978). The relation of attentional processes to cognitive/perceptual performance appears to be of major significance and has been investigated during both normal mental functioning and during

mystical experiences (Bennett & Trinder 1977; Deikman 1976). Sex differences have been noted in cognitive/perceptual performance and in studies exploring laterality (Knox & Kimura 1970; Tucker 1975; Buffery & Gray 1972; Kimura 1967; Ray, Morell, Frediani, & Tucker 1976). The differences between left and right modes of thought described in cognitive/perceptual terms have clear implications for personality functioning (Ornstein 1973; Galin 1974b; Abdullah & Schucman 1976). The next section will focus expressly on this area, following a brief review of cognitive/perceptual research findings presented below.

Broadbent's dichotic listening task has been used since the early 1960s to study functional asymmetry of the cerebral hemispheres, particularly of the temporal lobes (Broadbent 1954). This task involves the simultaneous presentation of different digits to left and right sides of the brain through earphones. The subject hears several sets of numbers, then reports all numbers heard. Each ear has a stronger neural connection to the contralateral side of the brain than it does to the ipsilateral side. Findings with brain damaged subjects show that left, but not right, temporal lobe damage impairs overall performance on this task and also impairs assimilation of verbal auditory material (Meyer & Yates 1955; Milner 1958). Kimura (1973) found that more digits were reported correctly when presented to the right ear (left hemisphere) in both

patients and normal subjects. Her normal subjects also more accurately identified melodies presented to the left ear than to the right, reflecting the right brain's specialization for music perception. This held for various other non-speech sounds as well, including coughing, laughing, and crying. The superiority of the right ear (left hemisphere) for digits has been found in 4 and 5 year old children, with girls showing a significant right ear effect and boys a trend in that direction (Kimura 1967). This suggests that, developmentally, sex differences are evident early on, and that language functions are becoming fixed in the left hemisphere quite early in life. The question arises whether personality characteristics associated with the separate hemispheres are becoming fixed on a neurological level as well. Kimura points out that brain organization remains flexible in children for some time, with each hemisphere capable of taking over functions of the other side should a loss occur. Perhaps the behavioral malleability of young children is also attributable to this neurological flexibility.

Kimura's extensive use of the tachistoscope to explore functional asymmetry of the visual system in normal subjects led her to conclude that the left hemisphere is superior in identification of verbal-conceptual forms such as letters, words, familiar figures (right visual field effect), while the right hemisphere is superior in

enumeration of non-verbal stimuli and where shape perception is not required (left visual field effect). She found the right hemisphere to be better than the left at localizing a single point in two and three dimensional space and at identifying slope (Kimura 1973).

Horan, Ashton, and Minto (1980) used electroconvulsive shock, unilaterally and bilaterally, to disrupt functioning in either one or both hemispheres, after which patients were asked to take the Knox Cube Imitation Test. The improvement in performance of patients administered right unilateral shock was interpreted by the authors as indicative of the left hemisphere's specialization for processing of sequential time-dependent information (reduced interference from the right hemisphere resulted in better performance). Laterality has been explored in relation to attention and field dependence-independence, providing some evidence that the right hemisphere is involved in the disembedding process, as well as further support for localization of verbal functions in the left hemisphere and configurational functions, including the perception of faces, in the right (Kinsbourne 1970; Pizzamiglio & Zoccolotti Note 3; Oltman, Ehrlichman, & Cox 1977; Zoccolotti & Oltman 1978; Oltman, Semple, & Goldstein 1978). Deikman (1976), looking at the mystical experience in terms of bimodal consciousness, distinguishes the receptive mode of awareness where attention is "reinvested" in perception,

from the ordinary active mode of consciousness which is geared towards manipulation of the environment in daily life. Whereas the active mode is characterized by an acute awareness of time and problem solving, the receptive mode, characteristic of the mystical experience, with its slower EEG activity, diffuse rather than focal attention, paralogical thought, and passive sensory receptiveness lacks regard for time, sequence, or boundaries. These two modes described by Deikman correspond well with the nature of the dominant and non-dominant hemispheres suggested by the research described above.

Studies on Handedness and Hemispheric Specialization. Handedness, one physical sign of lateral dominance evident behaviorally for centuries, became linked to cerebral dominance when the neurological structure of the brain was discovered to underly laterality preferences (Geschwind 1975). While not perfectly related to lateralization of speech, handedness does tend to be right dominant in persons with language functions located in the left hemisphere (Milner, Branch, & Rasmussen 1964, pp. 200-14; Ornstein 1973; Bogen 1969b; Benton 1962). Kimura (1973) notes that when speaking, gesturing is more frequently done with the right hand, and that persons suffering left sided stroke have difficulty making certain hand movements, which also supports a relationship between handedness and

lateralization for speech. Geschwind (1975) indicates that language functions appear to be lateralized to the left in about 96% of right-handed and 70% of left-handed persons. A lack of cerebral dominance is more common in the left-handed, who are more likely to show reverse asymmetry of functions; that is, to have language lateralized to the right (Galaburda, LeMay, Kemper, & Geschwind 1978). Galaburda et al. suggest also that these asymmetries may be differently distributed between the sexes.

An interesting finding by Levy and Reid (1978) regarding handedness and laterality indicates that hand posture in writing, whether left- or right-handed, reflects verbal organization. Right- and left-handers who used normal hand posture were found to have contralateral language and ipsilateral spatial function with strong differentiation. The reverse organization was found with inverted (hooked) hand posture. Additionally, these researchers found females in all groups to be less differentiated compared to males. In 70 of 73 subjects used in that study, laterality was accurately predicted by hand posture. Marshall (1973) noted some of the difficulties with current accounts of hemispheric specialization in normals. He observed that the Levy-Sperry view holds that left-handed normals have bilateral language representation and that the right hemispheric component interferes with visuo-spatial processing. Right-handed normals are seen as purely specialized and as

doing better on non-verbal IQ tests and visuo-spatial tasks. Marshall points out the incompatibility of this view with that of Buffery-Grey which holds that males are more bilateral and females more separated in linguistic (left hemispheric) and visuo-spatial (right hemispheric) representation, with bilateral distribution being considered the more efficient. Marshall concluded that research findings at the time were equivocal and not sufficient to support either hypothesis. He stressed the need for greater understanding of the psychological structure of linguistic and visuo-spatial tasks, before differences in brain organization between these various groups can be adequately evaluated.

Society has historically favored the right-handed. Left-handers have not only had to adapt to a world geared towards right-handedness, but also have sometimes been forced to suppress their innate lateral preference and adopt right-handedness themselves. This practice caused some to question the possible effects on personality of such coercion. Degree and direction of lateralization were examined and found to play an important role. Kovac and Brezina (1973) tested school children aged 10-15 and found neuroticism to be highest in both those strongly left-handed and also in those without a strong right hand preference. They concluded that emotional stability presupposes optimal lateral preference relations. Palmer (1963)

addressed the issue of differentiation rather than left-handedness per se. Pointing out that at birth the hemispheres are essentially equipotential, he related the degree of laterality which develops to motor maturity, with the more strongly lateralized adult seen as more motorically differentiated (mature) than the ambilateral or ambidextrous individual. In a study utilizing predominantly right-handed college students, Palmer found those more lateralized, or differentiated, to show greater ego strength, less maladjustment or awkwardness, than those less strongly lateralized whom he described as more poorly integrated both psychologically and motorically. Young and Knapp (1966) administered Cattel's High School Personality Questionnaire to left-handed Italian children and found a marked trend towards neuroticism. Their subjects tended to be demanding, impatient, subjective, dependent, and hypochondriacal. Considerable public disgrace was associated with left-handedness in Italy; Young and Knapp concluded that the forced conversion likely contributed to a higher degree of sensitivity and self-centeredness in these individuals. Horkovic (1973) discusses the relationship of laterality to psychopathology and points out the large number of left-handers, re-oriented left- to right-handers, and those lacking a pronounced lateral preference among psychopathological groups. He describes a group of schizophrenics which revealed considerable disorder of

hemispheric integration, lack of pronounced laterality and crossed preference. Seeing the personality as the highest integrating activity of the entire organism, Horkovic emphasizes the importance of lateral preference to harmonic personality development.

Studies on Hemispheric Specialization and Personality. The concept of personality subsumes a wide range of functions including those touched upon in the preceding sections. The dominance of one cerebral hemisphere over the other, given their most unlike characteristics, leads one to expect certain corresponding distinctions amongst individuals' personalities. A left and a right hemispheric personality type can be composed from the research evidence at hand (Abdullah & Schucman 1976; Galin 1974b; Bakan 1975, 1971).

The left or dominant hemisphere (in right-handed persons) profile is most aptly termed analytic and reflects a preponderance of characteristics considered typical of the left hemisphere, such as use of logic or rational thought as commonly recognized in language and arithmetic, the sequential and temporal processing of data, and linear integration. The data dealt with is structured in nature and is operated upon through sequencing, serializing, differentiating, and the relating of one individual bit of data to the next. The dominant hemisphere also having priority over the non-dominant hemisphere in the use of

motor and sympathetic nervous system, and hence tending to dominate overt behavior, the left hemispheric type of individual would be oriented towards action, fight and flight readiness, and manipulation of the environment in the interest of survival (Bakan 1971; Galin 1974a; Abdullah & Schucman 1976; Bakan Note 2).

Not surprisingly, the left hemisphere has been hypothesized to be involved in the experience of anxiety (Tucker, Antes, Stenslie, & Barnhardt 1978). Left hemispheric functioning seems to most closely approximate what we generally think of as the intellect. It is interesting, in light of its analytic nature, that on a physiological level left hemisphere functions are focally organized. That is, specific functions are located in specific cortical areas so that damage to an area results in loss of a certain ability (Semmes 1968). This is consistent with the fragmented, bits-and-pieces mode of operation in which data is digitized and then processed by rules of relationship (i.e., grammar or logic). Transformation of experience into symbolic form (as through arithmetic or language) preserves the data, allowing repetition and communication to others. A major cognitive operation conspicuous by its absence from left hemispheric function, however, is the ability to organize a well-integrated whole from discrete elements. The product of left hemispheric thought, while rational and logical, is also unimaginative

(Ornstein 1973; Galin 1974a; Abdullah & Schucman 1976). Left hemisphere dominant persons have been hypothesized to be very controlled, critical, and negative, in line with the above cognitive characteristics (Smokler & Shevrin 1979; Tucker 1981).

In contrast, the right hemisphere profile is one of synthetic function, with simultaneous processing of disparate stimuli and their uncritical integration into gestalts. Data bits are processed simultaneously, in a parallel, non-linear manner without reference to the separate elements, and integrated in a holistic fashion. The concept of a whole is readily grasped from the immediate integration of separate parts, rather than being gradually built up bit by bit in the manner of the left hemisphere. This gestalt-like mode of operation is implicated in spatial orientation, recognition of faces, music, imagery, and creativity. Consequently, right hemisphere dominant persons are hypothesized to be intuitive, inspired, artistic, as opposed to logical and analytic (Ornstein 1973; Galin 1974a; Abdullah & Schucman 1976). Abdullah and Schucman note that this hemisphere exerts little control over the muscles and sympathetic nervous system, depending on input from the dominant hemisphere to initiate and execute drives, and that low levels of arousal and parasympathetic nervous system functioning predominate, as this hemisphere is not geared to a struggle for

survival. Right hemispheric consciousness tends to be receptive, non-verbal, diffuse and spatial, with body awareness and sensitivity to somatic and visceral symptoms, as well as to body movement, facial expression, gestures, and voice tone (Kimura 1967; Galin 1974a). Right hemispheric functioning approximates what we think of as the unconscious mind, with its primary process style of expression. Multiple simultaneous interactions amongst stimuli occur, as is often experienced in dreams. Again, interestingly, on a physiological level right hemispheric functions are diffusely represented in the cortex, with a variety of functions occurring in any one area (Semmes 1968). Thus, damage to a given area results in global decrement in functioning rather than in the loss of specific functions.

Some interesting research findings regarding laterality and personality include evidence that male students who prefer sitting on the right side in classrooms report more psychopathology than males who sit on the left side, as measured by a seating preference questionnaire and a Manifest Symptom Questionnaire (Gur, Sackheim, & Gur 1976). Sex differences were evident in the Gur et al. study, with females who preferred the left side of the classroom indicating more pathological symptomatology than those choosing the right side. Gur et al. call attention to various research findings in this field which suggest that left-lookers (right hemispheric types) are more

emotional, more susceptible to hypnosis, prone to somatasize and they relate these characteristics to their students who choose to sit on the right side of the classroom. In contrast, they characterize right-looking students, choosing to sit on the left side of the room, as left hemispheric types, prone to externalize conflict, concluding that hemisphericity and self-reported psychopathology appear related.

Lateral asymmetry has, indeed, been found to differ between certain psychiatric groups (Gruzelier & Venables 1974). These investigators measured skin conductance in schizophrenics, depressives, and personality disordered patients. They found bilateral skin conductance greater in the schizophrenics and personality disordered patients than in normal subjects. The former groups had lability of direction and increased arousal which produced increased skin conductance in the right hand. Depressives, in contrast, did not demonstrate lability in direction and had a higher level of conductance in the left hand. Boklage (1977) looked at brain asymmetry in monozygotic twins discordant for schizophrenia. He notes that monozygotic twins are much more prone to neurological and other disorders than are dizygotic twins or siblings and that in the past schizophrenics have been shown to have autonomic lability including poor habitation, excessive generalization and no GSR on the dominant side, while psychotic

depressives have shown the opposite tendencies. Boklage identifies the left hemisphere as the primary focus of schizophrenic brain dysfunction and relates prognosis to the degree of functional flexibility in the brain. Gur (1978) suggests that the schizophrenic deficit is in initial visual processing of information within the left hemisphere rather than the right, so that these individuals are activating a hemisphere which is dysfunctional for the task. She notes that the left hemisphere seems to analyze visual-verbal information more accurately when it is initially processed in the right hemisphere, and then is acted on by the left. Gur assessed direction of lateral eye movement with verbal-emotional, verbal non-emotional, spatial-emotional, and spatial non-emotional questions and found schizophrenics to show more rightward lateral eye movements over all categories of questions than did controls. Compared with normal subjects, the male schizophrenics showed a pattern similar to normal females, with proportion of righward movements decreasing across the above four categories of questions. Likewise, female schizophrenics approximated the pattern of normal males, with non-emotional questions (both verbal and spatial) eliciting a larger proportion of rightward movements than did emotional questions (both verbal and spatial). Gur suggests that left hemisphere overactivation may be involved in this pathological group. She proposes that in

terms of therapy the schizophrenic needs help both in correcting the left hemisphere dysfunction (thought disorder) as well as in learning to make the shift to right hemisphere processing. In another pathological group, patients evidencing psychosomatic symptomatology, Galin, Dimond, and Braff (1977) found that somatic symptoms predominated on the left side of the body, implicating right hemisphere involvement. Unconscious thought processes believed to give rise to such symptoms were hypothesized to be mediated by the right hemisphere, independently of the left, and expressed in somatic form on the contralateral side of the body. In a study utilizing suggestion, psychiatric patients and nurses both reported a preponderance of left sided responses (sensation in the hand) as well as providing a history of more left than right sided previous psychogenic symptoms (Fleminger, McClure, & Dalton 1980).

In the area of cerebral specialization and dominance as it relates specifically to emotion, we find depression and anxiety have been of primary interest to researchers. An analysis of EEG amplitude in left hemisphere dominant psychotic depressives showed greater left than right hemisphere involvement, in proportion to the degree of depression (d'Elia & Perris 1973, 1974). These patients showed a low amplitude in the left hemisphere prior to electroconvulsive shock, which after treatment increased to the level of that found in the non-dominant hemisphere.

Metzig, Rosenberg, Ast, and Krashen (1976) found bipolar and unipolar depressives distinguishable on the basis of lateral asymmetry, with the former showing a pure dominance for hand preference and thumb rotation while the latter were found to be cross-dominant. Kovac (1972) found that, particularly for females, normal subjects with non-optimal lateral preference scored highest on anxiety and neuroticism. They tended to be more uncertain and to have lower intelligence scores than subjects with stronger and more stable lateral preferences.

Using special contact lenses, Dimond, Farrington, and Johnson (1976) presented three films to the left and right hemispheres of normal subjects who rated them for emotional effect. When presented to the right hemisphere the films were perceived as significantly more unpleasant and "horrific." The left hemisphere dominated the right, however, suppressing its emotional focus. It has also been shown that males and females differ in hemispheric functioning, demonstrating use of different cognitive modes during emotional arousal (Davidson & Schwartz 1976). These researchers compared cerebral asymmetry during self-control of heart rate (using biofeedback) with changes observed during production of affective imagery. They suggest that males have more bilateral improvement and females more right hemispheric activation.

Tucker (1981) has noted an apparent connection between lateralization in arousal systems and affective state, with the separate hemispheres likely being specialized not only for type of emotion but also for emotional valence (positive or negative). He proposes that not only does cognition prompt affective response, but affective arousal may increase or decrease cognitive activity, so that a complex interdependent relationship exists between emotion and cognition, which is not solely dependent on the underlying neurological structures involved.

The Conjugate Lateral Eye Movement Phenomenon

Teitelbaum (1954) had observed the occurrence of horizontal eye movements in therapy patients and others. He noted them to occur during periods of mental concentration and during the course of speech and found the pattern of movement fairly stable within individuals. He had suggested that EEG recordings should help to clarify the eye movement phenomenon, since mental activity disrupts alpha rhythm (which occurs during the resting state).

The phenomenon of lateral eye movement which eventually came to be used as an index of hemispheric activation, was first reported by Day (1964) who observed the tendency of individuals to make a quick lateral eye movement before answering a reflective question. He found the direction of movement to be quite consistent within

subjects and to differ between subjects. When questioned in a face-to-face situation he noted the person's typical eye movement would be in a given direction and when not faced by the questioner, would be in the opposite direction. EEG and EOG records did, indeed, indicate differential hemispheric activity during the respective directional shifts. Based on his clinical observations, Day related directionality to differences in the subjective experience of anxiety, to language styles and cognitive styles. Day incorporated this phenomenon into a therapeutic approach geared at achieving anxiety reduction through teaching attention shift techniques. He observed that during an anxiety condition the eye movement phenomenon was reduced or even eliminated as the individual shifted attention from others to self. Reversing this behavior brought not only greater eye movement but also relief from anxiety. Day's observations of hospital patients (V.A.) suggested left-lookers to be more passive, subjective, and internally focused than right-lookers (Day 1964, 1967a, 1967b, 1968).

Duke (1968) published the first research article on lateral eye movements. He recorded direction of lateral eye movements in response to reflective and factual questions in college students and found this to be consistent within individuals. Males were more consistent than females, but no direction was generally preferred. Eye

dominance was not related to direction of eye movement, to sex of subject, or to consistency of direction. This study failed to address several important issues later found to play an important role in relation to the lateral eye movement phenomenon: the nature of the questions used (in terms of cognitive functions tapped or emotions aroused), rapport with, and location of, the experimenter (Erlichman & Weinberger 1978). Bakan and Strayer (1973) found support for the consistency of conjugate lateral eye movements as an individual characteristic in high test-retest reliabilities over a 3-day testing period. Subjects were asked to interpret proverbs and direction of eye movement on first beginning to reflect was noted. Bakan (1969, 1971) also reported subjects were less likely to look in their preferred direction if the examiner were situated there, and so utilized an arrangement where the subject sat directly across a table from the examiner. Bakan proposed that the tendency for eye movement to be directional related to contralateral hemispheric activation, and that a directional preference reflected the relative importance to the individual of that particular hemisphere in their total psychological functioning. Bakan and Svorad (1969) recorded EEGs to determine whether more alpha activity occurred in left-lookers. This was suggested by Day's previous research showing left-lookers to be more prone to focus attention on

internal subjective experiences, while right-lookers tended to focus on the external, and by Bakan's own findings that left-lookers tend to be more easily hypnotized (a state in which alpha activity increases). Their findings confirmed the hypothesis, with more alpha activity found in left-lookers.

Kinsbourne (1972) found that right-handed subjects looked to the right when solving verbal problems, looked to the left when solving spatial problems, and showed no directional preference when addressing numerical problems. This suggests that for right-handers language is located in the left hemisphere, spatial functions in the right, and numerical on both sides. Left-handers in this study demonstrated equal left and right dominance for verbal, spatial, and numerical tasks, suggesting that the same hemisphere may process verbal and spatial material in these subjects, with one or the other hemisphere in control at a given time. Right-handers appeared to have more simultaneous activation of the hemispheres. Kinsbourne noted that different subjects could use different strategies with the same problem and consequently show different gaze patterns. Gur (1975) and Gur, Gur, and Harris (1975) also found right-handers to look predominantly to the left for spatial questions and to the right for verbal questions, showing lateral eye movements to be a function of question type. However, while this pattern obtained

with the examiner situated behind the subject, it did not occur in the face-to-face situation where, regardless of question type, their subjects showed a predominant left or right direction of eye movement. This interesting finding suggests that although the cerebral hemispheres may be specialized for problem type (e.g., verbal or spatial), there also is a preference within the individual to activate a specific hemisphere and thus to utilize the specific approach to problem solving. Meskin and Singer (1974) manipulated the position of a painting on the wall behind the examiner to rule out influence of external stimuli on direction of eye movement, and found no significant effects.

The matter of question/task type has been addressed by numerous researchers (Ehrlichman, Weiner, & Baker 1974; Kocel, Galin, Ornstein, & Merrin 1972; Weiten & Etaugh 1973, 1974a, 1974b; Crouch 1976). Horizontal gaze shifts, despite some equivocal findings, is generally found in right-handed subjects to be rightward for verbal, mathematical, and factual questions, and leftward for spatial and musical questions and tasks involving facial cues. Questions have been raised as to the meaning of vertical shifts in gaze and stares, which have not been adequately addressed (Ehrlichman & Weinberger 1978; Ehrlichman, Weiner, & Baker 1974; Galin & Ornstein 1974). Schwartz, Davidson, & Maer (1975) explored the effects of emotional

overtones to questions used with normal right-handers and found spatial-emotional questions elicted significantly more leftward than rightward movements. In terms of frequency of directional responses, spatial-non-emotional and verbal-emotional questions fell in between the above two categories. Ehrlichman et al. concluded that affective processes are separable from cognitive processes in complex tasks, in terms of hemispheric functioning.

Findings regarding sex differences relative to question type have not been consistent. Etaugh and Rose (1973) found no sex differences, but Weiten and Etaugh (1974a) found males produced more rightward eye movements than did females in all categories of questions used (verbal, numerical, spatial, and musical).

Some of the inconsistencies in findings regarding the lateral eye movement phenomenon could be a result of measurement error (Templer, Goldstein, & Penich 1972). It is at times difficult to catch and determine the direction of the initial eye movement due to its quick and brief nature.

Lateral eye movement as it relates to cognition and perception touches on cognitive style, creativity, and academic aptitude. Bakan (1971) provides an excellent characterization of the right- and left-looker based on data discussed in the literature, which is consistent with the profiles described in the preceding sections.

He characterizes the left hemispheric type as verbal, analytic, given to abstract, rational, and propositional thought (using words in relation to things), attentive to temporal sequence, prone to digitize, objective, active, tense, euphoric, having increased sympathetic nervous system arousal. These persons appear to function at a higher level of arousal, in general. In contrast, the left-looker, or right hemispheric type, Bakan characterizes as pre-verbal, synthetic, concrete, emotional, spatial, analogical, subjective, passive, relaxed, depressed, with greater para-sympathetic nervous system arousal, and appositional (in that uncodeable stimuli rather than words are used). These persons have a facility for dealing with imagery, melodies, faces, drawing, and are creative. Bakan identifies the highest level of functioning as the hemispheric integration of cognition and emotion and suggests that males may be less integrated than females, given their clearer differences in directional eye movements. Females he found to show more bi-directional eye movements and less consistency in alpha activity.

Galin and Ornstein (1974) investigated differences in cognitive style in lawyers (expected to be more verbal) and ceramicists (expected to be more spatial) and found differences for both question type and for vocation, as expected. Among a sample of mathematicians, those who were left-lookers used more imagery, were more artistically

diverse and rated as more creative than those who were right-lookers, pointing again to right hemisphere involvement in creativity (Harnad 1972).

Evidence regarding relationship of lateralization to intelligence level as measured by the eye movement phenomenon is inconsistent. Weiten and Etaugh (1974c) found that individuals more consistent in direction of eye movement in response to reflective questions scored significantly higher on the Scholastic Aptitude Test than did inconsistent responders. This finding was, however, not supported when interpretation of proverbs was utilized as the task (Bakan 1975).

Lateral eye movements have been explored in relation to various personality characteristics. Left-lookers were found more reactive to persuasion than right-lookers, although greater variability was evident amongst the former, suggesting they are more volatile and less predictable (Sherrod 1972). Left-looking college students were found to be less affected by feelings, more assertive, shrewd and suspicious (Etaugh 1972). These findings are inconsistent with other studies which tend to show these sorts of traits in right-lookers (Day 1968, 1970). Several possible explanations for these results are offered by Etaugh and include unreliable eye movement measurement, differences in the populations sampled, invalid initial clinical observations by Day, and inaccurate self-report by subjects

in response to the 16PFT which was used to assess personality traits in Etaugh's study. Left-lookers were found by Ashton and Dwyer (1975) to score higher on a leftist (humanistic) index and right-lookers higher on a rightist index. The differences were not significant, but the trends found are consistent with expectations based on available evidence about laterality and the researchers attributed their findings to underlying dichotomies of ideology/personality. Shevrin, Smokler, and Wolf (1979; Note 4) looked at lateral eye movements in relation to the perceptual trait of field dependence, personality style, and defensive style. Their results did not support previous findings of Smokler and Shevrin (1979) which had suggested hysterics to be left-lookers and obsessive-compulsive personality types to be right-lookers. Nor did they find field independence to be a left hemispheric function. Men were found more field independent than women on the Rod and Frame Task and the Embedded Figures Test, but neither result correlated with direction of lateral eye movement. Smokler and Shevrin suggest that differentiation rather than being a basic principle may simply involve different patterns of integration of many skills in different people such that both hysteric and obsessive-compulsive, left hemisphere and right hemisphere types, might appear differentiated as measured by these particular tests.

Gur and Gur (1975) looked at right-handed males and found right-lookers used significantly more projection as a defense than did left-lookers, who used significantly more repression and denial and showed more psychosomatic symptoms. Gur (1978) found schizophrenics to show a right hemisphere superiority on both verbal and spatial tasks indicating left hemisphere dysfunction at the same time as they showed more rightward eye movements (regardless of question type), indicating left hemisphere overactivation, as well.

Gur also looked at depressed, right-handed males and found a higher proportion of leftward eye movements, regardless of question type (Gur, Note 5). This finding nicely complements Gur's previous findings regarding schizophrenics, discussed above.

Anxiety appears to play an important role in relation to how individuals allocate their attention, as had been suggested by Day (1964, 1967a, 1967b, 1968). He described left movers' experience of anxiety as having an internal locus with associated tension, arousal and loss of impulse control. Right movers' experience of anxiety he described as external in locus and experienced as "diffuse." The break in visual fixation appeared to Day to represent a shift in attention from a passive, listening mode to an active, expressive mode. He observed that in normals asked embarrassing questions (presumably made anxious)

the phenomenon was absent and that in neuropsychiatric patients it often was not apparent, or sometimes was increased in velocity but decreased in extent. Bakan and Shotland (1969) also found right movers to be more visually attentive in that they read words significantly faster and performed significantly better on a color-word naming task than did left movers whom they felt attended to color before attending to the verbal cue. Susceptibility to hypnosis, which involves reflection and inward direction of attention, has been related to a predominance of leftward eye movement implicating right brain activity (Bakan 1969). Clearer imagery and poorer math performance also typified these individuals. When hypnotic induction techniques were geared to the specific characteristics of the two hemispheres, calling for focusing of attention on either internal or external cues as appropriate, no significant effect was found for either direction of eye movement or for induction method, but there was a significant interaction effect in that left-lookers responded better to the left induction style and right-lookers to the right induction style (Gur & Reyher 1973). Tucker, Antes, Stenslie, and Barnhardt (1978) found high anxiety to disrupt left hemisphere functioning to a significant degree, while not affecting right hemisphere functioning. They found no significant correlation between state anxiety and eye movement, however. Kinsbourne (1974)

holds that lateral eye movements reflect cognitive processing except when the individual is under stress, for then anxiety brings out the person's characteristic gaze direction. Tucker, Roth, Arneson, and Buckingham (1977) found an increase in leftward eye movement under a stress condition over a neutral condition, suggesting greater right hemisphere activity when emotionally aroused.

As is evident from the various findings presented above, there is considerable inconsistency and divergent interpretation of research findings in this area. However, many of the perceptual, cognitive, and personality variables which have drawn attention as a result of these investigations are variables which the Rorschach Inkblot Test is hypothesized to reflect. Ryan, Boersma, and Mills (1971) found that inhibited subjects (as determined by MMPI scores reflecting neurotic overcontrol) spent significantly more total time looking at colored areas of the inkblots and looked significantly more frequently at them, than did impulsive subjects (as determined by MMPI scores reflecting hypomania). Impulsive subjects, however, reported color more often than did inhibited subjects. Smokler and Shevrin (1979) used the Rorschach and WAIS to find hysterical and obsessive-compulsive type subjects, then measured lateral eye movement and found the former looked leftward more and the latter looked rightward more, with no sex differences noted. This finding is consistent

with the majority of the research and suggests that the Rorschach may be just the sort of psychometric instrument which might prove useful in a comprehensive assessment of cognitive, perceptual, and personality features of the individual and how these are integrated into a total pattern. The obsessive-compulsive and hysteric styles appear especially suitable in that of the many styles of personality, these two seem the most diametrically opposed as well as differentiable by a variety of measures or techniques as demonstrated by the foregoing survey of related research. A brief characterization of these two interesting personality styles follows.

Personality Styles

In this section, the obsessive-compulsive and the hysteric personality types will be presented as the individuals O.C. and H. For readability, both O.C. and H. will be referred to as masculine, although it is pointed out to the reader that both personality styles are found in males and females. Given that hysterical types are, in fact, more frequently identifiable among females than males, this arbitrary denotation of both types as male does not constitute sexist bias and should be considered a technical convenience.

The Obsessive-Compulsive Personality

An excellent sketch of the obsessive-compulsive, O.C., style is offered by Shapiro (1965) and is summarized here in terms of typical thinking and behavior patterns and reality perception. This individual's prime characteristic is rigidity. In thought this is expressed in a dogmatic, opinionated stance. O.C. concentrates to the extreme on detail, with a sharp, penetrating attention that yields him inattentive to, and hence uninfluencible by, the larger picture. He misses peripheral cues due to this lack of a passive, impressionistic perceptual receptiveness. O.C. sticks to the facts and so misses the flavor or tone of situations. To let the mind wander and entertain a hunch is much too distracting for O.C. The constant maintenance of this sort of focal attentiveness requires considerable energy, which is experienced in the form of tension.

O.C.'s behavior reflects this high tension level. He is "driven," engaged in intense, continuous, and concentrated activity where a sense of deliberateness and effort is always evident, whether the activity be work or play. O.C. tends to think in terms of "should" and feels pressed by what he perceives as externally imposed necessity--often requirements actually set by himself. A stern self-control is applied to wants and feelings as well as to behavior, and impulses or wishes are perceived as inimical. O.C. "plays roles" in every area of life

and carefully follows the directives he ascribes to those roles. Thus, he lacks spontaneity and playfulness and concerns himself with quasi-moral principles, duties, and requirements with which he feels dutybound to comply. In terms of a superego, O.C. might be said to lack a real superego and to possess a harsh one. An uncomfortable, seemingly alien pressure provides him external directive, separate from his own wishes, needs, and demands, which he actually finds reassuring. O.C. is not comfortable with freedom, but needs to have some authority from whom to take direction, whether this be external or created within his own mind. Due to these contingencies, O.C. has a shrunken psychological life, he is dry, mechanical, and characterized by restricted affect and a sort of dull heaviness in personality. He wants to control affect and impulse and, while this may not be directly possible, his tense, deliberate, work-oriented attitude indirectly and automatically restricts affective experience. When O.C.'s rigidity is disturbed in some way, he feels a loss of control and begins to fear "going crazy." Laughing can stimulate this sequence since it represents a loss of volitional tension. Hence, it becomes impossible for O.C. to relax and simply enjoy anything--he needs a goal or purpose in everything he does--he needs to make even pleasure an effortful, "work" experience.

An interesting characteristic of O.C. is his avoidance of decision making or agreeing/disagreeing. Behind this lies his inability to recognize his own wants and freedom of choice, as well as his need to maintain balance. It is not necessarily a matter of ambivalence, but rather, O.C. "stews" over relevant facts and possibilities, invokes rules to help him reach the "right" solution. The solution he seeks is a technical one, not one based on his own preference. In the end the decision is made abruptly and then treated as an unmodifiable new directive by which to live.

The extent of O.C.'s worry, doubt, and preoccupation with technical detail to the point of missing the impact of things has almost a delusional quality about it, as it affects his behavior. Subjective experience is restricted so severely that O.C. lacks any conviction about his external world. Rather, he experiences "indicators" as to the state of his world and attends to how things fit with those rules. He lacks a broader attentiveness, sensitivity to shadings and proportions, and lacks the capacity to respond directly. Dogmatism serves to overcome doubt, uncertainty, and ambivalence. It requires a narrowing of attention and a technical-indicator cognitive style, thus permitting avoidance of new information which distracts and which may contradict "the rules." The delusional quality arises, for example, when exclusive

focus on some insignificant detail leads to a radical change in perception of the whole. O.C.'s memory, like his original cognition in content and style, is factual, detailed, technical, and "good." This makes it unlikely that O.C. would be able to repress memories. Shapiro describes his performance on the Rorschach as characterized by careful delineation of responses, listing and active organization of relationships. On inquiry he provides factual, technical information. Typical defense mechanisms include regression, reaction-formation, isolation of affect, and undoing.

The Hysterical Personality

In stark contrast to O.C., H. is a master of repression, has a romantic outlook on life and tends toward emotional lability (Shapiro 1965). This individual operates on impressions (not facts) which are vivid but not detailed, sharply defined, or technical. Rather, H.'s perceptions, and hence thought processes, are global and diffuse. This sets the stage for ready forgetting of both affect and ideas and has implications for learning and attention. H. responds very quickly, is highly susceptible to the obvious, the striking, the immediately impressive. There is an incapacity for persistent, intense intellectual concentration which leads to the distractibility and impressionability and, hence, the

non-factual world in which the hysteric lives. When faced, for instance, with math problems, the hysteric typically hopes to be inspired with the answer, then guesses, and cannot explain the process by which he arrived at the answer. Even though intelligent, H. is not intellectually curious and stops willingly at the obvious. Passive, impressionistic hunches rather than being the stimulus for further intellectual processing, constitute the final cognitive product. H.'s thinking may be described as "scattered" and his expression follows suit. His attention is easily captured by passing influences and he is highly suggestible, easily distracted and surprised. Such persons are remarkably deficient in fund of knowledge and often are sexually and emotionally naive. On testing they do poorly in vocabulary and general information areas. Since the original cognitions are not logically coordinated with facts, they are susceptible to fusion with or displacement by other impressions, which facilitates repression. Likewise, given that the same process occurs in recollection, H. is unlikely to have a clear, sharp, factual memory of anything, particularly when emotionally charged. Absence of a sharp focus of attention permits neglect of the uncomfortable but obvious, making H.'s naivete understandable, given his cognitive style.

H.'s romanticism involves not daydreaming, but a general outlook or attitude in which there is an

impressionistic quality to the neglect of facutal detail and obliviousness to objective defects, possible complications or contradictions. H. notices the vivid, the emotionally charged, the colorful--not the technical details. H.'s behavior is often theatrical with exaggerated, unconvincing emotionality. This is not due to a lack of sincerity, per se, but a lack of a sense of his own convictions, of the factual world. H., carried away by his immediate response to his impressions and captivated attention, does not know what he really feels like, or who he really is. He lacks a sense of personal substance, a sense that things count (even truly serious matters). For example, consequences of his own behavior and the reactions of others to his behavior are not wholly appreciated. Money and romance alone may matter to H. H. distorts reality because he does not ask serious questions which would lead to predictions and evaluatable outcomes. H. does not test reality but maintains an attitude of "la belle indifference."

In the emotional sphere, H. is given to sudden outbursts followed by brief periods of contrition. These outbursts frequently involve anger with depressive overtones. H. experiences these episodes as not his true feelings, but as visited upon him; hence, he is unperturbed by his symptoms (defensive denial). There is a shallowness evident in H.'s emotionality despite the

intensity of its expression. H. shrinks from serious affect and cognition--forgets half of his experiences and does not mean the rest. While usually mild-mannered, unassertive, and inhibited in both affect and behavior, H. can present as explosively infatuated and then become quite inhibited in a sustained love relationship. His judgments and ideas are not deeply integrated, but transient. Thus emotional outbursts when they occur do not feel real. This is consistent with H.'s cognitive style in that the affect expressed is not tied to attitudes, feelings, interests. Some hysterics may live in a chronic state of sub-acute explosion; in any case, there always are large quantities of labile emotions evident in this style. In response to the Rorschach inkblots, Shapiro describes the hysteric as looking quickly, exclaiming, and frequently seeing "whispy, floating things." On inquiry, the lack of technical determinants is notable. This is not unexpected, given the lack of introspection and the lack of clear, sharp thought content.

Cognitive/Perceptual Style

There are numerous approaches which can be taken when assessing cognitive style, including looking at degree of authoritarianism, dogmatism, cognitive complexity, and performance on various perceptual tests. In terms of the particular concerns of this study, the developmental theory of the Gestalt school of thought is especially

pertinent and will be considered here, in addition to certain problem solving styles and the measure of field dependence-independence.

Developmental Theory

This theory relates to perception and the process of perceptual development in particular, but is applicable more generally to human cognition, behavior, and psychological functioning. Werner (1940) delineates the developmental conceptual system. The theory holds that behavior proceeds from an undifferentiated response, through selective part-perception, to synthesis of details into a whole which is definite, discrete, and articulated. At the most primitive level, perception constitutes a coalescence of motor, imaginal, emotional, and sensory processes which Werner has termed "syncretic." This perceptual fusion occurs to some extent in normal functioning, such as when listening to an orchestral piece and not perceiving the individual instrumental parts. In the pathological and brain injured states the lack of differentiation can be exaggerated. At the highest developmental level, separate parts are appropriately integrated, in hierarchical fashion, into a meaningful whole. Using the orchestral example, the perception of separate sectional parts and instrumental melodic lines within the overall musical piece constitutes an integrated perception. In determining developmental level, the following distinctions

need to be made: whether the percept is syncretic or discrete, diffuse or articulated, indefinite or definite, rigid or flexible, labile or stable. Phillips and Framo (1954) review a number of studies which utilized the Rorschach Inkblot Test to study the development of perceptions. The Rorschach is an ideal instrument for this purpose since response to ambiguous perceptual material makes the organizing aspect of the perceptual process more apparent. Location scores and integration were considered and results confirmed that genetically early perception has primarily diffuse features. Individuals with a variety of pathologies could be placed on a perceptual continuum in terms of a developmental hierarchy and Phillips and Framo suggest that psychopathology can be conceptualized and quantified along the same dimension as perception, that is, diffuse, discrete, and integrated. Thus, degree of perceptual regression might reflect severity of disturbance, and increase in genetically high responses on the Rorschach (integrated responses) might reflect therapeutic change. They go even further to suggest that the various ego defenses might also be so ordered on a genetic scale if preferred modes of defense were related to level of perceptual maturity.

Flavell and Draguns (1957) take a microgenetic approach to perception and thought, focusing on events that take place between the presentation of the stimulus and

the individual's response to it. They hold that inner, personal factors characterize first perceptions and external, objective factors become influential only later. Early thought is described as vague, undeveloped, global, unarticulated, and more likely to involve imagery. Later thought contains fully formed propositions and conscious meaning which differentiates out of the earlier diffuseness and becomes more reality oriented. Pathological conditions show immature cognition or cognition similar to that shown by normals in atypical conditions such as distraction, sleep, drugs, fatigue, hypnosis, anoxia, etc. Flavell and Draguns' descriptions of early and late thought are remarkably similar to right and left brain function as described in the foregoing.

Elkind, Koegler, and Go (1964) report that the ability to see parts and wholes increases with age, parts being perceived earlier and part-whole integration being present by age 9 in 75% of people. Elkind et al. identify four stages in the perceptual process: complete centration when only parts or only wholes are perceived; a transitional state with fluctuation between perception of the whole and of the parts, and ultimate denial of the whole; intuitive decentration where whole and part alternate but are not integrated; and, finally, complete regulational decentration where part and whole are perceived simultaneously and attributed to the same perceived form.

Navon (1977) addresses the issue as to whether global perception precedes analysis of detail, suggesting that perceptual processes are temporally organized proceeding from global to analytic. Thus, complex perceptions are de-composed rather than being built up. A scene, for example, would be the hierarchical organization of subscenes interrelated by spatial relationships. One begins with a rough idea of the general structure and as the perception develops, the details become articulated and integrated. In ambiguous situations where detail is of poor quality, Navon points out, a good global analysis becomes especially important. This suggests initial right hemispheric processing followed by left hemispheric processing, which Gur (1978) alludes to as the normal progression of thought/perception (and which did not characterize the schizophrenic subjects in her study).

Problem Solving Styles

McKenney and Keen (1974) and Ewing (1977) describe two styles of problem solving which are interesting to consider in terms of the left/right hemisphere distinctions and the perceptual processes discussed above: Systematic Thinking and Intuitive Thinking. Again, each type will be arbitrarily referred to as masculine. The Systematic Thinker faced with a problem sizes up the situation and identifies the main problem, then organizes a method of solution. He devises step-by-step procedures, always

knows what he is doing and why and can communicate this well. He is good at planning and organizing. A predominance of the left hemispheric mode is apparent here, while the right hemispheric mode is easily recognized in the Intuitive Thinker, who, on the other hand, is continuously redefining the problem. He produces endless possible solutions, follows hunches, and avoids committing himself too soon. He is good at solving elusive and indefinable problems. The Systematic and the Intuitive Thinkers can be either preceptive or receptive in information gathering. The preceptive information gatherer actively searches out new bits of important information, relates them, and fits them into his existing conceptual system. The receptive information gatherer, in contrast, focuses on details without fitting them into a conceptual system at all, suspending judgment a long while. McKenney and Keen suggest that each of the four types of thinkers may function most effectively within certain career areas. For example, they suggest that the Systematic-Preceptive person would do well in financial analysis, logistics, management, while the Systematic-Receptive person would do better in clinical medicine or auditing; the Intuitive-Preceptive would be most suitable for work in history, psychology, or marketing-management, and the Intuitive-Receptive for architecture or bond-selling careers. About three-fourths of the people they studied showed a preferred style of

problem solving which they tended to apply to all problems, the rest favored, but did not rely solely on, one style.

Field Dependence

Witkin (1950) found persistent individual differences in the ability to perceptually disembed a simple figure from a complex background, with women taking longer than men to accomplish the task. The approach taken to the task reflected how difficult it was for subjects to perceptually break up a complex figure. Some traced the simple figure, some sought a salient feature and reconstructed the remainder from that point (an analytic approach), while others, who were less successful at the task, tended to adhere to the complex pattern and had difficulty finding the salient feature and the remainder of the figure. The latter subjects, being more reliant on external cues were termed field dependent, while those less distracted by external cues were termed field independent. The cognitive styles and personality styles of these two groups have been found quite different from each other (Witkin and Goodenough 1977). Field dependent people, in ambiguous situations revert to referents outside themselves to eliminate the ambiguity. Hence, they are more attentive to social cues, have much interest in other people, and tend to be emotionally open and sociable. They share many of the qualities attributed to the right hemispheric and hysteroid personality profiles. Field independent

persons function more autonomously in ambiguous situations, are not particularly interested in other people, tend physically and psychologically to distance themselves from others and lack social skills comparable to those evident in the field dependent person. Rather, they tend to be impersonal and to excel in cognitive analysis and structuring. Many of the left hemispheric and obsessive-compulsive personality traits are evident here.

As is apparent from each of the areas so far reviewed, perception, cognition, and behavior are clearly interrelated functional areas. Bruner and Postman (1949), some 30 years ago, identified the need for a unified theory which would treat the organism as an organized whole and define the role of perception as one aspect of the overall adjustive activity of the individual. One instrument likely to prove useful in formulating such a theory, the Rorschach Inkblot Test, will be examined in the next section.

The Rorschach Inkblot Test

Hermann Rorschach developed the Inkblot Test on an empirical basis with psychiatric patients (Rorschach 1921/1942). During the 20 years following its publication in 1921, the test was used as a perceptual measure to identify schizophrenics. Rorschach had found schizophrenics differentiable from the mentally retarded and from non-patients on the basis of perceptual characteristics such

as contour accuracy, and held that test factors reflected various psychological processes. As clinical psychology began to flourish during the 1940s, projective testing became popular and the inkblots came to be used as a projective rather than a perceptual test. The empirical approach was discarded. Although a number of individuals attempted to further develop the test (Beck, Klopfer, Hertz, & others), it was not until the 1970s and Exner's development of the Comprehensive System that empirical research with the Rorschach and interest in it as a perceptual test resurfaced (Exner 1974, 1978; Exner, Weiner, & Schuyler 1976). The Comprehensive System was used in this study. It requires a standardized approach to administration, scoring, and interpretation, which is described in a later section. Various research findings regarding the Rorschach will be reviewed here.

Beck studied both schizophrenics and normals in seeking to elucidate the test factors and formal structures as they form into configurations corresponding to clinically observable patterns of reactions and general psychological functioning (Beck 1955; Beck, Rabin, Thiesen, Molish, & Thetford 1950). Beck remarks upon the multidimensionality of human personality and states that at any one point in time human functioning represents the interaction of all the psychological forces within the individual. The inkblot test, he states, allows us to break up the

personality into its component elements while also examining that personality as an integrated whole.

One such element of interest is the white-space response (S) where the subject utilizes a white detail area as a figure, thus reversing the ordinary perception of the white as ground. DeKoninck and Crabbe-Decleve (1971) found that field independent subjects produced significantly more of these white space responses than did field dependent subjects and that males were more field independent than females. They noted that personality correlates of the S response included productivity, flexibility, oppositionality, and the likely use of intellectualization as a defense. Strong support for the relation of S to oppositionality comes from a study by Stein (1973). Right- and left-handed men were rated by their supervisors on oppositionality and were given the Rorschach. Stein found a significant correlation between S and oppositionality rating; left-handed subjects produced significantly more S scores and got higher oppositionality ratings than did right-handers.

Another aspect of personality, ego boundaries, was investigated with the Rorschach by Goodman (1973). She utilized Landis' ego boundary permeability scores and found these related to whole-part perception. Whole responses were related to permeability, and part or detail responses were related to impermeability, the former being

more global and the latter more analytic styles. In examining age levels Goodman found that the youngest subjects (nursery) produced all whole responses and the oldest (adolescents and adults) equal numbers of D's and W's. Interestingly, in terms of development, kindergartners gave twice as many D's as W's and first graders all D's except 2 W's. This meshes well with developmental theory in that there appears to be an initial global reaction to the stimuli which gives way to an analytical orientation that becomes increasingly dominant before the individual becomes capable of cognitively handling both the global and detail perceptions simultaneously, leading to integrative ability.

Wagner and Wagner (1978) examined the Rorschach protocols of diagnosed anorexia patients and concluded they are basically hysteroid rather than obsessive-compulsive in makeup. They note the low number of total responses and human movement responses with predominantly non-form-dominated color and a W:M ratio suggestive of much striving beyond the level of inner resources available to the person. There were also indications of sexual conflicts and need for attention.

Exner (1969) found that subjects specifically selected for high level of narcissism (as determined from responses to a sentence completion test devised to focus on the self) gave significantly more reflection responses, pairs, and non-form-dominated color responses on the

Rorschach, than did subjects selected for low level of narcissism. The latter group gave significantly more human movement responses.

The perceptual organization that takes place in formulating a response to the inkblots can be variously complex and the inkblots themselves lend themselves more readily to various degrees of organization (Beck 1933). Less broken up figures seem to be most easily seen as wholes, then interconnected detail areas, and distant details. The most difficult organizational activity involves the breaking down of the stimulus into component parts (analysis) which are then integrated (synthesis). Organization of white space with solid details, according to Beck, also constitutes a relatively difficult cognitive/perceptual operation.

Perceptual regression has been found in schizophrenics (Friedman 1952), in female psychiatric inpatients of various types (Blumetti & Greenberg 1978), and in cerebrally damaged adults (Pena 1953). In these conditions, perception reverts at least partially, if not completely, to a genetically more primitive level, approximating that typical of children, although some evidence of previously higher level functioning remains. That is, perception becomes more global, diffuse, labile, syncretic, and rigid, with the loss of the more mature characteristics of structural differentiation, flexibility, organization,

and hierarchic integration. This regression was expressed in Rorschach performance involving genetically low quality whole responses (vague, global, and unintegrated wholes).

As an indicator of cognitive functioning, organizational activity in the Rorschach responses has been examined by many researchers (Wilson & Blake 1950; Sisson & Taulbee 1955). This organizational activity occurs when two or more portions of the inkblots are perceived in relationship to each other. This activity can result in responses where the entire inkblot is utilized, representing either a single, undifferentiated whole or an integrated whole combining separate portions in a meaningfully related fashion. This latter consistitutes a higher level of cognitive functioning, consistent with that described above in terms of developmental theory. Other types of organization involve adjacent details in relationship, distant details separated by white space or solid areas seen in relationship, and white spaces combined with solid details. The relative difficulty of these levels or organization differs depending on blot characteristics, with the more solid blots tending to evoke undifferentiated whole responses, which are quite difficult to formulate for the more broken up blots. Thus, this variable reflects not only the ability to organize, but also the amount of effort the individual puts into thinking abstractly and generalizing. Amount of organizational

activity has been found to be positively related to intelligence level, particularly verbal intelligence as measured by the Wechsler-Bellevue Intelligence Test (Wishner 1948; Sisson & Taulbee 1955). These studies involved various groups of people including neurotics, brain damaged, schizophrenics, and normals. Kropp (1955), however, presents contradictory evidence from the literature that organizational activity does not accurately reflect intelligence or academic success. Rather, he points out the positive relationship between organizational activity and number of whole responses, number of human movement responses, and total number of responses. Klopfer and Davidson (1944) developed form level rating as an index of intellectual functioning. Form accuracy reflects how well the blot area indicated by the subject fits the form qualities generally attributed to the object which he labels it. Klopfer and Davidson emphasize that in considering intellectual functioning, form level is an important aspect of the individual's performance and should be evaluated in relation to the organizational activity which he demonstrates. Podell and Phillips (1959) found three dimensions when they cluster analyzed Rorschach developmental indices. These were globality, varied productivity, and accuracy and human movement, which are consistent with developmental theory in terms of increasing extent of differentiation and integration. An interesting alternative to the developmental

view is supported by Fast (1969): if concrete and abstract thought both develop out of an undifferentiated state and both become disordered in pathological conditions (as held by Searles 1965), then those who attribute physical properties to abstract ideas on the Rorschach should also attribute inappropriate physical properties to objects in their responses. This hypothesis was supported.

Mental imagery often plays an important role in cognitive functioning. Hughes and Fitzgerald (1977) expected persons with more vivid imagery to provide more movement responses to the Rorschach but found that there were no significant differences for low and high vividness of imagery subjects on human movement or total perceived movement (including animal and inanimate in addition to human movement). Possibly the assessment of imagery vividness by self-report rather than by performance measure, and the limitation to two responses per card may have been responsible for the results Hughes and Fitzgerald obtained. Perhaps, also, it is not vividness of imagery but the extent to which imagery is used which matters. The human movement variable was found to differentiate a group of psychologically disordered individuals of various types from controls (Schori & Thomas 1977). Schori and Thomas concluded that the disordered group had more active fantasy lives and hence were more sensitive or vulnerable. Those who later suicided had had significantly more form

determinants in their Rorschach protocols than did controls, probably being more concrete in their thinking. More recently, Exner and Wylie (1977) have identified a constellation of eleven variables which occurred more frequently in protocols obtained within 60 days prior to effected/attempted suicides than in protocols of inpatient depressives, inpatient schizophrenics, or nonpatients. The human movement variable was not one of those implicated. Weiner and Exner (1978) did a normative study of disordered thinking in patients and nonpatients as reflected in the Rorschach, and found nonpatient adolescents significantly more likely than nonpatient adults to display disordered thinking, but significantly less so than adolescent patients. Nonpatient adults showed significantly less disordered thought than did adult patients. Weiner and Exner conclude from these results that disordered thought occurs on a continuum from occasional incidence in normals to more frequent occurrence in the mildly disturbed, and flagrant occurrence in the more severely disturbed, such as in schizophrenics.

Todd (1973) explored the effect of color on field dependent and field independent subjects. While he did not use the Rorschach in this study, his findings have clear implications for that instrument. Todd presented two TAT cards to younger and older preadolescent children. These cards were filtered red and blue. He found significantly

greater disruption to the red card, but not to the blue card, over the achromatic. There were significantly more feelings expressed in response to the red and field independent subjects gave the most feeling responses to that card. The achromatic and red stimuli elicited significantly more defensiveness in the stories than did the blue filtered cards. Field dependent subjects were more defensive to red than to blue, while field independent subjects showed no difference. Todd concluded that red and blue have differential psychological properties for field dependent and field independent subjects, with the negative, stressful impact of red more pronounced for the former group. They were highly defensive to the red card and this is consistent with Witkin's findings that field dependent people tend to use denial and massive repression while field independent persons rely on intellectualization as a defense. In this study the latter produced a higher word count than the former, which fits with Witkin's findings. Todd suggests that while both types of people are responsive to environmental stimulation and emotion, they differ in modulation of response. These findings are interesting in relation to color shock to the Rorschach inkblots (Whitaker 1973). Color shock is found when a subject, on being handed an inkblot in which color is present, suddenly has a latency prior to offering the first response which is markedly longer or shorter than latencies to the preceding

cards. Katz and Ziffo (1975) looked at color responding on the Rorschach in terms of cognitive tempo and found that impulsives tended to give more color and color-form responses and to respond more quickly than reflectives. They tend to not take the time to process all information available or to consider alternatives before responding.

Shading responses have long been taken as signs of anxiety in Rorschach protocols. For example, Boreham (Note 6) discusses two types of anxiety and how these may appear in the Rorschach. Fear of losing a needed or loved object is experienced as depressive anxiety and is shown in the Rorschach through shading where the insubstantiality of fog, clouds, smoke, etc. reflects the state of mind experienced on loss of contact with these objects. A second type of anxiety described by Boreham is the persecutory type where attack from an object is feared. This may appear in threatening response content and inanimate movement responses. Another way to conceptualize anxiety is in terms of anxiety as a personality trait or a temporary emotional state. Spielberger has looked at how the Rorschach might reflect these types of anxiety and has concluded that shading variables best index state anxiety while movement may be the best indicator of trait anxiety. Longer reaction times and fewer responses appear to be defensive reactions (caution, guardedness) that are found in state anxious subjects (Auerbach & Spielberger 1972).

Relating the literature on lateral eye movement and personality styles, Barnat (1974) used the Rorschach Inkblot Test to compare cognitive/perceptual characteristics of left- and right-lookers, expecting the former to display a more diffuse, "tender-minded" cognition and the latter a more focused, "toughmindedness" with higher scores on form level, location, populars, color responsiveness and indices of primary process thinking. Subjects chosen had unidirectional eye movement to reflective questions of 66.6 to 100 percent. The Rorschach was administered following Beck's method. Results were marginal except for sample extremes who differed significantly on form level and organization. For both males and females left-lookers produced more vague, diffuse responses than did right-lookers. Interestingly, left-looking males also produced significantly more high level, organized responses, as well. Marginal relationships to lateral eye movement were found (for the entire sample) for the following Rorschach variables: organization and populars (higher for right-looking males), number of responses (higher for left-looking males); color responsiveness was higher for left-looking females and a measure of verbal fluencey for right-looking females. Barnat concludes that while major differences between left- and right-lookers were not found in cognitive characteristics, the suggestion of group differences (especially for males) justifies further exploration

along the lines of this study. The research to be described in the following addresses the same question raised by Barnat, but takes a somewhat different approach on two counts. First, Exner's Comprehensive System of the Rorschach is used. This is a significant difference in that the System is empirically grounded. Exner compared all the major systems of Rorschach interpretation and compiled the Comprehensive System from elements of each of these which were substantiated by research, eliminating all other indices. There is normative data available on the variables included in the Comprehensive System. Second, rather than hypothesizing that left- and right-lookers will differ significantly on one or two dimensions, the larger question of overall pattern of cognitive/perceptual differences as well as personality/emotional differences is examined in terms of the variables and other indices available from the Rorschach protocol. Those of particular interest in this comparison will be described in the following section.

CHAPTER II

STATEMENT OF THE PROBLEM

The literature reviewed in the foregoing sections highlights the distinct, and divergent, styles which can be identified in the areas of personality, cognition, and perception, through various tests, measures, and clinical observation.

Research on cerebral hemispheric specialization has revealed the unique capacities of the right and left halves of the brain, in terms of specific cognitive and perceptual capabilities, emotional function and overall method of processing data. In addition to showing a dominance of one or the other hemisphere over the opposite half of the brain, individuals have also been found to differ in their pattern of lateralization of specific cognitive functions. This raises the question as to whether a correspondence exists between brain asymmetries of function/dominances and personality/cognitive/perceptual styles. That is, does the neurological organization of the brain account for individual differences in style?

A complex measurement problem arises here, in that existing tests which might be utilized to address this

question have not been formulated with specific left/right hemispheric characteristics in mind.

Tasks presented by standard test instruments may confound left and right hemisphere skills. For example, a verbal test might involve perceptual elements processed by the non-dominant hemisphere, or a spatial test might require analytic or verbal skills. Further, a person might use the appropriate hemisphere for the task, but happen to be cross-dominant for certain critical cognitive operations so that performance is somewhat impaired for that reason. We do not yet have a sufficient understanding of the distribution of elemental cognitive functions, to adequately address the question through the standard objective test procedures.

The Rorschach Inkblot Test, however, appears to offer a number of advantages as a prospective instrument through which to explore this area. Its ambiguity allows the subject to draw upon the full range of his resources at will and to respond in his characteristic fashion to demands of the task. While it is basically a perceptual task and revealing of perceptual/cognitive strategies utilized in dealing with ambiguous stimuli, many personality characteristics have been related to specific aspects of Rorschach performance, as well. If features of an individual's Rorschach responses can be linked to known laterality effects, this would lend support to the

hypothesis of lateralization of style, particularly cognitive style, but also personality style.

This raises another measurement problem in identification of individuals with strong hemispheric preferences to whom the Rorschach might be administered. Research described in the foregoing suggests that the direction of conjugate lateral eye movements on being asked reflective questions indicate hemispheric activation and that individuals tend to show a directional preference, and thus, by inference, a hemispheric preference. Evidence on brain asymmetries relative to handedness dictates that only right-handed subjects be used, to avoid introducing mixed or reversed dominance patterns. Rorschach data obtained from such subjects was examined for consistency with research findings regarding left- and right-lookers as well as general cognitive, perceptual, and personality style evidence, thereby testing the hypothesis that these styles relate to hemispheric functioning.

It was proposed that right- and left-lookers would differ from each other on many of the Rorschach variables in predictable ways, congruent with what we know of left and right brain function. Right-lookers were hypothesized to be more like the obsessive-compulsive personality (Shapiro 1965; Smokler & Shevrin 1979); to be detail oriented and to demonstrate more selective part perception (Werner 1940; Phillips & Framo 1954; Flavell & Draguns

1957; Elkind, Koegler, & Go 1964; Goodman 1973) than whole percepts; and to take a more analytical, step-by-step approach to the task (McKenney & Keen 1974; Ewing 1977; Navon 1977; Bakan 1971; Abdullah & Schucman 1976). They were expected to show less emotionality, less responsiveness to the color in the inkblots (Katz & Ziffo 1975), and more conventionality (Barnat 1974), self-control, and criticalness/cautiousness in responding, such as providing fewer responses and favoring the use of form as a determinant over other determinants or blends (Hall et al. 1968; Smokler & Shevrin 1979; Tucker 1981). Their form quality was expected to be better than that of left-lookers due to their concern with correctness and focal attentiveness, perhaps more so in detail than whole percepts which, when occurring as organized wholes are more likely to be poorly integrated.

Left-lookers, in contrast, were hypothesized to be more like the hysteroid personality (Shapiro 1965; Smokler & Shevrin 1979); to demonsrate a more global, holistic mode of thinking and perceiving (Flavell & Draguns 1957; Gazzaniga 1967; Bogen 1969b) which might be shown in unintegrated or diffuse whole responses (Barnat 1974; Goodman 1973; Phillips & Framo 1954; Elkind, Koegler, & Go 1964) which approximate the syncretic perceptions described by Werner (1940). When these subjects provided integrated responses, they were expected to show less good

form than right-lookers due to the vagueness of their perceptions and disregard for accuracy and boundaries (Goodman 1973; Hall et al. 1968). They were expected to be more productive and to utilize numerous determinants and blends (Hall et al. 1968), to show emotional responsiveness (Gainotti 1972; McIntyre et al. 1976; Gazzaniga 1967), for example, as in the frequent use of color in formulating precepts (Katz & Ziffo 1975) and in impulsive responding (Day 1967a). The tendency to act on hunches and uncritically integrate into gestalts approximates the Intuitive Thinker (McKenney & Keen 1974; Ewing 1977). Barnat's (1974) results suggest that, particularly for males, left-lookers are also likely to provide high level orgznized responses to the Rorschach, in addition to diffuse wholes. This provocative finding raises the possibility that males, in progressing along the developmental continuum from diffuse through part to integrated whole perception, are more likely than females to reach the final, integrative level. It is possible, also, that males and females may differ in their underlying neurological makeup.

Many of the previously noted studies, while not specficially designed to address sex differences, have provided some, not entirely consistent, information in this regard. Kimura (1967) found pre-school age girls to show a clear right ear effect on a dichotic listening task, while their male peers showed only a trend in that direction,

appearing to lag behind developmentally. In adults, differences between males and females in degree of hemispheric specialization and EEG pattern were noted (Tucker 1975; Ray, Morell, Frediani, & Tucker 1976), as well as differences in brain asymmetries (Galaburda, LeMay, Kemper, & Geschwind 1978). Kovac (1972) found non-optimal lateral preferences associated with increased anxiety and neuroticism and lower I.Q.s, particularly in (normal) females. Males were considered more bilateral than females, who were seen as more separated in representation of language and visuo-spatial functions (Buffery & Gray 1972). Davidson and Schwartz (1976) found that males used different cognitive modes when emotionally aroused, being more bilateral, than did females, who demonstrated greater right hemispheric activation. With regard to lateral eye movements, Duke (1968) found normal males more consistent in direction than females, but evidencing no preferred direction. Bakan (1971) considered males less integrated than females, due to clearer differences in lateral eye movements and noted females to be more bi-directional with less consistent hemispheric activation. Etaugh and Rose (1973) found no sex differences, but Weiten and Etaugh (1974a, 1974b) found males had more rightward eye movements than did females when responding to visual, numerical, spatial, and musical questions. The Gur, Sackheim, and Gur (1976) study showing females preferring to sit on the left side

of the classroom to have greater psychopathology, while the opposite held for males, is quite suggestive of sex differences. So, also, is Gur's (1978) finding that male schizophrenic eye movement patterns approximated that of normal females while schizophrenic females approximated normal males in pattern of eye movement. Both groups demonstrated more righward movement than did normals, consistent with the hypothesis of left hemispheric overactivation which Gur has espoused.

It is not clear from these various and diverse investigations just what sex differences there may be in neurological organization of the brain and in what way this may be reflected in Rorschach performance. Consequently, the data obtained in this study was examined by sex as well as by direction of lateral eye movement. It was hoped that analysis of their test results would bring to light some differences between males and females which would suggest further research strategies or directions.

In sum, then, the problem which this study approached concerns the basic underlying relatedness between cognitive, perceptual, and personality styles, which were hypothesized to reflect, in the aggregate, the differences between right and left hemispheric function, as these predominate within the individual. Persons with a clear hemispheric dominance, as indicated by right-handedness and a predominance of rightward or leftward conjugate lateral eye movements,

were expected to demonstrate most clearly the left versus right hemispheric characteristics and capabilities as they addressed the Rorschach task. Rorschach scores for these two groups were compared for the characteristics delineated in this section which appear to discriminate between left and right hemispheric types. In addition, the Rorschach data were examined for possible evidence of sex differences which might be ascribed to neurological organization of the brain and might provide some direction for further exploration regarding style and hemispheric asymmetries. Specific variables of interest will be described in the next section, along with the measures used.

CHAPTER III

METHOD

Subjects

Subjects for this study were 43 right-handed undergraduate psychology students from the University of North Dakota, Grand Forks, North Dakota. Participation was on a voluntary basis and subjects were compensated $10.00 each. They were solicited from among the 97 participants in a related study, who had been screened for dominant direction of lateral eye movement to reflective questions and had completed the State-Trait Anxiety Inventory of Spielberger (1972).

Screening for dominant direction of lateral eye movement had been accomplished in individual sessions by one of four advanced undergraduate research assistants who had been trained in the administration of the lateral eye movement screening questionnaire and in the observation and recording of responses. Introduction to the test and directions for its completion had been provided to the assistants in written form and were read verbatim to the subjects. The questionnaire contained a balanced subset of 20 items taken from the 40 originally used by Schwartz, Davidson and Maer (1975). It consisted of 5 of each of

the following question types: verbal emotional, verbal non-emotional, spatial-emotional, and spatial non-emotional. This measure appears in the Appendix attached. During the screening process, each subject sat across a table from one of the examiners at a distance of about 2-1/2 feet, in an experimental room devoid of visual distractions. After presentation of each item the examiner covertly recorded the direction of initial gaze shift on a form resembling the face of a clock. Summary statistics were computed by the examiners and were re-checked by the investigator after the sessions. The total number of non-lateral, right lateral, and left lateral eye movements were recorded for each subject. A raw score computed for the lateral eye movement measure consisted of the proportion of left minus right lateral eye movements to all initial lateral eye movements, i.e., (l-r/all laterals). Thus, a higher lateral eye movement score reflected more left-looking or, by inference, greater right hemispheric preference. Prior to testing actual subjects, the research assistants were trained in scoring of non-lateral, right lateral, and left lateral eye movements using a sample subject in a videotaped interview. Interscorer reliability of the assistants was calculated using the Kuder-Richardson formula which yielded an inter-rater reliability of .96. Although n=50 was sought in the study, an insufficient number of males was acquired, despite vigorous recruitment efforts, and

ultimately 52 female and 45 male right-handed, undergraduate volunteers participated and received partial course credit (Kuchler, Note 7).

Of the above 97 individuals, those with a lateral eye movement raw score of 70% or higher were invited to take part in the present research. The distribution of participating students was: 11 male left-lookers, 9 male right-lookers, 12 female left-lookers, and 11 female right-lookers. This rendered a left-looking group of 23 individuals and a right-looking group of 20, with altogether 20 males and 23 females participating. These n sizes constitute an acceptable minimum number of subjects per group for the analyses planned. Although larger n sizes are preferrable in order for significant findings to carry more meaning and to permit greater generalization, it was considered important to keep the number of males and of females comparable. This imposed some restrictions on n size in that the number of available males who met the 70% criterion was limited. In fact, of those solicited, all qualifying right-looking males (8) and all but one of the qualifying left-looking males (10) ultimately took part in the study. To minimize the discrepancy in n between the male and female groups, three males who scored slightly under criterion were included, one in the right-looking group and two in the left-looking group. In sum, this constituted all available, acceptable subjects. Right-looking males were the least

frequently occurring type of subject and this consequently had a limiting effect on n size, overall. Using the minimum acceptable n size for males/females and right-/left-lookers precludes serious examination of the subgroups (male right-lookers, male left-lookers, female right-lookers, female left-lookers) since n size for these subgroups is smaller still.

Materials and Equipment

Three psychometric instruments were used. Scores on Spielberger's 40-question, paper-and-pencil, self-report Trait Anxiety Inventory entitled "Self-Evaluation Questionnaire" obtained from previous testing, made available a measure of each subject's characteristic level of anxiety in addition to that induced under the stress of the present testing situation. The latter was assessed through pre and post administrations of the State Anxiety portion of that instrument. The "Hysteroid:Obsessoid Questionniare" (HOQ), a 48-question, paper-and-pencil, self-report measure developed by Foulds, Caine, Adams and Owen (1965) provides a score reflecting relative degree of hysteroid tendency in the personality, as compared with obsessive-compulsive tendency. It includes questions tapping traits of attention-seeking, emotional display, speed of decision-making, lability and shallowness of affect, and conscientiousness. The instrument of primary interest, The

Rorschach Inkblot Test, a projective measure, was administered and scored in accordance with the Exner Comprehensive System, yielding a variety of ratios, percentages, and derivations relevant to personality, cognitive, and perceptual functioning. These measures are described more fully in the following pages.

Other equipment used included a cassette tape recorder for recording the Rorschach performance and a card size calculator incorporating a stopwatch feature for timing Rorschach responses. This latter instrument made it possible to obtain response latencies in an unobtrusive fashion, whereas use of a conventional stopwatch can draw the subject's attention to the fact that responses are being timed and so influence performance.

Description of Measures

The Speilberger State-Trait Anxiety Inventory

This brief self-report instrument measures anxiety level of the individual in terms of both personality trait and the degree of transient or state anxiety experienced at a particular point in time (Spielberger 1972). Initially, Spielberger developed the individual items by selecting those based on the content of scales widely used to measure trait anxiety and rewriting these to reflect both trait and state anxiety, so that separate sets of instructions could be used with the same items. Encountering some difficulties with the connotations of words in

the process, Spielberger shifted tactics and developed two separate scales. The Anxiety Trait scale contains 20 items relating to how the individual generally feels. These are answered through checking one of the following: "Almost Never," "Sometimes," "Often," or "Almost Always." The items chosen correlated highly with other widely used anxiety trait measures. Spielberger approached development of the Anxiety State portion of the Inventory with three requirements in mind: that the measure be brief and easily completed so as to permit the capturing of passing emotional states, repeatedly if desired, as in research activities; that the items be highly reliable, to allow for use of difference scores which would retain good reliability; and that the items reflect a higher degree of anxiety in known high stress than in stress-free situations. This portion of the Inventory is also comprised of 20 items, to which individuals respond by indicating how they feel at a particular point in time by checking: "Not At All," "Somewhat," "Moderately So," or "Very Much So." Spielberger (1972) describes the Anxiety State portion of the Inventory as tapping feelings of tension, nervousness, worry and apprehension which contrast with feelings of calmness, security, and contentedness. The items are balanced between these two emotional states with the rating scale providing gradations from calmness through increasing tension to intense anxiety.

Spielberger's State-Trait Anxiety Inventory has been used with the Rorschach Test to assess which of the various Rorschach variables might reflect these two types of anxiety (Auerbach & Spielberger 1972). Auerbach and Spielberger found the shading variables to best measure state anxiety, and movement variables appeared the best measure of trait anxiety. Those subjects highly state anxious provided fewer responses, with longer reaction times, which the investigators interpreted as reflecting defensive reactions of caution and guardedness.

The Hysteroid: Obsessoid Questionnaire

Foulds et al. (1965) recognizing the need for a personality test which would not confound symptoms and traits amongst the test items, constructed the Hysteroid:Obsessoid Questionnaire. Beginning with 9 traits descriptive of the hysteroid (excessive display of emotion, vivid daydreams, frequent mood changes, under-conscientious, given to precipitate action, over-dependent, careless and inaccurate, shallow emotionally, and desire to impress and gain attention) and 9 traits descriptive of the obsessoid (scarcely any display of emotion, inability to indulge in fanciful thinking, constant mood, over-conscientious, slow and undecided owing to weighing of pros and cons, obstinately independent, stickler for precision, feels things deeply, self-effacing), 48 statements were formulated pertinent to these items, which could be scored in

a hysteroid or obsessoid direction. For example: "I like to wear eye-catching clothes," "I keep quiet at parties or meetings," "I like discussing myself with other people." After behavior ratings by staff on 76 hospital patients and analysis of internal consistency of the items, the following traits were retained and formed the basis of the questionnaire: attention-seeking, emotional display, speed of decision, lability of affect, conscientiousness, and shallowness of affect. Scores on the HOQ for 77 patients diagnosed as hysteric or dysthymic were found to be normally distributed, with no sex differences. Mean hysteroid score was 27.08 (S.D. = 6.64) and mean obsessoid score was 19.08 (S.D. = 4.20), significantly different at the .001 level. A score of 24 or higher is considered hysteroid, lesser scores obsessoid. Foulds and Caine, on the basis of their research, state that the HOQ has "a reasonably high validity in terms of an outside criterion and a high re-test reliability in spite of intervening psychotherapy" (Foulds, Caine, Adams, & Owen 1965, p. 46). These researchers found a significant correlation between the HOQ and diagnosis, with diagnosed dysthymics tending to have obsessoid personalities.

An interesting observation made by Foulds and Caine regards the relationship between the hysteroid/obsessoid dimension of personality and that of extraversion/introversion (based on the close association they found between

the HOQ and the MPI E scale). They note that these represent different levels of personality functioning, with the latter indicating the direction of behavior while the former indicates the "how." An individual may be, for example, an extraverted type of thinker, yet obsessoid in personality, or vice versa. Elaborating on this rather intriguing observation, they point out that it is the obsessoid who typically is extraverted, demanding more data from the environment prior to decision making, distrusting his own judgment, and always checking the facts. The hysteroid utilizes minimal environmental cues to embark on trips of fantasy, making judgments on the basis of little evidence, lacking interest in detail and precision. They raise provocative questions regarding symptom formation within the various personality/thinking styles, such as whether extraverted thinking obsessoids may develop hysteria rather than dysthymia, since their attention is directed outward, and whether the extraverted thinker is also extrapunitive, while the introverted thinker might be intropunitive. These issues would seem to relate closely with some of the Rorschach scores, such as active and passive movement scores and the ratio reflecting introversive/extratensive tendencies.

Exner's Comprehensive System of the Rorschach

Exner views the Rorschach as a problem-solving task wherein the testee is asked to 'violate reality and get

away with it' by reporting in response to the ambiguous inkblots, percepts that are within normal limits in terms of form accuracy, content, and other determinants.

The instrument itself consists of a series of 10 cards, each with a blot (splattering) of ink upon it. Half of the inkblots appear in shades of grey/black and half contain color, either isolated splotches of red, or a range of colors throughout the blot. Standard administration, according to the Comprehensive System, is one-on-one, with the examiner presenting the cards, in sequence, to the testee with instructions to report what he sees. The examiner then records verbatim what the testee says, avoiding any casual remarks or conversation which might create a special set towards the task, or otherwise influence responses. Following this free-association period, an inquiry phase occurs during which the testee is asked to point out the location on the inkblots where he saw each percept reported and to explain what it was about the inkblot that made it seem like that was what it was. One way in which the Comprehensive System differs from other approaches to Rorschach administration and scoring is in requiring the examiner to elicit determinants used by the testee without suggesting them to him during this process. Thus, the examiner must have clearly in mind all the determinants possible and must carefully formulate any questions posed to the testee during the inquiry phase. On the basis of

the information obtained, each response is scored and the resultant configuration of scores is interpreted in terms of the psychological operations reflected by them. The manner in which an individual approaches the Rorschach and articulates his responses to the ambiguous stimuli tends to be consistent over time and can be taken as representative of the individual's typical response style or coping style in a problem-solving situation (Goodman 1973; Exner 1974, pp. 221-22).

Test Variables of Interest to the Study

Schori and Thomas (1972) performed an image analysis on 35 Rorschach variables obtained on 586 subjects followed by a factor analysis with Varimax rotation, which produced 4 factors accounting for nearly 83% of the variance. The factors identified were: intellectual productivity (high R), form (high form determinant), human movement (M) and holism factors (high W). These variables were included in the present study, among other Rorschach variables which are judged pertinent to the hypothesis here being tested and which appeared likely to reflect aspects of right and left hemispheric function. These and other test variables will be identified and defined in the following section. Many of the Rorschach variables are complex combinations of other Rorschach variables, as in some of the Rorschach ratios and derivations. For ease of reference and because

they are more concise, variable names used in the statistical analyses are used in the text as well. The more cumbersome actual variable names are parenthesized along with descriptive information in the following list of variables. This list should be referred to as needed when considering the data analyses and discussion of results in later sections.

LEM (lateral eye movement) an indicator of whether the individual was in the left- or the right-looking group.

SEX (sex of subject) entered as a variable so that various groupings could be compared on the following test variables.

HOQ (Hysteroid:Obsessoid Questionnaire) reflects the degree of hysteroid tendency in the personality. Score of 24 or higher is categorized hysteroid, 23 or less, obsessoid.

TANX (Trait Anxiety Score) represents the level of trait anxiety as measured by that subsection of Spielberger's State-Trait Anxiety Inventory.

SANXI (State Anxiety Pre-test Score) reflects the level of state anxiety reported by the subject prior to administration of the Rorschach Inkblot Test, as measured by that subsection of Spielberg's State-Trait Anxiety Inventory.

SANXII (State Anxiety Post-test Score) reflects the level of state anxiety after completion of the Rorschach.

SANXDIFF (State Anxiety Pre-Post-test Difference Score) indicates whether and to what extent an individual's anxiety increased/decreased following their experience with the Rorschach Inkblot Test.

The following are Rorschach variables:

R (total number of responses to the inkblots) unless specifically identified as representing the original number of responses, this represents the number of responses utilized in the statistical analyses after a data reduction procedure to be described in a later section.

ZF (frequency of organizational activity, Zf) represents the number of responses in which the subject either meaningfully related two or more separate detail areas or provided a percept involving the entire inkblot.

ZD (ZSum-Zest, Zd) is calculated by subtracting the expected Z value, given the number of times Z occurs in the record, from the sum of the weighted Z scores (reference is made to Exner's Z value tables for this purpose; see Exner, Weiner, & Schuyler 1976). This score represents over- and under-incorporation when its value exceeds $\pm$ 3.0, respectively.

W (total number of wholes) represents responses in which the entire inkblot is included in the percept, whether as a single object or as a composite of separate contents.

D (common detail area) represents frequently used blot areas, in the normative sense.

DD (unusual detail area, Dd) represents infrequently or rarely used blot areas, in the normative sense. These may be perceptually creative or may reflect cognitive impairment with poor reality contact, depending on the form quality of the response.

S (space detail) is always combined with one of the other location scores (W, D, Dd) and indicates that white space was used in the percept. This variable is associated with oppositional tendency, as may be recalled from discussion of S in the literature review.

DW (a confabulated response) occurs when the subject provides a W response based solely on the characteristics of a D area, and is not able to justify the total percept using any blot characteristics beyond the D that stimulated the response, so that form quality of the whole may be impaired.

DDD (a confabulated response, DdD) occurs when the subject provides a D response based solely on the characteristics of a component Dd area, and is not able to justify the percept using any other blot characteristics than what occur to the Dd area, so that form quality of the D may be impaired.

DDW (a confabulated response, DdW) occurs when the subject provides a W response based solely on the characteristics of a Dd area, and is unable to justify the percept utilizing any other blot characteristics than what

occurs to the Dd area. This is a very rare response and likely to be of poor form quality.

DQP (plus developmental quality) is assigned to organized responses in which separate contents are seen in relationship to each other.

DQO (ordinary developmental quality) is assigned to unorganized responses in which contents may be single or multiple, but no meaningful relationship is postulated between them.

DQV (vague developmental quality) is assigned to rsponses consisting of vague, diffuse contents which could take any form, such as clouds, fog, water, smoke.

DQM (minus developmental quality) is assigned to those responses in which gross perceptual distortion occurs, with blot areas articulated in ways not consistent with their structural limitations. Form quality is necessarily poor. These responses cannot be ones which it is possible to score as vague.

M (total number of human movement responses) represents ideation of a purposeful sort such as would be involved in controlled fantasy operations. Represents introversiveness in the EB ratio, below.

SUMC (sum of the weighted color responses, SumC) is used in the EB ratio which reflects introversive v. extratensive orientation, discussed below. Represents the extratensive component of the EB ratio.

EA (summation of M and SumC) reflects the amount of organized, controllable, accessible psychological resources upon which the individual can draw in coping with life stress.

EB (ratio of M to SumC) reflects introversive versus extratensive personality tendencies. The former refers to an inner tendency under stress to turn inward in seeking gratification of needs, while the latter refers to a turning towards others and the external world for this purpose. This is an inclination not necessarily reflected in overt behavior. Because it is possible to obtain a zero value on the left of this ratio, it was calculated as M-SumC for purposes of entry into the computer.

LEB (ratio of FM+m to sum of all shading and C') represents the proportion of stress to painful affect that the individual is experiencing. For purposes of computer use it was entered as a difference score to allow for a zero value on the left half of the ratio.

FMPM (FM+m) is the sum of animal and inanimate movement in the record and reflects the amount of unmet basic needs which are prompting uncontrolled ideation.

SHADCPRM (sum of shading and achromatic color responses) represents the amount of painful affect the individual is experiencing.

EP (summation of FM+m and sum of all shading and achromatic color in the record) represents the total amount

of uncontrolled psychological activity impinging upon the individual and prompting behavior.

BLENDS (total number of responses having multiple determinants) reflects degree of cognitive complexity.

A (total number of active movement responses, ^{a}superscript on all movement responses, e.g., M^{a}, FM^{a}, m^{a}) reflects ideation of a passive orientation.

ACTPAS (ratio of active to passive movement, a/p) represents the active versus passive orientation in thought characteristic of the individual. It was entered into the computer as A-P, to allow for a zero value on the left. A difference of 3 points suggests cognitive rigidity.

MA (total number of active human movement responses, M^{a}) reflects fantasy thinking of an active variety.

MP (total number of passive human movement responses, M^{p}) reflects fantasy thinking of a passive variety.

MACTPAS (ratio of active to passive human movement in the record, M^{a}/M^{p}) represents the active versus passive orientation in fantasy thinking characteristic of the individual. It was entered into the computer as MA-MP, to allow for a zero value on the left. A difference of 3 points suggests cognitive rigidity.

FC (form dominated color responses) reflects affect that is modulated during expression.

CF (color dominated responses in which form plays a secondary role) reflects affect that is more spontaneously expressed.

C (pure color response) reflects affect that is uncontrolled during expression.

COLOR (FC:CF+C) reflects the extent to which affect, when expressed, is modulated by the individual. It was entered as a difference score due to the possibility of a zero value on the left.

LAMBDA (ratio of pure form responses to nonpure form responses, L) is an index of the extent to which the individual is responsive to stimulus complexity and tends to maintain emotional control. Very low and very high scores raise the question of possible emotional lability.

FP (percent of pure form responses with good form quality, F+%) includes both plus and ordinary form quality and represents perceptual accuracy when defending against experience of emotion.

XP (percent of all responses with good form quality, X+%) includes plus and ordinary form quality and represents perceptual accuracy when emotional experience is included in the response.

AFR (Affective Ratio) is the ratio of number of responses to the last three inkblots which are composed of various colors, to the number of responses to the first seven inkblots which are either grey/black or may include some red portions. It reflects the tendency of the individual to respond to emotionally toned stimuli.

EGOCENTR (Egocentricity Index, 3r+(2)/R) reflects the degree of self-focusing in the individual, and can be taken to reflect level of self-esteem.

H (whole human contents) is the total number of responses which include the percept of one or more whole human figures.

HD (human detail, Hd) is the total number of responses which include the percept of one or more human details, e.g., head, foot.

AN (whole animal, A) is the total number of responses which include the percept of one or more whole animal figures.

AD (animal detail, Ad) is the total number of responses including the percept of one or more animal details, e.g., ears, horns, tail.

WHOLDET (ratio of total number of whole responses, W, to total number of detail responses, D, W/D) reflects the extent to which the individual focuses on simple details or tries to organize these into larger percepts or wholes.

BLENDSR (ratio of total number of blended determinants to total number of responses, Blends/R) was used to take into account the number of responses involved when assessing cognitive complexity.

WHOLMOV (W/M) reflects level of aspiration relative to capability or current functioning level. Entered

as a difference score to allow for a zero value on the left.

DEVQUAL (proportion of plus developmental quality responses in the record) used as a measure of the extent to which integrated/organized responses were formulated by the individual.

HUMDET (H+Hd:A+Ad) reflects extent of concern with people.

HUMANI (H+A:Hd+Ad) reflects whole versus detail perception. Used in addition to W/D because this is one of the primary differences hypothesized between left- and right-lookers.

Procedure

The study was conducted in single, individual sessions. Each participant was first informed of the general procedure to be followed and a written consent form for participation in the study was signed. Tests were then administered in the following order: (1) HOQ, (2) State Anxiety Inventory, (3) Rorschach Inkblot Test, and (4) State Anxiety Inventory. Approximately 2 hours were allowed per person for completion of the entire test battery.

Each individual was asked to complete the first two measures in accordance with the standard instructions for the instruments. The Rorschach was then administered

following Exner's Comprehensive System guidelines. This test was introduced as a procedure designed to study the personality and consisting of a set of ten inkblots to be handed individually to the subject for him/her to look at and report to the examiner what he/she saw. If necessitated by pointed inquiry, it was also remarked that people see many different things in the blots. However, care was taken that any such preliminary discussion not lead to an unusual set towards the test. No reference was made to card turning, right/wrong answers, timing, or number of responses. Questions raised were given non-directive encouragement to respond as the individual chose. Upon presentation of each card the question "What might this be?" was posed, and a verbatim record was made of all responses offered. These were, in addition, tape recorded to facilitate easier scoring of the protocols in event of unclear handwriting. All verbalizations by the examiner were deliberate and formulated with care, possible reinforcement through verbal and non-verbal cues, including eye contact, being avoided. Encouragement to provide more than one response was offered only on card one and in the case of rejection on any card, with a minimum of 2 minutes allowed for further response. In the case of persistent excessive responding, the examiner stopped the individual after 10 responses to a card. In any case, an upper limit of 10 minutes

was allowed for responding to each card, regardless of the number of responses provided in that time.

Following completion of the Rorschach, participants were again administered the State Anxiety Inventory to reflect their current feelings.

Each person was then thanked for participating in the study, was paid the ten dollars, and arrangements were made for provision of feedback on results of the study when available.

Hypotheses

Left-lookers and right-lookers were expected to differ from each other in specific ways based on the research findings discussed above and based on the theory here being proposed that the neurological organization of the brain (as reflected in left-versus right-looking) unifies perceptual, cognitive, and personality function in a meaningful way within the individual.

Left-lookers (right hemispheric types) were expected to score higher than right-lookers (left hemispheric types) on the following variables: HOQ, R, ZF, W, DW, DQP, DQV, DQM, SUMC, M, P, MP, CF, C, AFR, EGOCENTR, H, AN, DDD, DDW, WHOLDET, WHOLMOV, DEVQUAL, HUMDET, HUMANI. Descriptively, they were expected to have a more hysteroid than obsessoid personality tendency (HOQ), to be more responsive to the Rorschach (R), to make more efforts to organize responses

(ZF and DEVQUAL), thus providing more wholes (W), and sometimes even confabulating them (DW), perhaps confabulating less inclusive responses also (DDD and DDW). They were also expected to be given to more whole perceptions than to detail (WHOLDET and HUMDET). The developmental quality of their whole responses was expected to be either very good (+) signifying meaningfully related response components (DQP), or vague (DQV), or minus, where form quality is poor (DQM). This would reflect the right hemisphere's involvement in global, diffuse perception and its role in formulation of integrated wholes. Given the right hemisphere's involvement in emotional experience, this group of subjects was expected to show more responsivity to emotionally toned stimuli (SUMC and AFR), to give more pure color (C) and color predominating over form (CF) responses. They were expected to show more self-focusing (EGOCENTR) as well as more interest in others (HUMANI), higher aspirations (WHOLMOV), more passive/receptive thought generally (P) as well as in creative thinking M, MP), more whole human (H) and whole animal (AN) percepts, reflecting both involvement with others and their preference for wholes rather than details.

On the other hand, right-lookers were expected to score higher than left-lookers on the following variables: TANX, SANXI, SANXII, SANXDIFF, D, DD, S, DQO, ZD, EA, FMPM, SHADCPRM, EP, BLENDS, A, MA, ACTPAS, MACTPAS, FC,

LAMBDA, FP, XP, HD, AD, BLENDSR, EB, LEB, COLOR. They were expected, that is, to be more chronically anxious (TANX), to be more subject to anxiety arousal (SANXI, SANXII, and SANXDIFF) and to experience more inner tension (FMPM) and unpleasant affect (SHADCPRM, LEB, and EP), and to exert more control over emotional expression (LAMBDA, FC, and COLOR). Their cognitive operations were anticipated to be more complex (BLENDS and BLENDSR), with greater attention to detail (D, DQO, HD, and AD), utilizing even very rarely noticed detail areas (DD), and better form accuracy (FP and XP). They were expected to overincorporate rather than underincorporate in formulating percepts (ZD), to be more introversive (EB, EA), and to engage in active type thought (A, MA, ACTPAS, MACTPAS). A greater degree of obstinacy or oppositionality was expected, as well (S).

Additionally, a limited number of expectations were held regarding differences between male and female subjects based on the literature discussed in the previous chapter, which suggests that these differences may relate to hemisphericity. It was decided, on that basis to further explore sex differences in the data. Males were expected to score higher on the following variables: S, EGOCENTR, BLENDSR, EB, ACTPAS, and FP. Males are stereotypically seen as more self-centered, oppositional, and cognitively more competent (complex) than females, and more prone to assuming an active rather than a passive mode in both

thought and behavior. Etaugh (1972) found males to have more rightward lateral eye movements regardless of question type, suggesting greater reliance on left hemispheric processing.

Females, on the other hand, were expected to score higher on: HOQ, TANX, SANXI, DQV, SUMC, CF, LAMBDA, AFR, WHOLDET, and C. They are traditionally viewed as more hysteroid in make-up, are expected to be less self-confident and hence more anxious. Davidson and Schwartz (1976) found females to have greater right hemispheric activation when emotionally aroused and they are typically seen as more emotionally responsive as well as more inhibited and unassertive, and given to vague, global perceptions (to the relative neglect of detail).

On the remainder of the variables, the direction of any sex differences was not specified and statistical analyses were exploratory in nature.

Statistical Treatment of the Data

A 2x2 factorial design was utilized, with independent variables being "sex" and "dominant direction of lateral eye movement," as shown in Table 1.

An Analysis of Variance (ANOVA), using the General Linear Model (GLM) procedure of the SAS data processing package, was performed on each of the 53 variables, testing for both main effects of sex and direction of eye movement, as well as for a significant interaction between

Table 1

Distribution of Subjects among the Groups

	Left-lookers	Right-lookers	
Females	12	11	n = 23
Males	11	9	n = 20
	n = 23	n = 20	

them. Eleven dependent variables were examined via a Multivariate Analysis of Variance (MANOVA) using, again, the GLM procedure of the SAS system, to determine whether left- and right-lookers, males and females, and groups differed significantly from each other on these measures. The variables, selected for their importance to the hypotheses being tested, were: EB, DEVQUAL, COLOR, WHOLDET, AFR, LAMBDA, BLENDSR, ZD, EGOCENTR, FP, and HUMANI.

On a supplemental basis, the following additional statistical procedures were applied as they can provide valuable descriptive information, while the above statistical analyses permit greater generalization due to the smaller number of variables involved and constitute a stronger test of the hypothesized relationships.

A Factor Analysis of all available scores from the instruments used (53) was done to reduce these to a smaller number which accounts for most of the variance in the sample. This statistical technique was not used as the primary statistical strategy in the study because, while a limited number of factors might be identified which account for most of the variance, these might not include variables critical to the hypothesized relationships (which might account for only a small proportion of the variance). Nonetheless, some interesting findings relative to the dimensions along which left- and right-lookers differ, were anticipated through examining the data in this way.

A Discriminant Function Analysis was performed upon the 13 major factors obtained in the Factor Analysis to determine what proportion of subjects were correctly classified. These two procedures were also accomplished using the SAS system.

CHAPTER IV

RESULTS

Scoring of Responses

Each subject obtained a total of 53 scores, as follows: one score reflecting degree of hysteroid personality tendency (HOQ); four scores relating to anxiety level (a trait anxiety score, a pre-test and a post-test state anxiety score, and a pre-post-test difference score for state anxiety); forty-eight Rorschach scores representing a variety of variables, ratios, and derivations, as described in Chapter III.

Scoring of the HOQ and anxiety measures was straightforward. A number of problems arose, however, in scoring the Rorschach. These will be briefly summarized here and will be discussed in greater detail in the next chapter where important procedural issues are considered. The Rorschach records obtained from participants in this study were exceptionally long, both in terms of response frequencies and in elaboration of responses. Out of this arose numerous scoring ambiguities which were not readily resolved, despite the encyclopedic nature of the Comprehensive System guidelines. It was, therefore, decided to modify the scoring procedure in a manner most

compatible with the standard scoring procedure recommended by Exner and the first, middle, and last response to each card was taken as representative of each individual's entire protocol. Specific scoring questions concerned, for example, whether scoring of multiple "pair" (unrelated, double percepts, as in "two elephants") responses is appropriate; whether "popular" responses should be scored as such when slightly altered from the norm; whether more than the usual primary and secondary scoring of response contents should be done, given the exceptionally complex, descriptive nature of these responses; whether, and how, color projection and negative responding should be accounted for. The existence of a variety of unresolved scoring issues, the unusual length of the protocols obtained from the sample, and the sampling procedure used to reduce the data mass to a manageable form must be taken into consideration when examining the results of the statistical analyses which will be presented in the next section.

Statistical Analyses

Results of each statistical analysis will be presented in order: Analysis of Variance, Multivariate Analysis of Variance, Factor Analysis, and Discriminant Function Analysis of the factors obtained.

Analysis of Variance

The Analysis of Variance procedure testing for an interaction between sex and direction of lateral eye

movement yielded significant results for 5 variables and a trend towards significance was evident for 3 additional variables. Table 2 shows the means of each subgroup on these 8 variables and it can be seen by inspection that female right-lookers scored higher than male right-lookers, while male left-lookers scored higher than female left-lookers on all of these variables. The differences in mean scores were significant for: DQP ($df = 1$, $F = 4.16$, $P > F = .05$), DQM ($df = 1$, $F = 4.70$, $P > F = .04$), ZD ($df = 1$, $F = 4.63$, $P > F = .04$), EA ($df = 1$, $F = 4.95$, $P > F = .03$), HD ($df = 1$, $F = 5.81$, $P > F = .02$). The trends towards significance appeared for: ZF ($df = 1$, $F = 3.83$, $P > F = .06$), HUMDET ($df = 1$, $F = 3.43$, $P > F = .07$), M ($df = 1$, $F = 2.83$, $P > F = .10$).

Thus, female right-lookers and male left-lookers in this sample produced significantly more high level, organized responses (DQP) than did their counterparts, male right-lookers and female left-lookers. Interestingly, the former two subgroups also produced significantly more responses of poor developmental quality (DQM). They scored significantly more in the direction of over-incorporativeness (ZD), demonstrated greater psychological resources for coping with life stress (EA), and more attentiveness to human-related detail (HD). They tended to be generally more other-oriented (HUMDET), to make more efforts to organize their responses to the inkblots (ZF),

Table 2

Subgroup Means on Variables with an Interaction between Sex and Direction of Lateral Eye Movement

	Subgroup Means			
Variable	Male/Right	Male/Left	Female/Right	Female/Left
ZF	11.78	15.00	14.64	10.92
DQP	6.11	8.00	7.18	4.75
DQM	1.89	4.00	3.46	2.42
ZD	1.44	1.32	2.82	-1.17
M	2.67	4.55	3.09	3.08
EA	6.72	8.32	7.64	5.67
HD	2.22	3.73	3.27	2.17
HUMDET	.48	.61	.64	.47

and to engage in purposeful, controlled, imaginative thought (M).

In contrast, male right-lookers and female left-lookers produced significantly fewer high level organized responses (DQP), but also fewer responses with poor developmental quality (DQM). Male right-lookers scored less high in the direction of over-incorporativeness and female left-lookers actually scored in the direction of under-incorporativeness (ZD). Male right-lookers and female left-lookers showed less available psychological resources for coping with stress (EA) and less attentiveness to human-related detail (HD). They tended to be less other-oriented (HUMDET), less prone to engage in imaginative thought (M), or to make efforts to organize their responses to the ink-blots (ZF).

Testing the remaining 45 variables for main effects of sex and direction of lateral eye movement, the 2x2 Analysis of Variance procedure yielded significant results for 11 variables, with trends towards significance evident on 10. Table 3 shows the group means on all of these variables.

Since directional relationships relative to direction of lateral eye movement were hypothesized for the 45 variables for which an interaction effect had not been found, and since the Analysis of Variance is a two-tailed test, half of the resultant probabilities were utilized in determining the significance of the obtained

Table 3

Group Means on Variables having Main Effects for Sex and Direction of Lateral Eye Movement

	Group Means			
Variable	Male	Female	Right	Left
TANX	40.60	45.78	41.30	45.17
SANXI	30.55	35.96	30.90	35.65
S	3.35	2.39	2.35	3.26
DQV	1.35	1.04	1.50	.91
SUMC	3.90	3.52	4.33	3.15
FMPM	7.50	6.65	8.10	6.13
BLENDS	6.35	4.48	5.75	5.00
MA	2.80	1.91	2.10	2.52
MP	1.45	1.39	1.05	1.74
CF	.75	.39	.50	.61
C	1.10	1.35	1.75	.78
LAMBDA	.59	.84	.71	.74
EGOCENTR	.43	.34	.34	.42
AD	4.00	2.57	3.05	3.39
BLENDSR	.24	.18	.23	.19
EB	-.20	-.44	-.43	.63
COLOR	1.15	.48	.15	1.35

relationships. Left-lookers scored higher than right-lookers on 7 of the 11 variables for which significance or trends appeared. These will be described in the following. It is noted that direction of group differences did not in many cases accord with expectations. Non-significant results were obtained for the remaining 34 variables. Findings regarding the main effect of the independent variable "sex" will be considered separately subsequent to the present discussion on the effect of lateral eye movement.

Differences in mean scores by direction of lateral eye movement were significant in the expected direction for: FMPM ($df = 1$, $F = 2.95$, $P > F = .05$) with right-lookers scoring higher, and EGOCENTR ($df = 1$, $F = 2.98$, $P > F = .05$) with left-lookers scoring higher. Significant results were also obtained, but in the direction opposite of that expected, for: C ($df = 1$, $F = 4.87$, $P > F = .02$) with right-lookers scoring higher, and EB ($df = 1$, $F = 4.13$, $P > F = .02$) with left-lookers scoring higher. There was one trend in the expected direction: MP ($df = 1$, $F = 1.89$, $P > F = .09$) with left-lookers scoring higher. Six trends in the opposite direction to that expected also occurred: TANX ($df = 1$, $F = 1.92$, $P > F = .09$), SANXI ($df = 1$, $F = 2.58$, $P > F = .06$), S ($df = 1$, $F = 2.36$, $P > F = .07$), and COLOR ($df = 1$, $F = 2.47$, $P > F = .06$), all four with left-lookers scoring higher, DQV ($df = 1$, $F = 2.01$, $P > F = .08$) and SUMC ($df = 1$, $F = 2.64$, $P > F = .06$), both with right-lookers scoring higher.

In comparison to left-lookers, right-lookers in this sample appear to have significantly more unmet basic needs which prompt thought/behavior (FMPM) and to be given to unmodulated expression of affect (C). They tend to be more extratensive (SUMC) and efforts at organization more often result in vague, diffuse cognitive/perceptual products (DQV). In contrast, left-lookers appear to have significantly higher self-esteem (EGOCENTR) and introversiveness (EB). They show an inclination towards passive, imaginative thought (MP) and modulated expression of affect (COLOR). Interestingly, they tend to acknowledge more trait anxiety (TANX) and more state anxiety on entering a stressful situation (SANXI), and also appear prone to be more oppositional (S).

With regard to a main effect for sex, directional hypotheses were held for 16 variables for which an interaction effect had not been found. The probabilities obtained with the Analysis of Variance procedure were accordingly halved to determine the significance of the hypothesized directional relationships. For the remaining 29 variables where directional predictions were not made, the usual Analysis of Variance probabilities were utilized.

Differences in mean scores, accounted for by sex of subject, were significant, in the expected direction for: TANX ($df = 1$, $F = 3.33$, $P > F = .04$), and SANXI ($df = 1$, $F = 3.29$, $P > F = .04$), both with females scoring higher,

and EGOCENTR (df = 1, F = 3.20, P > F = .04) and BLENDSR (df = 1, F = 2.81, P > F = .05), both with males scoring higher. Significant differences were also obtained for three additional variables where directional hypotheses were not held: MA (df = 1, F = 4.13, P > F = .02), AD (df = 1, F = 5.16, P > F = .01), and BLENDS (df = 1, F = 3.54, P > F = .03), males scoring higher in all three cases. Two trends in the expected direction occurred on: S (df = 1, F = 2.63, P > F = .06) with males scoring higher, and LAMBDA (df = 1, F = 2.17, P > F = .07) with females scoring higher. There was one trend in the opposite direction from that expected: CF (df = 1, F = 1.64, P > F = .10) with males scoring higher. Nine of the 16 variables with directional predictions yielded non-significant findings.

Males in this sample appear to have significantly higher levels of self-esteem (EGOCENTR), cognitive complexity (BLENDS, BLENDSR), and active, imaginative thought (MA), than the females. Interestingly, females showed a tendency to avoid complex stimuli and to be affectively constrained (LAMBDA). They acknowledged significantly more trait anxiety (TANX) and state anxiety on entering a stressful situation (SANXI), than did male subjects. Males appear significantly more attentive to non-human related detail (AD), and prone towards oppositionality (S), as well as the spontaneous expression of affect (CF).

Multivariate Analysis of Variance

A Multivariate Analysis of Variance was performed to determine whether any of the four subgroups differed significantly on any of a selection of 11 variables initially expected to be critical ones, and to determine whether there was any overall group effect. This procedure yielded no significant results. However, when the data is broken down into the male left-lookers, male right-lookers, female left-lookers, and female right-lookers subgroups, the n size becomes so low that these results must be interpreted with caution.

Factor Analysis

A Factor Analysis was performed using 53 variables to determine whether these could be reduced to a fewer number which would tap the same functions. Thirteen factors were identified which had eigenvalues greater than 1. These 13 factors together accounted for 86% of the variance. Table 4 presents the factors, following a Varimax rotation, including important variables on each factor, along with their respective factor loadings in order of greatest to least contribution to the factor. Variables having a factor loading of 3.5 and higher were included. Also presented in the table is the percent of the variance accounted for by each factor.

The final community estimates are high for all variables, ranging from .64 for DW to .98 for EP, with 40 of

the 52 variables falling at .80 or higher. This indicates that the factors are accounting for all the variance and that no important indices are left out because they do not correlate with any other variables.

The Factor Analysis must be considered exploratory in nature, particularly since so few of the findings from preceding analyses proved significant. Yet the factors which were obtained are of interest, especially when a non-Rorschach variable loads on one, because the vast majority of variables do stem from the Rorschach test. Tentative interpretations can be offered regarding the factors, if one keeps in mind the question of accuracy when considering these. The following interpretations are offered:

Factor 1: GOOD COGNITIVE AND EMOTIONAL FUNCTIONING--this factor appears to reflect good overall functioning as might be shown by an energetic, spontaneous individual with a high need for achievement, who takes pains to organize and integrate and does so effectively.

Factor 2: IMAGINATIVE UNCONVENTIONALITY--this factor appears to reflect a high degree of independence, self-confidence, and ability to think creatively and effectively.

Factor 3: IMPAIRED COGNITIVE AND EMOTIONAL FUNCTIONING--this factor appears to reflect the emotional and cognitive dyscontrol that follows on significant psychological pain and inner turmoil, leading to poor perceptual

Table 4

13 Major Factors Extracted from 53

Dependent Variables

Factor 1		Factor 2		Factor 3	
Variable	Factor Loading	Variable	Factor Loading	Variable	Factor Loading
HUMANI	.90	M	.92	EP	.96
CF	.77	MA	.76	BLENDS	.81
WHOLDET	.74	DDD	.74	FMPM	.80
W	.70	MP	.67	SHADCPRM	.80
WHOLMOV	.70	DQP	.61	BLENDSR	.73
AD	-.64	EB	.60	LAMBDA	-.66
ZF	.56	DEVQUAL	.55	A	.62
D	-.50	EA	.55	P	.50
AN	.41	H	.53	DQP	.43
DD	-.39	A	.45	XP	-.41
DEVQUAL	.38	ZF	.42	DQM	.38
DQP	.37	S	.37	ZF	.37
SUMC	.35	EGOCENTR	.35		
HD	-.35				
Variance Accounted for: 5.61%		Variance Accounted for: 5.73%		Variance Accounted for: 6.10%	

Table 4--continued

Factor 4		Factor 5		Factor 6	
Variable	Factor Loading	Variable	Factor Loading	Variable	Factor Loading
DQO	.77	MACTPAS	.88	C	.86
R	.76	ACTPAS	.82	SUMC	.79
ZD	-.66	MP	-.64	EB	-.64
D	.62	P	-.64	DQV	.61
DEVQUAL	-.49	MA	.50	EA	.60
S	.46	A	.43	DDW	.50
DDW	-.43	S	-.40	EGOCENTR	-.40
DD	.38	Variance Accounted for: 3.36%		COLOR	-.39
LAMBDA	.37			Variance Accounted for: 4.10%	
WHOLDET	-.36				
Variance Accounted for: 3.76%					

Factor 7		Factor 8		Factor 9	
Variable	Factor Loading	Variable	Factor Loading	Variable	Factor Loading
LEB	.84	TANX	.75	AFR	.92
FP	-.64	DQM	.69	CF	.37
HD	.61	DW	.66	Variance Accounted for: 1.52%	
SHADCPRM	-.47	Variance Accounted for: 2.24%			
FMPM	.46				
H	-.37				
Variance Accounted for: 2.97%					

Table 4--continued

Factor 10		Factor 11		Factor 12	
Variable	Factor Loading	Variable	Factor Loading	Variable	Factor Loading
SANXI	-.82	FC	.86	HUMDET	-.83
SANXII	-.75	COLOR	.78	AN	.60
XP	-.51	DDW	-.38	H	-.52
AD	.46	ACTPAS	.36	DD	-.51
R	.35	Variance Accounted for: 2.62%		WHOLMOV	.38
Variance Accounted for: 2.66%				Variance Accounted for: 2.37%	

Factor 13	
Variable	Factor Loading
HOQ	.84
XP	-.40
DQM	.39
Variance Accounted for: 1.71%	

accuracy and emotional lability, despite complex cognitive makeup and effort to organize and integrate (which is, at times, successful).

Factor 4: LEFT HEMISPHERIC PROFILE--this factor reflects many of the salient left hemispheric features: high productivity with detail orientation and lack of organizing effort, rigidity, and restricted affect.

Factor 5: FLEXIBLE AND IMAGINATIVE--this factor appears to reflect the action oriented, imaginative or fanciful thought that occurs in an individual who tends to be relaxed and easygoing, similar to the right hemispheric model.

Factor 6: STABILIZED EMOTIONAL ORIENTATION--this factor appears to reflect a great deal of emotional responsiveness, with little emotional control in an individual who has adopted this as a stable response style. There are overtones of poor self esteem or lack of identity, such as the hysteroid may demonstrate through vague, diffuse type of perception/cognition, with a tendency to jump to conclusions without much substance based on first impressions.

Factor 7: COGNITIVE IMPAIRMENT ASSOCIATED WITH TENSION--this factor appears to reflect the impaired perceptual accuracy which might follow from focusing inappropriately on irrelevant details in relation to other people, because of severe tension.

Factor 8: COGNITIVE IMPAIRMENT ASSOCIATED WITH ANXIETY--this factor appears to reflect impairment in organizing ability with the tendency to jump to conclusions as a result of high levels of chronic anxiety.

Factor 9: HEALTHY EMOTIONALITY--this factor appears to reflect responsivity to emotional stimulation with spontaneous affective display.

Factor 10: ANXIETY CONTROL--this factor appears to reflect effective control of anxiety, likely through productivity and focus on non-other related details, with impaired perceptual accuracy when dealing with emotion.

Factor 11: EMOTIONAL AND COGNITIVE CONTROL--this factor appears to reflect healthy cognitive and emotional functioning in an individual who is able to modulate expression of affect and who engages in active type thinking without jumping to conclusions.

Factor 12: ISOLATED PERFECTIONISM--this factor appears to reflect social disinvolvement with high aspirations and concern with accuracy or conventionality.

Factor 13: HYSTERICAL PERCEPTION--this factor appears to reflect hysterical personality traits along with poor perceptual accuracy, as might be expected from such an individual.

These factors are interesting because they break up the array of Rorschach variables into some unusual aggregates that do seem to make some sense in terms of

aspects of personality/cognitive/perceptual function. Some of the hemispheric and lateral eye movement implications regarding these areas are visible here as well.

Discriminant Function Analysis

A Discriminant Function Analysis was performed upon the 13 factors, obtained from the Factor Analysis noted above, to ascertain whether the four groups of subjects could be differentiated on the basis of the measures constituting the various factors. No overall effect was found for either direction of lateral eye movement, sex, or the interaction of lateral eye movement with sex. However, the Analysis of Variance portion of this procedure did suggest a trend towards significance on Factor 8 (P = .07) which accounts for 17% of the variance among the factors. Factor 8 was labeled "Cognitive Impairment Associated with Anxiety" in the previous section, and included the variables TANX, DQM, and DW. A near significant interaction effect between sex and direction of lateral eye movement appears on this factor (df = 1, F = 3.33, P > F = .08). It also appears that on Factor 10, labeled "Anxiety Control," sex of subject was important (df = 1, F = 3.54, P > F = .07). This factor included the variables SANXI, SANXII, XP, AD, and R. These rather marginal findings do serve to lend further substance to the results of the primary statistical analyses presented in the foregoing where

an interaction between sex and direction of lateral eye movement or a main effect for the independent variable of "sex" was found for numerous dependent variables.

CHAPTER V

DISCUSSION

Results obtained in this study can be summarized as follows: the Analysis of Variance showed left-lookers and right-lookers to be differentiable on the basis of significant differences on 4 Rorschach variables (EGOCENTR, EB, FMPM, C) out of the 48 examined, with trends towards significance appearing on 5 others (MP, S, COLOR, DQV, SUMC) and on 2 anxiety measure scores (TANX, SANXI); males and females were differentiable on the basis of significant differences on 5 Rorschach variables (EGOCENTR, BLENDSR, MA, AD, BLENDS) and 2 anxiety scores (TANX, SANXI), with trends occurring on 3 Rorschach variables (CF, S, LAMBDA); an interaction between sex and direction of lateral eye movement was found on 8 Rorschach variables where significant differences occurred on 5 (DQP, DQM, ZD, EA, and HD) and trends towards significance on 3 (ZF, HUMDET, and M), with left-looking males and right-looking females scoring higher on these variables than did right-looking males and left-looking females; the Multivariate Analysis of Variance on 11 pre-selected Rorschach variables (EB, DEVQUAL, COLOR, WHOLDET, AFR, LAMBDA, BLENDSR, ZD, EGOCENTR, FP, HUMANI) showed no significant group effect for the

subgroups (male left-lookers, male right-lookers, female left-lookers, female right-lookers), but the small n size may be at least partly responsible for this result; Factor Analysis extracted 13 factors from the 53 total variables, which accounted for 86% of the variance; Discriminant Function Analysis on these factors yielded no overall effect for sex, lateral eye movement, or the interaction between sex and lateral eye movement. However, the Analysis of Variance portion of this procedure suggested a trend towards significance on Factor 8 ($p = .07$) in categorizing subjects according to group membership, accounting for 17% of the variance. This is particularly interesting in that a non-Rorschach variable (TANX) loaded on the factor with Rorschach variables (DQM, DW). The factor was labeled Cognitive Impairment Associated with Anxiety. It appears that anxiety plays a significant role in performance on the Rorschach task, with trait anxious persons being more prone to show impaired organizational ability and a tendency to jump to conclusions, perceptually, on the basis of isolated portions of the inkblots. It would be interesting to examine Rorschach data from high and low anxious males and females as they might be expected to produce quite different Rorschach profiles. On Factor 10, Anxiety Control, although itself not a good predictor of group membership ($p = .26$), there was a trend evident for sex, indicating that this rather than

direction of lateral eye movement was more important to the factor.

The right-looking group scored higher than the left-looking group on DQV, SUMC, C, and FMPM, while the latter scored higher on TANX, SANXI, S, MP, EGOCENTR, EB, and COLOR. The first group, hypothesized to be left hemisphere dominant, was expected to show more unmet basic needs (FMPM), which they did. However, they were also expected to show more introversiveness (EB), greater control over affective expression (COLOR), greater oppositional tendency (S), and a higher level of trait anxiety (TANX) and state anxiety (SANXI) prior to administration of the Rorschach, which they did not. Contrary to expectation, the left-looking group, hypothesized to be right hemispheric, scored higher on these 5 variables, as well as showing more self-focusing (EGOCENTR) and more passive/receptive type of imaginative thought (MP), as they were expected to do. It is interesting that the right-lookers scored higher than the left-lookers on spontaneous and unmodulated affective expression (C, SUMC) and on vague developmental organization (DQV). This is diametrically opposed to expectations based on the laterality and perception literature, which suggests that left-lookers (right hemisphere dominant individuals) should demonstrate less emotional control and be given to diffuse, vague perceptions and thought.

Looking at the data by sex, the results are more in line with expectations. Males appeared more oppositional (S), more self-focusing (EGOCENTR), and more complex in their cognitive operations (BLENDS, BLENDSR), as it was anticipated they would. They also appeared more spontaneous in their affective expression (CF), which was not expected, and demonstrated more action-oriented thought (MA) and attention to non-people related detail (AD), for which directional predictions had not been made. Three variables on which they were expected to score significantly higher than females (FP, EB, ACTPAS) showed no sex differences. It is noted that while males scored high on MA, there were no sex differences found for ACTPAS. Thus, males showed more active imaginative thinking, but in terms of the active-passive dimension in thought in general, they did not differ from females. It is interesting to contemplate the possible relationship of this finding to that of cognitive complexity which also characterized males. Perhaps the ability to actively direct and control the thinking process also makes it possible for more sophisticated or elaborate cognition to take place.

Females showed higher trait anxiety (TANX), higher state anxiety (SANXI) prior to Rorschach administration, and greater emotional restraint (LAMBDA), all of which were expected. No sex differences appeared in the data for the following variables, on which females had been

predicted to score higher: HOQ, DQV, SUMC, C, AFR, and WHOLDET. On CF males actually scored higher, contrary to the prediction that females would. It seems from this that in terms of emotionality, females are generally more constricted, males more spontaneous, but both equally prone to loss of emotional control.

Although research findings in the areas of brain laterality, cognition, perception, and personality appear to converge, forming two distinct patterns characterized by a hysteroid personality style with genetically early perceptual and cognitive functioning consistent with the right hemispheric mode of operation, on the one hand, and, on the other, an obsessoid personality style with developmentally more mature perception and cognition consistent with the left hemispheric mode, when left- and right-lookers' Rorschach protocols were compared, no such clear patterns emerged. A number of results were obtained which were either not predicted or which were opposite to what was predicted. These findings are as interesting as they are surprising. Perhaps the sex differences and the interaction effect between sex and lateral eye movement may account for some of the conflicting research results reported in the literature. The failure to find significant relationships between direction of lateral eye movement and certain of the Rorschach variables, where an especially strong relationship had been anticipated (for example, D, W, AFR, ZF, WHOLDET, DEVQUAL, ZD,

LAMBDA, FC, FP, BLENDSR), is puzzling. Some of the factors which may have contributed to this outcome will be examined in the section dealing with procedural issues.

Procedural Issues

A number of procedural issues may have had an impact on the results obtained in this study. These include the modification of the scoring procedure, the method of administration of the Rorschach, the screening of subjects for the study, and the matter of allocation of attention. These issues will be considered in terms of their possible role in the present study. Some implications regarding their importance to future research are also suggested.

Administration and Scoring Problems

One of the most intriguing characteristics of the students participating in this study was their high responsivity to the Rorschach inkblots. They generated dramatically more responses (R) than examination of Exner's norm tables would lead one to expect, despite the fact that standard administration procedures endorsed by the Comprehensive System were conscientiously adhered to.

The average non-patient record, as reported by Exner, is 21.75 responses with a standard deviation of 5.1 (Exner 1978, p. 4). Within this average range (16.65-26.85) fell only 13 of the 43 records obtained in the study. Two fell below average (R = 14 and R = 15) and the remaining 29 ranged from R = 27 to R = 76, nearly

10 S.D. above the mean. The average length Rorschach record obtained was 2 S.D. above the mean, with 37 responses.

An interesting aspect of this responsivity was the tendency for these individuals to develop and elaborate on their responses aloud. This created the initial impression of an even greater number of responses, until it became evident on closer examination that they were merely voicing their thoughts in the process of formulating a response. It was this voluminous, and frequently discursive, nature of the Rorschach data which rendered it unwieldy and ambiguous to score. Consequently, the first, middle, and last response on each card was taken as representative of each individual's entire protocol. (In the case of an even number of responses to a card, the first of the middle two was taken.) This modification of the scoring procedure was elected because more than half of the protocols contained an R value more than 3 S.D. above the mean and because it has been suggested by Exner on the basis of his research that little is gained from such excessively long protocols. He notes that a high R value, such as R = 33, tends to influence some of the proportions and percentages in ways making the profile more difficult to interpret (Exner 1974, p. 234). For example, Exner points out that in giving a high number of responses, subjects exhaust the possibilities for whole responses and consequently give proportionately more D and Dd responses

than occur in a normal length record. The first, middle, and last responses were expected to fairly represent the progression of the individual's productions across the total of his/her record, picking up on any pattern of deterioration in form quality, developmental quality, or use of determinants, which might exist, while at the same time reducing the data mass to a manageable size.

This manner of handling the data could have affected outcome of the study, although it appeared reasonable and most consistent with the basic guidelines of the Comprehensive System. This procedure could have been problematic in that the number of unusual detail areas used by the subject was likely artifically inflated. Another option would have been to score the first three responses, arguing that these represent the individual's most spontaneous and genuine reactions to the blots. However, as more responses are given, the individual's psychological state and mental set evolves such that he may approach the next card in quite a different manner and some measure of that change in attitude should be taken. It is possible, also, that during the process of responding to one card, the individual may show a gradual deterioration in quality of response. In some cases there may be sudden deterioration followed by recovery, or erratic performance. In such cases there is no assurance that the first, middle, and last response will constitute an average measure of

the individual's functioning. It is possible that severely deteriorated responses may have been either completely missed or overly represented as a result of this procedure. Until there is evidence from research showing that selection of a subset of responses results in no appreciable differences in scores, it appears advisable to score all the data obtained from those tested. Not only is it necessary to determine whether a subset of selected responses may result in a substantially different protocol than that based on the full data set, but the question is also raised as to whether the same would hold true for different subsets of scores. It is not uncommon for examiners, particularly in research, to limit number of responses by directive. It would be interesting to compare such protocols with those obtained from the same subjects given no limitations. Additional research to determine whether repeated testing in and of itself produces substantially different protocols would be required. A starting point might be to run the same statistical tests as utilized in this study on the complete protocols from these subjects, testing for significant differences between the two data sets.

Unresolved scoring issues were necessarily settled by judgment call, due to the lack of sufficient research evidence available. Had these questions been answered in another direction, many Rorschach scores would have been different, possibly leading to different results of the

study. Some of the scoring difficulties which arose will be examined here as they raise important questions calling for further research on this instrument.

In the responses involving more than one pair (2), such as "two men here and here," it seems appropriate to account for each pair. However, this appears not to be the general practice and so was not done with this data. Whether or not multiple pairs are counted is important both in reference to the significance of that variable itself and in reference to the Egocentricity Index into which it feeds. If all pairs had been counted for these subjects, the Egocentricity Index (EGOCENTR) would have tended to be somewhat higher, reflecting greater self-esteem.

As a rule, primary and secondary content is scored. Many responses involved numerous contents which seemed equally significant to the response as a whole and it did not seem justifiable to recognize only the presence of two content areas, particularly in the more elaborate percepts. Therefore, all content areas were noted for each response. In terms of the actual scores used in the analysis, this only affected Human (H), Human Detail (HD), Animal (AN), and Animal Detail (AD) categories. What this scoring decision means is that any such contents are accounted for in the H+A:Hd+Ad and the H+Hd:A+Ad ratios, whether they were the dominant contents of a response or merely of peripheral significance. These ratios reflect

attention to wholes versus details and attention to other people, respectively.

Some individuals, after giving several responses to a card, would, in a subsequent response, make reference to a detail utilized a number of responses previously. That detail often was not ingegrated into the new percept but seemed to serve as more than merely a means of locating portions of the current response. No clear solution to this perplexing scoring question was found, but if it was possible to interpret such references as means of locating portions of the blot, this was done.

There were cases of color projection and negative responding where the subject either spoke of the black-grey blots as having color or gave responses such as "well, it's not a ___" and then proceeded, when this was read back to him/her during the inquiry phase, to provide determinants for the percept. In both cases, such responses were scored in the accepted manner (with no account taken of either the experienced color projected onto the blot or of the determinants attributed to the denied response). However, both cases raise important scoring issues in that there is no way at present whereby Rorschach scoring accounts for what likely are significant perceptual/ cognitive processes taking place here.

Numerous other technical scoring questions arose, including whether a reflection response is "meaningfully

related" such that it would be ascribed a Z score, whereas a pair response would not; whether small points of contact are sufficient to consider detail areas to be adjacent ones, which affects the Z value attributed to the response and hence the determination of extraintensiveness versus introversiveness; whether two vague response contents (such as clouds) seen in relationship to each other (such as floating away from each other), is given a developmental quality score of + or v, implying quite different things about the individual's ability to organize his/her percepts. These issues are arguable and further research is required to determine what personality/perceptual characteristics may be reflected and how scoring should proceed, as quite different conclusions may be reached regarding the individuals functioning.

Although there is no clear and apparent explanation for the exceptionally high response frequencies obtained from participants in this study, a number of factors may have contributed to this outcome. Those participating in the study were college students, who, as a class, tend to be more competitive, achievement oriented, and verbal than the general population. They had been phoned from out of state and personally invited by the investigator to participate in the study, with generous financial compensation promised. This may have motivated them, in turn, to try to please the examiner (perhaps a cognitive dissonance effect). On such an unstructured,

ambiguous task as the Rorschach, there are few clues as to what the examiner is looking for and, hence, how to go about pleasing him/her--other than telling what the ink-blot might be. These individuals may have, therefore, sought especially hard to meet that one, clear request made of them.

The issue of administration procedure is also raised. In addition to direct instructions (or lack of instructions) to provide a given number of responses, there are other ways in which productivity may be affected. In the current study, pains were taken to avoid eye contact and to maintain an attitude of business-like disinvolvement, allowing the subject to proceed with the task as free of external influence as possible. Perhaps this approach was too formal, offering the subject no clue whatever as to when a sufficient number of responses has been provided.

Another factor to consider is that these were normal individuals, which makes it inevitable that complexity dominate the picture. Whereas in braindamaged individuals functions are eliminated, making it easier to separate out the roles of the hemispheres in cognition, perception, and behavior/personality (particularly in the case of commisurotomy or hemispherectomy), in normal, fully functioning individuals these roles remain intertwined in a frustratingly, yet fascinatingly intricate manner. Thus,

when the college students applied themselves to the task, not only did they produce huge quantities of percepts, but these were elaborated on and developed into often very complex interpretations of the inkblots.

Subject Screening Issues

In considering characteristics of the participants in the study, one major factor is the screening process by which they were selected. Two highly distinct subject groups were sought: one strongly left hemisphere dominant and one strongly right hemisphere dominant. The role of handedness in the dominance scheme has long been recognized and taken into account in choosing subjects. Right-handers appear to be the most clearly lateralized. Choosing all right-handed subjects increases the probability that their dominance patterns are similar and their cognitive functions distributed in a similar manner, i.e., language lateralized to the left and spatial functions to the right. Differences in neurological organization of the brain unique to certain individuals can still introduce unanticipated sources of variance into the data, however, this would appear to be minimized by such screening.

In this connection, significance of hand posture in writing has only recently been identified. Failure to limit subjects to those being non-hooked right-handers

could introduce mixed dominances into the sample. Screening for hooked handwriting posture would be of greater concern were left-handed subjects used, however. Levy and Reid (1978) were able to find only one person using a right-handed hook posture to balance 24 left-handed hooked writers in their study involving 73 subjects. Thus, it appears that a very small proportion of the population of right-handed people has this characteristic. Screening for hooked handwriting posture among right-handed potential subjects would seem to be of minimal importance and probably did not contribute in any significant way to results of this study.

The other major screening procedure used to select these subjects was that for dominant direction of lateral eye movement. Those individuals showing the most extreme dominance patterns (highest percentage of unilateral gaze shifts on reflective questioning) were selected. While all but 3 of these persons scored at 70% or higher (2 scoring at 67% and 1 at 63%), even these percentages may have been too low to allow the hypothesized differences between groups to appear very clearly. It must be remembered that within the normal, intact individual the left and right hemisphere operate in unison and the influence of each upon the other may camouflage the traits unique to each half of the brain--which appear so clearly in the split brain patients and those with hemispherectomies,

as well as normals subjected to intracarotid sodium amytal injection.

The validity of the conjugate lateral eye movement phenomenon as an index of hemispheric activation can be questioned. Although some of the research literature reviewed in the foregoing does support its use in this way, there are many contradictory findings, as well. As an indicator of hemispheric activation, the phenomenon may be far too simplistic and limited a measure to reflect the sort of brain activity which may occur during the Rorschach task, with its multifaceted cognitive and perceptual aspects. lateral eye movements may constitute but a minor element in a much larger cognitive/perceptual process. The lateral eye movement phenomenon may, indeed, reflect concurrent activation of the contralateral hemisphere, but does it necessarily follow that the strategy of that hemisphere continues to be used throughout the task at hand? What is to disallow a switch in strategy at any given point in the process, even immediately following the initial reaction? It has already been proposed by numerous researchers that optimal and normal brain function requires flexibility in using both hemispheres, as required by the particular task. Possibly normal individuals alternate between hemispheric usage in unpredictable ways, perhaps rapidly and repeatedly, in attempting to resolve a difficult, multifaceted problem.

Although research findings presented in earlier sections do show rather clear and consistent differences between left- and right-lookers in terms of cognitive, perceptual, and personality style variables, based on initial eye movement, these are not entirely consistent findings. Method of measurement and task demands have been questioned more than once in cases of unclear or contradictory results, as witness the study of Ehrlichman et al. (1974). Ehrlichman et al. found initial gaze shifts reliable only for the vertical dimension, not for the horizontal dimension which the majority of other studies have found. The effect of verbal/spatial question type is hereby challenged and Ehrlichman et al. note that there is no theory which might account for the presence of vertical shifts and linking that phenomenon to cognitive processes. These investigators utilized video recording and face-to-face conditions with essentially similar results. They suggest the differences between their findings and those of other researchers may be due to procedural and methodological differences or differences in population characteristics (such as degree of field dependence). The entire matter of dominance, thus, appears complex and it seems unlikely that a single measure, itself not perfectly consistent (as the eye movement phenomenon is not), could adequately reflect what must also often be a mixed bag.

The effect of anxiety or stress upon lateral eye movement direction further complicates the process of accurately assessing hemispheric activation, even were this proven a good measure for that purpose. The Rorschach is generally considered an anxiety arousing test, in that the inkblots are ambiguous and testees are given little structure to guide them in responding to the blots. Some individuals may find the experience considerably more or less anxiety arousing than do others. Further, due to the nature of the blots, some of them may be experienced as more anxiety arousing than others, so that anxiety level may fluctuate throughout the test in response to blot sequence. The lateral eye movement phenomenon is a gross measure, not sensitive to such fluctuations in anxiety to the extent that it could adequately reflect hemispheric activation during other activities than the measurement of lateral eye movements itself.

Distribution of attention plays an important role in connection with the eye movement phenomenon. Day related inward and outward directed attention to the presence and absence of anxiety, for example. Perhaps attention is also a critical variable on a more basic level. What appears to be activation of a dominant hemisphere might actually represent 'interference' to an individual attempting to attend to a different mode, so that whatever virtues it might have for solution of a

particular problem are lost, due perhaps to inattention or lack of facility with the strategy inherent to that hemisphere. Using a given operational mode may not necessarily mean one is using it well and thereby achieving one's cognitive goals.

It would appear that this eye movement phenomenon may not, for a variety of reasons, provide an accurate assessment of hemispheric dominance. However, it is at present the best measure available for use in this type of research. Given the difficulties inherent to it, the lateral eye movement phenomenon must be used with discretion and results from such research interpreted with care.

The Question of Sex Differences

Results of this study emphasize further the need to examine males and females separately in regard to hemispheric lateralization and cognitive style. Although there is disagreement as to whether males or females are the more differentiated in hemispheric representation of functions, it is clear that sex differences do occur in a number of functional areas which relate to hemisphericity: males are typically more field independent than females, who have greater difficulty disembedding figures from a complex background (e.g., Witkin 1950); when emotionally aroused, males show more bilateral, and females more right, hemispheric activation (Davidson &

Schwartz 1976); males preferring to sit on the right side of the classroom ascribe to more psychopathological symptoms than do those preferring the left side of the room, while the reverse holds for females (Gur, Sackheim, & Gur 1976); males show more clear and consistent lateral eye movements than do females, more right lateral eye movements as opposed to more bidirectional lateral eye movements as shown by females (e.g., Duke 1968; Bakan 1971). This latter observation has led some to view males as less integrated in their cognitive/perceptual processes than females who are seen as both more integrated and less differentiated. For males to be less integrated and predominantly right-looking implies a strong reliance on the left hemispheric mode, while females (supposedly more integrated and less differentiated) must either have developed both left and right hemispheric modes equally well or be functioning at an impaired level in both modes. The HOQ scores for females somewhat supports this idea in that they showed greater variability than did the males. The former type might be expected to have developed the obsessoid traits and perceptual/cognitive characteristics to a greater degree while others might show relatively more hysteroid traits and less mature perceptual/cognitive functioning. It would be most interesting to explore this angle further, perhaps selecting females on the basis of extreme differences in field

dependence and/or bi-directional versus unidirectional lateral eye movements, then comparing their Rorschach protocols in the manner of the present study, particularly in terms of variables shown here to reflect sex differences between left- and right-lookers. One might expect the less integrated female to approximate the typical male protocol if both indeed are relatively less integrated. If these females show a predominance of right eye movements as the males would be expected to do, they might also be expected to demonstrate the left hemispheric type of cognition/perception with, for example, fewer vague wholes, fewer organized responses, more blends. Another possibility would be for less integrated females to fall into the hysteroid/right hemispheric camp with the opposite characteristics, or, more likely, to split as a group between these two types.

Directional tendencies in the Rorschach data from the present study suggest sex differences between left- and right-lookers which require further exploration. Left-looking males and right-looking females did provide more whole responses, although not significantly so, and organized their responses more often than did right-looking males and left-looking females. Their developmental quality scores showed more pluses, but also more minuses, and somewhat more vagues, while right-looking males and left-looking females gave more common detail

responses and received more ordinary developmental quality scores. Left-looking males and right-looking females tended in the direction of overincorporativeness while their counterparts tended towards underincorporativeness. The former were more cognitively complex than the latter, tended to engage in more action-oriented thinking, to be more readily taken up by the complex and ambiguous, and had more organized/usable psychological resources with which to cope with life stress. They also showed poorer perceptual accuracy when affectively aroused. These findings indicate it may be necessary to use more circumscribed groups of subjects in order to obtain clearer differences in patterns of Rorschach scores. It appears likely that there are variables exerting a differential impact upon males and females resulting in their dissimilar performance. Once these are identified and screened for, perhaps the proposed left versus right hemispheric styles will emerge. Specifically, the data suggest that distinct patterns on the measures used in this study may only become evident when subjects are grouped by similarities on more variables than sex and direction of eye movement. The more all-encompassing the range of hypothesized relationships, the more crucial it becomes to have homogeneity within each group of subjects. This is in line with Foulds and Caine's suggestion, discussed earlier, that more than a single dimension or

level of personality is involved. With each additional dimension, the influence of one upon the next becomes even more subtle and difficult to deduce. The higher the level of integration, the greater the complexity in the relationship of component parts. Cognitive, perceptual, and personality styles are each highly complex aggregates of simpler functions; when integrated into a more comprehensive, overall style comprised of cognitive, perceptual, and personality substyles, the complexity of the system geometrically increases. The relationship between lateral eye movement and cognitive style may not be a straightforward one, given these complexities in organization.

Related Issues and Research Possibilities

The findings of this study raise more questions than they answer, suggesting numerous possible avenues for further research. Some of these will be mentioned briefly here.

The direction of lateral eye movement has been noted to reverse under stress (Day 1964; Bakan 1969, 1971; Gur 1975; Gur, Gur, & Harris 1975; Kinsbourne 1974). It would be interesting to establish typical direction of eye movement then to manipulate anxiety level through administration techniques with the Rorschach itself. Rorschach performances of left- and right-lookers subjected to high and low anxiety levels could be compared. One would

expect to find evidence of a reversal in cognitive/perceptual mode. It would also be illuminating to record EEGs during the Rorschach administration to assess actual activation of left and right hemispheres.

The lack of significant differences between W and D responses and between under- and over-incorporation in this sample is particularly puzzling, as these are hypothesized as salient features of the right and left hemispheric profiles. Modification of the scoring procedure may account for this and it would be important to check that possibility by statistical analysis of the complete protocols. Significant findings would confirm the need to utilize all data provided by the subject.

All groups obtained an unusually high frequency of S scores. The reason for this might be their status as college students, typically concerned with independence issues, but other conditions or personal variables might also account for this finding, as might the elevated response frequencies. The S variable should be considered in relation to frequency of m (inanimate movement) in the record. The m variable reflects the extent to which the individual feels a loss of control. It may vary with the level of induced anxiety. One shortcoming of the present study is that not all of the individual Rorschach variables were included in the analysis and one of those left out was m. There would be many more inter-relationships

amongst the variables which could be examined and perhaps further clarify the significance of the high S frequency if they were included.

More than 100 individual scores can be extracted from the Rorschach protocol. A factor analysis of all 100 or more possible Rorschach scores would certainly be of interest. Likewise, a pattern analysis of such a complete set of protocols might be accomplished. This, while not strictly a statistical technique, would provide a means of identifying important groups of subjects based on similarities in the configuration of their scores. If all possible Rorschach variables were considered, these research techniques might lead to some interesting information.

Males and females, left-lookers and right-lookers, all scored in the hysteroid direction on the HOQ. One wonders whether this might reflect a cultural or societal influence, or perhaps be age-related. It aligns with poor form quality and poor developmental quality in Factor 13, which is consistent with right hemispheric perceptual tendencies, suggesting immaturity. The fact that females were more variable than males in HOQ scores may reflect both underdevelopment and overcompensation amongst females. This would be consistent with the traditional female stereotype contrasting with the more modern image of women as independent, capable, aggressive, etc.

It is peculiar that while all groups tended to be generally unresponsive to emotionally toned stimulation and to modulate expression of affect, females appeared the more controlled and right lookers the most prone to lose control over affective expression. Women have typically been viewed as emotional and men as unemotional by society. This finding contradicts that stereotype. Right hemispheric types are expected to be more emotional, more histrionic, yet these results show the left hemispheric individual to have less control. This could be understood in terms of the left hemisphere's proneness to overcontrol, with occasional lability when that coping style fails to function effectively.

Although the findings obtained in this study provide limited support, overall, for the hypothesis that brain lateralization underlies an integrated cognitive/perceptual/personality style, this does not rule out the possibility of such a relationship. It does suggest that an unknown number of other critical influences also enter the picture, affecting performance on the Rorschach task. It appears reasonable to expect to find neurological structure underlying individual differences in the separate functional areas of concern to this study and uniting each of these areas into a distinctive functioning style that incorporates complementary personality, cognitive, and perceptual features. It also appears

reasonable to expect these differences to result in distinct patterns of scores on the Rorschach, given the extensive and thorough research which has been done on that instrument, particularly by Exner (1974, 1978) and Exner et al. (1976), supporting relationships between the various variables, ratios, percentages, and derivations of the Comprehensive System and certain cognitive, perceptual, and personality characteristics. The various screening, administration, and scoring issues which remain unresolved at this time, however, dictate that these be first addressed and resolved, and that the question then be reexamined.

Finally, it is noted that results of this study may be partially accounted for by the use of normal subjects who may not have responded to the test instruments or demonstrated the effects of anxiety in ways typical of pathological groups, the latter having been utilized in the bulk of research in these areas. Results of such research may apply more to pathological subjects, or perhaps to the most extreme of normals. The construct of lateral eye movement as an indicator of hemispheric preference and cognitive style may be far too simplistic and limited a measure by which to ascertain hemispheric activation/preference in light of the extensive and rich array of Rorschach variables to be delineated in terms of cognitive, perceptual, and personality style.

APPENDIX

LATERAL EYE MOVEMENT SCREENING QUESTIONS

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1. Envision the keyboard of a typewriter. In which corner of the keyboard is the letter "p"?
2. Tell me how you feel when you are anxious.
3. What is meant by the proverb: One today is worth two tomorrows?
4. Visualize and describe the most upsetting photograph of the Vietnam war that you have seen.
5. What is the primary difference between the meanings of the words mischief and malice?
6. Make up a sentence using the words code and mathematics.
7. If you were crossing a street from west to east, and a car coming from the south smashed into you, which leg would be shattered first.
8. Imagine a rectangle. Draw a line from the upper left hand corner to the lower right hand corner. What two figures do you now have?
9. Imagine that you are relaxing in hot sulfer baths looking westward over the Pacific Ocean in California on a clear, sunny day. Your friend is peacefully resting with his back toward your right side. Approximately what direction is your friend looking out over?
10. Visualize the Prudential Tower in Boston and the United Nations building in New York and tell me which one is taller.
11. Make up a sentence using the words shock and sadness.
12. What is the primary difference between the meanings of the words recognize and remember?
13. For you is anger or hate a stronger emotion?
14. Envision walking through your house or apartment and tell me how many doors there are.
15. Picture the last automobile accident that you have seen. In which direction were the cars going?
16. Do you use the word logical or rational more often?
17. What is meant by the proverb: the more cost, the more honor?
18. When you visualize your father's face, what emotion strikes you?
19. On the face of the quarter does the face of George Washington look to the left or right?
20. Tell me how you feel when you are frustrated?

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