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Affect, Cognition and Attention in the Chronic Alcohol Abuser: A Hemispheric Laterality Perspective

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AFFECT, COGNITION AND ATTENTION IN THE CHRONIC ALCOHOL ABUSER: A HEMISPHERIC LATERALITY PERSPECTIVE

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This Dissertation submitted by Edward P. Kehrwald in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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Signature Edward P. Kelsrwald

Date 1-7-87

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This is dedicated to my family: Chris, Adam, and Emily.

I want to take the calculated risk,
To dream and to build,
To fail and to succeed.
- G. Bland

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ABSTRACT

The present study investigated the performance of chronic alcohol abusers and controls on attention, memory, cognition, and emotion from a hemispheric laterality perspective. The purpose of this study was to explore the relationship between these variables and their role in processing of experiences. Measures which are believed to be predominantly a function of the right hemisphere were explored in some depth.

The subjects in the experimental group were chronic alcohol abusers recently admitted to an inpatient addiction facility. The subjects in the control group were volunteers from the community who did not have any significant alcohol problem. Only right-handed males were used as subjects. The subjects in the experimental group were matched with controls on age and years of education. Their ages ranged from 21 to 63 years.

The chronic alcohol abusers differed significantly from controls on cognitive and personality measures, primarily, with other significant differences on memory subtest performance. Chronic abusers showed deficits in abstracting, sequencing, and general memory functioning. They also presented themselves significantly differently than controls on personality characteristics measured by the Minnesota Multiphasic Personality Inventory. Though the chronic abusers did not fit typical personality profile types that other investigators have described, the chronic abusers reported more depression, anger, anxiety, physical

complaints and irritability than did controls. Controls, however, were somewhat guarded.

There were no significant differences between groups on attentional bias measures, even those right lateralized, or on emotive imagery. Additionally, the more depressed alcohol abusers did not perform differently than those less depressed on right lateralized tasks. The chronic abusers with extensive drinking histories did not show visuospatial performance deficits as had been hypothesized. Also contrary to prediction, chronic abusers were not significantly defensive on personality measures as compared to controls. This investigation did provide evidence for the effects of alcohol upon specific cognitive, memory and affective features and did suggest that the detoxification process extends longer than once believed.

CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

There is continued interest in research which investigates the effects of excessive, chronic alcohol consumption upon individuals and which seeks to clarify the dynamics of the alcohol abuse process. The cognitive, affective, and personality functioning in the individual who chronically abuses alcohol were the focus of study in the current research project. Such aspects of cognitive, affective and personality functioning reviewed in sections below were examined from a hemispheric laterality perspective. This perspective attempts to clarify the interrelationship between cerebral hemispheric operations and the processing of experiential information. Alterations in processing of experiential information and other physiological, psychological, social-interpersonal, legal, and financial consequences of chronic alcohol consumption represent a major problem in the United States. This problem affects at least 10 million people who are "alcoholic," and affects numerous others due to an estimated 200,000 alcohol-related fatalities per year (NIAAA Third Special Report to Congress, 1978).

Alcohol abuse is defined as a pattern of disruptive use of alcohol (for example, failure to control usage, blackouts, drinking despite a medical condition) that results in an impairment in occupational or social functioning. Both criteria must exist for at least a one month duration (American Psychiatric Association, 1980). For the purposes of

the present study, chronic alcohol abuse was defined as above but for a period of at least one year and significant enough that the individual entered treatment. This definition described the minimum amount of alcohol abuse for the experimental subjects in the current study.

The purpose of the current study was to examine the relationship between cognition, memory, and attention and affect, personality, and defensiveness. While past research had investigated each area separately, and often with only one group of subjects, alcohol abusers versus nonabusers, the current study investigated many performance areas using a group of chronic alcohol abusers and a group of controls who did not abuse alcohol. In addition, the current investigation provided a neuropsychological laterality perspective. It is possible from a laterality perspective to compare what is known from the assessment of brain disordered and psychiatric populations on test performance in the areas of cognition, memory, attention and affect to the test performance of chronic alcoholic abusers in these same areas. At the same time, it is useful to review the theoretical conceptualizations from the laterality perspective to evaluate its application to alcohol abuse research in order to further understand the effects of alcohol upon functioning. This laterality perspective had been employed more recently in investigations of cognitive, memory and visuospatial performance but had only been utilized infrequently in investigations of affect, personality and attention. A number of common descriptors of chronic alcohol abusers noted in alcoholism research such as denial, defensiveness and impulsivity were also reviewed from a neuropsychological laterality perspective.

The literature review below was derived from alcoholism, neuropsychology, and personality research for each of the topic areas investigated. The deficits associated with chronic alcohol abuse, as it pertains to cognition, affect and personality, are reviewed first. Next, hemispheric specialization is reviewed as it pertains to cognition, affect, personality and attention.

Deficits Associated with Chronic Alcohol Abuse

Neurophysiological Functioning

There were two common methods for investigating the type and location of brain impairment believed to be a result of alcohol abuse which were reviewed: the direct examination of cortical pathophysiological effects of alcohol, and the indirect examination through the study of neuropsychological deficits that commonly appear among abusers (Bolter & Hannon, 1980).

Pathophysiological studies used findings from pneumoencephalograms (Tumarkin, Wilson, & Snyder, 1955), autopsy (Courville, 1955), electroencephalograms (Brewer & Perrett, 1971), computerized tomography (Carlen, Wortzman, Holgate, Wilkinson, & Rankin, 1978; Golden, Graber, Blose, Berg, Coffman, & Bloch, 1981), and regional cerebral blood flow (Altura, Altura, & Grebrewald, 1983; Bergland & Ingvar, 1976). These studies provided evidence for cortical atrophy in the frontal area (Brewer & Perrett, 1971; Bergland & Ingvar, 1976; Courville, 1955) as well as in the parietal area of severe chronic alcohol abusers (Brewer & Perrett, 1971; Tumarkin, Wilson, & Snyder, 1955). Ventricular enlargement, particularly in computerized tomography studies, had been reported frequently as evidence of subcortical atrophy (Carlen,

Wortzman, Holgate, Wilkinson, & Rankin, 1978; Courville, 1955; Fox, Ramsey, Huckman, & Proske, 1976; Golden et al., 1981; Graff-Radford, Heaton, Earnest, & Rudikoff, 1982). The regional cerebral blood flow work of Bergland and Ingvar (1976) indicated a significant reduction in such cerebral blood flow in the anterior temporal and inferior frontal regions in older alcoholics as well as a successive decrease in mean hemispheric cerebral blood flow with advancing age of chronic alcoholics.

The prevalence of left hemisphere dominance in a subpopulation was another general indicator of neurophysiological functioning. Evidence suggested that for chronic alcohol abusers there was an unusually high incidence of persons who were right hemisphere dominant as noted by handedness, eye preference, and cognitive style. This change in response preference from right to left in how an individual responds on tasks is known as a shift in laterality. Bakan (1973) found an excess of left-handedness among alcohol abusers relative to the general population while Nasrallah, Keelor, and McCalley-Whitters (1983) found an unusually high number of alcohol abusers who were ambidextrous or had left eye preference. Left eye preference is the eye preferred for processing incoming stimuli as in the situation when different stimuli are simultaneously presented to different areas of the visual fields. Two other groups of researchers had found evidence of a left to right laterality shift also in patterns of cognitive style. Sandel and Alcorn (1980) measured lateral eye movements of chronic alcohol abusers and found 68 percent had left lateral eye movements to questions suggesting a preference for right hemisphere processing of information; right hemispheric preference was associated in males with defenses of repression

and denial, reports of psychosomatic illness, and behavioral problems (Day, 1967).

Impairment in Cognition

Intellectual Functioning. Examination of neuropsychological deficits has revealed cognitive impairment of persons who chronically abuse alcohol (Ryan & Butters, 1983). The cognitive areas explored in Ryan and Butters' study (1983) included general intelligence, learning and memory, abstract reasoning, and visuoperceptual organization. Chronic alcohol abuse did not result in general intellectual performance deficits on intelligence tests like the Wechsler Adult Intelligence Scale (WAIS) (Bauer & Johnson, 1957; Goldstein & Shelly, 1971; Halpern, 1946; Malerstein & Belden, 1968; Wechsler, 1941, 1958). Even the most extreme chronic abusers who have suffered vitamin deficiency resulting in the amnesic Korsakoff syndrome scored within the normal range on the WAIS, although the memory quotient from the Wechsler Memory Scale was clearly impaired (Butters, 1979). Also, although the chronic excessive users produced WAIS fullscale scores within the normal range, there were subtest scores on the WAIS suggesting subtle cognitive deficits in visuoperception and visual sequencing as measured by Object Assembly and Digit Symbol Substitution on the WAIS (Butters, 1979).

Learning and Memory. The evidence regarding the performance of chronic, excessive users on tasks of learning and memory suggested that some types of learning and memory were impaired by excessive usage. Riege, Holloway, and Kaplan (1981) found that length of heavy drinking, and subject's age were significant predictors of chronic alcohol abusers' memory performance on visual, auditory and faces recognition

tasks. The faces recognition task consisted of matching 30 names to 20 pictures of prominent persons. Items in the visual task were 10 geometric patterns shown to subjects tachistoscopically prior to being shown later along with 30 other distractor patterns. Subjects were required to identify the target items (saying yes or no) when they were presented intermingled with the distractor items. On the auditory task, 8 bird calls were presented once to chronic alcoholics and after a brief delay the calls had to be recognized twice when presented in a 32 item series with distractor bird calls. Recovering alcoholics also showed quick improvement of verbal memory on WAIS Comprehension subtest as the duration of the abstinence lengthened (Yohman, Parsons, & Leber, 1985). However, they initially had more pronounced deficits on perceptuomotor and visual memory functions than on other cognitive tasks upon abstaining. They recovered these functions more slowly than tactual recognition of shapes and recognition of words in a list (Riege, Holloway, & Kaplan, 1981) and digit span or verbal paired associate learning (Yohman, Parsons, & Leber, 1985).

Memory and Visuoperceptive performance were compared in three groups of detoxified alcoholics (Butters, Cermak, Montgomery, & Adinolfi, 1977). There were 47 long-term alcoholics (10 or more years of alcohol abuse), 15 short-term alcohol abusers (less than 10 years of abuse), 9 Korsakoff alcoholics, and 28 controls. On the short-term memory task, consonant trigrams were presented to subjects who subsequently counted backward as a distraction. After varying periods of delay, the examiner asked subjects to recall the three letters. The stimuli items were administered two ways, orally and visually. The Korsakoff subjects were impaired under both types of presentations.

The long-term and short-term alcoholics were identical on the oral presentation. The short-term alcoholics did not perform differently from controls on the visual presentation but the long-term alcoholics did perform significantly differently. These four groups of subjects were tested on a semantic encoding task, also. A list of eight words containing two words from four semantic categories (e.g., animals, vegetables) was read to subjects. The subjects were required to recall words under a free recall condition and under a cued recall condition. Prior to recall, either a one minute delay or no delay was implemented. The results showed Korsakoffs were not aided by cuing in either delay condition. It also showed no significant differences between the two chronic alcoholic groups and the controls in their use of semantic encoding. The authors noted that failure to find verbal memory deficits between the two groups of chronic alcoholics was likely due to lack of task difficulty. In a follow-up study using a short-term memory task of word triads as stimuli and a longer delay between presentation and recall (from 18 to 36 seconds), the long-term alcoholics showed impairments on this task.

Visuospatial Functioning. The ability to process spatial information was disrupted in those who chronically abuse alcohol (Tarter, 1975). They showed problems in spatial synthesis, which is the ability to organize spatial elements to form a percept as on the WAIS Block Design (Claeson & Carlsson, 1970; Fitzhugh, Fitzhugh, & Reitan, 1965; Goldstein, Neuringer, & Klappersack, 1970). Another spatial capacity category often assessed is spatial orientation. Tests require the subject to judge stimulus properties when either the stimulus is rotated to various positions as in the Figure Classification Test, or when the

subject is under a condition of body rotation, as in the Rod and Frame Test. Alcohol abusers tended to be categorized three-fourths of the time as field-dependent, relying upon contextual cues to orient themselves (Karp, Witkin, & Goodenough, 1965; Witkin, Karp, & Goodenough, 1959).

According to Butters (1979), chronic abusers without amnesia, non-Korsakoff alcohol abusers, had been reported to have visuoperceptive and visuospatial deficits (e.g., visual scanning and sorting of complex visual stimuli) similar to those observed in alcoholic Korsakoff patients. A common visual scanning task is the timed WAIS Digit Symbol Substitution test in which the subject must find the appropriate symbol associated with a digit from a key at the top of the answer form to insert in the box below rows of random digits on the answer form. The visuoperceptive sorting of complex stimuli investigated subjects' tendency to use only superficial cues in facial recognition, such as through clothing paraphernalia or facial expression, rather than using more advanced cues based upon configuration of the face. On this visual sorting task, facial matching, the subject was given a card with one target face at the top and two comparison faces at the bottom. The subject then had to select the correct comparison face (Diamond & Carey, 1977). Other scanning tasks included embedded figures in a complex background. The Korsakoff patients were also impaired on digit-symbol tasks, embedded figure tests, and on various tests that required the sorting of complex visual stimuli. Jarho (1973) suggested these disorders may be due to atrophy around limbic structures near the third ventricle; but other research

suggested it was most likely that they were due to atrophy of cortical association areas (Parsons, 1975).

Psychomotor Speed. Chronic abusers were found to be deficient on tasks which required perceptuomotor speed and dexterity, such as dexterity in finger tapping and on pegboard tasks (Kish & Cheney, 1969; Tarter & Jones, 1971). Finger tapping required the subject to press a key attached to a counter with an index finger as quickly as possible in a certain time interval, such as 10 seconds. On a pegboard task, the subject was to place metal pegs into holes on a form board one peg at a time as quickly as possible. Bender (1938), Kaldegg (1956), and Vivian, Goldstein, & Shelly (1973) all found such visuomotor performance deficits.

Cognitive Flexibility. Tests of cognitive flexibility and abstraction, reflecting conceptual capacity, indicated that chronic abusers had difficulty specifically in maintaining a concept and in flexibly shifting cognitive set (Jones & Parsons, 1971; Klisz & Parsons, 1977; Tarter, 1971, 1973). One of the most common types of tasks measuring cognitive flexibility used was the Wisconsin Card Sort (Berg, 1948). In this task a subject sorted cards from a pack to match one of four stimulus cards that varied on dimensions of color, form, and number of elements. After a subject made 10 correct responses, the experimenter changed the sorting criteria.

Summary. Theories summarizing deficits in cognition of alcohol abusers and deficits associated with frontal and right brain dysfunction were provided by Gudeman, Craine, Golden, and McLaughlin (1977). They concluded that cognitive deficits in alcohol abusers are related to an inability to integrate the dimensions of space and time. Their

factor analysis of neuropsychological test scores for alcoholics and controls produced five factors: a) spatial conceptual skill, an ability to conceptualize spatial configurations for structuring new data; b) associative conceptual skill, a capacity for maintaining a verbal concept and associating it to other concepts; c) flexibility, an ability to adapt responses to a changing task; d) spatiotemporal motor skill, an ability to integrate motor responses involving speed; and e) serial integration, an ability to integrate new verbal or sensory data into a sequential continuum. In their analysis of data from neuropsychological tests, the first factor, spatial conceptual skill, accounted for 55 percent of the variance with the spatial element of the factor predominating in all procedures. They hypothesized that alcoholics are impaired on tasks requiring an ongoing integration of space-time in the immediate situation, that is, changes in behavioral responses based upon immediate perceptual feedback. Previous well-rehearsed patterns and verbal skills in their results were less impaired, except for fluency of verbal associations.

Impairment in Affect and Personality

To understand changes in affect caused by or related to alcohol abuse, one must also consider that emotions are a consequent of an individual's level of arousal and that both are a factor in an individual's personality style (Schacter, 1970). Arousal depends upon brainstem and thalamic activating systems (Valenstein & Heilman, 1979). Additionally, there are visceral changes mediated by the hypothalamus that accompany emotions; the hypothalamus is strongly influenced by the limbic system, a system which has pathways with the frontal lobes.

Historically there had been very little research assessing the effect of chronic alcohol abuse upon emotion since there were very few individual measures to assess emotionality. Measures of emotion had been incorporated into measures of personality. Personality as a construct generally refers to relatively enduring patterns of behavior called traits, behavioral tendencies, or interaction characteristics. Such trait dimensions in personality tests frequently included characteristics of activity level, defensiveness, sociability and impulsivity in addition to emotionality.

Assessment of Emotionality. Emotionality is defined psychologically as a susceptibility to become easily and intensely distressed (Buss & Plomin, 1975). Affect is the expression of emotion. Physiologically, emotionality can be defined as excessive autonomic lability (Tarter, Alterman, & Edwards, 1985). In the review by Tarter et al. (1985), the authors were quick to note that there was a high degree of association between physiological hypersensitivity and psychological instability as noted in Eysenck's (1973) research. They reviewed studies yielding physiological evidence that among alcoholics, alcohol stimulated persons low in sympathetic reactivity as measured by galvanic skin responses to cold-pressor noxious stimuli (Kissin, Schenker, & Schenker, 1959), and increased arousal levels as measured by changes in heart rate subsequent to alcohol consumption (Docter, Naitoh, & Smith, 1966). Kissin, Schenker, and Schenker (1959) obtained data on three groups of male alcoholics on numerous physiological measures which suggested baselines that were not within normal limits; however, subsequent to consumption of one milliliter of alcohol per kilogram of body weight, these alcoholics' measures approached levels of the

controls. This led the researchers to hypothesize that alcoholics were drinking to "normalize" psychophysiological activity. Naitoh (1972) reviewed evidence suggesting alcohol in alcoholics produces changes on physiological measures reflective of contrasting excitement and relaxation, as noted by high amplitude slow alpha electroencephalograms, elevated hand temperature, accelerated heart rate and increased visual scanning.

Tarter et al. (1985) reported that psychological emotionality, noted by above-average levels of affect on psychological testing, was vulnerable to the effects of alcohol. Tarter (1982) found that people who developed alcoholism early in life scored significantly higher on the neuroticism scale of the Eysenck Personality Inventory (EPI) than people who developed alcoholism later in life. Rosenberg (1969) found that alcoholics under age 30 scored higher on the neuroticism scale than alcoholics over age 30. Tarter and his colleagues (1985) discussed anxiety level and intense reactions to stimulation (stimulus augmenting) as additional covariates of emotionality. They provided evidence that alcoholics are stimulus augmenters (Barnes, 1983; Petrie, 1967), stimulus seekers (Costello, 1981; Rydelius, 1983) and anxious (Barnes, 1983; Gromberg, 1982; Rosenberg, 1969).

Assessment of Personality Characteristics. Common personality profile types of chronic alcohol abusers were reviewed. The relationship between personality and consumption variables was also explored. A variety of personality assessment techniques had been used in the identification and treatment of alcoholics (Neuringer & Clopton, 1976) but the Minnesota Multiphasic Personality Inventory was the most widely used measurement (Clopton, 1978).

A brief description of MMPI scales referred to in this section are as follows (Graham, 1981): Scale 2 (Depression) assesses dysphoria, withdrawal, psyhomotor retardation, and poor morale; Scale 4 (Psychopathic Deviate) assesses antisocial conduct, sexual problems, family problems, conflict with authority, and social poise; Scale 7 (Psychasthenia) assesses obsessive thoughts, fears, insecurity, and compulsion; Scale 8 (Schizophrenia) assesses thinking disturbances such as delusions or hallucinations, social alienation, family conflicts, difficulties in concentration and impulse control, and dissatisfaction; and Scale 9 (Hypomania) assesses elevated mood, accelerated motor activity, grandiosity, gregariousness, and low frustration tolerance. In addition to frequent peak elevations of either scale 2 or 4 on the MMPI of alcohol abusers, scales 7, 8, and 9 are often secondarily elevated.

One procedure utilized in describing the personality characteristics of alcohol abusers was through their group average MMPI profile. These studies reviewed by Clopton (1978) have most frequently shown profiles with the highest scores on scales 2 and 4. Nearly all of the frequently occurring highpoint pairs on the MMPI's of alcohol abusers included either scales 2 or 4.

Other studies reported diverse or distinct MMPI profile types of alcohol abusers. One common profile with elevations on 2, 7, and 4 was found by Whitlock, Overall, & Patrick (1971), Goldstein and Linden (1969), Marks and Seeman (1963), and Gilberstadt and Duker (1965). Whitlock et al. (1971) found four profiles in their sample: one with elevation on scale 2, one with an elevation on scale 4, and two with elevations on sales 2, 4, and 7. This suggested to them that there

were two basic groups of alcohol abusers in their treatment population. One group consisted of persons characterized as sociopathic, with poor impulse control and whose moderate drinking led to antisocial behavior; the other group could be characterized as depressive-neurotic persons who misused alcohol to a greater extent but without problems in society because of better impulse control and less underlying hostility. In his review, Hoffman (1976) also noted that alcoholics in treatment produced profiles elevated on scales 2 and 4 with additional elevations on 7, 8, or 9. Such findings were interpreted in terms of neurotic depression, sociopathy, and neurotic anxiety. Again it was noted that primarily depression and anxiety are the two most commonly reported affects in the subpopulation of alcohol abusers.

There were several longitudinal studies regarding the effect of alcohol on affective and personality features as measured by the MMPI. Hoffman, Loper, and Kammeier (1974) and Kammeier, Hoffman, and Loper (1973) examined prealcoholic, pretreatment MMPI profiles and treatment MMPI profiles for a group of males who were initially tested while attending college. Alcoholics scored higher at time of treatment on anxiety, depression, anger and resentment but did not show such elevations on their prior MMPI which was completed an average of 13 years previously. While the profile patterns on the pretreatment MMPIs did not approach significant levels on clinical scales, these patterns were similar to the more elevated treatment MMPI profiles. They showed, however, similar underlying characterological patterns on their treatment and pretreatment MMPI's. Based upon the treatment MMPI's, the authors described the profile as reflecting a self-centered, immature,

dependent person who had difficulty in facing reality (Kammeier et al., 1973).

The research by Whitlock et al. (1971), mentioned above in the review of two-point MMPI personality types, defined characteristics like impulsivity, inhibition, agitation, and irritability for persons in these alcohol-abusing groups. These were the same characteristics which Tarter, Alterman, and Edwards (1985) described in chronic alcohol abusers from a psychophysiological perspective through their temperament descriptors of emotionality, sociability and soothability. Both sets of characteristics implicated probable disturbances in arousal regulation. These features were important in the hemispheric laterality perspectives of personality reviewed below.

Generally, the personality characteristics of alcoholics were defined by the most frequently appearing MMPI profiles or by the group average profile. While this approach to the description of characteristics was primarily useful in the therapy or treatment of individual alcoholics, it has not greatly improved the understanding of the process of alcoholism or of the effects of alcohol on personality functioning. This approach also does not offer many suggestions for predicting which individuals may be more susceptible to alcohol or to the addiction process. The categorization of subjects into MMPI profile types clearly suggests that different types of patient groups exist (Clopton, 1978; Nerviano, McCarty, & McCarty, 1980; Wanberg & Horn, 1983), and that the severity of alcohol abuse appeared related to the degree of psychopathology. Since there were different types of patient groups as noted by MMPI personality profile types and since the degree of psychopathology varied with severity of alcohol abuse, it was

important to define the behavioral functioning of patients in order to establish appropriate expectation for treatment intervention, both to maximize utilization of treatment resources and to maximize patient recovery.

Personality and Consumption Pattern. Nerviano, MaCarty, and MaCarty (1980) found differences between MMPI types when they examined consumption variables and psychiatric history from outpatient alcohol abusers. Outpatients with a 278 profile and an 842 profile reported the highest intake of alcohol, 9.3 and 7.2 ounces per day, respectively. Both groups of alcohol abusers reported previous experience with psychotherapy, job loss, anger control, tremors, loss of interest, loss of memory, and a higher frequency of daily drinking. Persons with a 278 profile have reported features that include depression, anxiety, obsessions, and poor concentration. Persons with an 842 profile were characterized by social aloofness, anger, impulsive or poorly planned behavior, and emotional lability. These observations suggested that the severity of alcohol dependence or abuse was related to personality characteristics.

The alcohol treatment literature mentioned symptoms of denial, impulsivity, confabulation, anxiety, and affective lability associated with chronic alcohol abuse. The MMPI and other personality measures provided a self-description by the alcohol abuser of cognitive-emotional styles, that included self-protective defense mechanisms like denial, repression, and intellectualization. Cognitive styles related to the nature of these defenses and it was shown that alcoholics as a group were more field dependent, more dependent upon situational or background cues than upon cues from a predominant figure, than controls

(Sugerman & Schneider, 1976). Chronic alcohol abusers and other field dependent persons tended to use global defenses such as repression and denial; they were also likely to be passive, dependent, and hysterical (Witkin, 1965). Some chronic alcohol abusers also showed MMPI evidence of repression and denial, as previously noted.

Theories Regarding Neurophysiological Effects of Alcohol

A proposal that chronic abusers have nonspecific, generalized cerebral atrophy (Chafetz, 1967) received little support from neuropsychological test studies. Common significant symptoms in diffuse cerebral atrophy as noted by Brosin (1967) included memory impairment, disorientation to place and time, clouded consciousness, impaired WAIS IQ, and poor capacity to make judgments. While excessive alcohol use was associated with some types of memory impairment in chronic abusers, there was no evidence for such extensive, pervasive loss of intellectual function as measured by intelligence test fullscale scores.

Evidence for specific brain dysfunction derived from data on deficits in the memory capacities of chronic abusers and was particularly pronounced for visuospatial functions and for some serial learning tasks (Tarter, 1975). The visuospatial tasks included measures of visual scanning, attention to configural cues and sorting of complex visual stimuli such as on Block Design, Digit Symbol Substitution, Rod and Frame Test, Matching Faces, and Embedded Figures. The serial learning tasks involved learning a list of words in a particular order. Impairment was found on the Benton Visual Retention Test (Bergland & Sonesson, 1976; Page & Linden, 1974) and on verbal serial learning tasks (Weingartner, Faillace, & Markley, 1971). Collectively, the

neuropsychological evidence from intellectual and memory test results provided support for specific versus general damage as noted above (Tarter, 1975).

Another explanation to account for the pattern of observed deficits proposed that chronic abusers exhibit behavioral decrements suggestive of relatively greater right hemisphere impairment (Jones & Parsons, 1971; Parsons et al., 1972). This hypothesis received substantial support from neuropsychological data. Abusers consistently showed lower WAIS Performance IQ relative to Verbal IQ (Wechsler, 1941) and this inferiority on performance scale scores was indicative of a right hemisphere disorder (Vega & Parsons, 1969). Furthermore, alcohol abusers showed spatial performance deficits on visuospatial perception and integration, such as in Matching Faces and Block Design. These deficits were similar to spatial deficits observed in patients with right hemisphere lesions (Claeson & Carlsson, 1970; Goldstein et al., 1970; Karp et al., 1965; Witkin et al., 1959). For example, they exhibited other characteristics similar to those found in patients with right hemisphere lesions such as denial and minimizing of their problem (Kellerman, 1979). Chronic abusers showed greater degree of impairment with their left hand, which is controlled by the right hemisphere, though right hand performance was equivalent to that of nonabusers (Parsons et al., 1972). Poorer left ear (right hemisphere) dichotic memory performance was also observed with chronic abusers (Goodglass & Peck, 1972). Additional support for the lateralized effects of alcohol was derived from research on patients with alcoholic Korsakoff Syndrome and from patients with unilateral neglect of their left side due to right hemisphere damage. Patients with years of alcohol abuse showed

various impairments indicative of right hemisphere dysfunction. They had deficits on a task which required them to find visual patterns or objects which were embedded in a distracting background (embedded figures task) (Kapur & Butters, 1977). These patients showed deficits in sorting complex visual stimuli, where irrelevant details were added as distractors to visual stimuli (Oscar-Berman & Samuels, 1977) and deficits in their ability to select or match a picture given along with other pictures to a target picture (facial matching) (Diamond & Carey, 1977). The severe chronic alcohol abusers showed deficits in processing of difficult discriminations to numerical stimuli presented dichotically, discriminations requiring processing of simultaneous auditory input (Glosser, Butters, & Samuels, 1976).

Denial of problem severity and confabulation have long been noted as characteristic of chronic alcohol abusers (Tarter, Alterman, & Edwards, 1985; Zangwill, 1966). These performance difficulties and symptoms observed for chronic alcohol abusers and Korsakoff patients were similar to performances observed for patients with right hemisphere lesions. The patients with right lesions also showed the following characteristics: denial and indifference to their problem (Critchley, 1966; Gainotti, 1972; Heilman, Schwartz, & Watson, 1977) and inability to match a stimulus face to one of several alternatives (Benton & Van Allen, 1968). In addition, such patients show constructional deficits with patterns on blocks or with reproduction from models (DeRenzi & Faglioni, 1967); and disorientation in ambulation or the inability to find one's way around the environment (Benton, Levin, & Van Allen, 1974). All of the above evidence suggested that the right hemisphere may be differentially vulnerable to the effects of alcohol.

Another explanation proposed by Tarter et al. (1985) suggested a multifactor behavior-genetic model to account for the available evidence on functional deficits of alcoholics. They suggested that alcoholics are genetically more predisposed to alcohol and its effects due to a multiple gene expression as the alcohol abuser interacts in the environment. This interaction results in the manifestation of behavioral outcomes noted in the research above and places offspring of alcohol abusers at risk for developing a significant alcohol problem. Such offspring were predisposed for developing a problem which could trigger a vicious cycle of disregulation and exacerbation of relative weaknesses once they initiated a pattern of alcohol abuse. The behavior-genetic theorists proposed forebrain and midbrain dysfunction to account for the following impairments: regulatory mechanisms relevant to arousal, motivation and emotion; planning; abstraction; persistence; problem-solving; homeostatic regulation pertaining to exploratory and consummatory behavior; and monoaminergic levels related to emotional elation and sensation-seeking. Patients with Korsakoff's syndrome were found to have damage in the limbic diencephalic regions (Meissner, 1967; Talland, 1965). Autopsy results by Courville (1955) showed the most damage to be in the anterior frontal lobes. EEG measures also indicated frontal lobe atrophy (Brewer & Perrett, 1971). Computerized tomography findings showed that alcoholics develop brain atrophy and the findings correlated with impairment on behavioral measures believed to tap frontal lobe functioning (Graff-Radford, Heaton, Earnest, & Rudikoff, 1982). Graff-Radford also reviewed radiographical evidence for cerebral atrophy in alcoholics. Damage to the frontal-limbic-diencephalic systems could explain several performance

difficulties noted in chronic abusers such as their inability to persist, to plan, to organize, and to regulate or modulate behavior. A summary was provided in a review by Tarter et al. (1985).

A hypothesis suggested by Goldman (1983) was that the behaviors of alcohol abusers parallel those of aging nonabusers. One cannot be sure that the underlying neuropathological processes for aging are the same as those for chronic alcohol abuse, though this notion of premature aging can be applied descriptively to the chronic abusers. It is useful to note the performance similarities for their heuristic value in understanding commonalities of underlying functions. It is known that deficits are more readily apparent in older alcohol abusers (Goldman et al., 1983; Jones & Parsons, 1971). The data suggested there may be a critical age predisposing the aging brain to effects of alcohol and to detoxification from alcohol.

An additional explanation by Tarter (1985) suggested that chronic alcohol abuse may be linked to minimal brain dysfunction (MBD), a clinical syndrome with symptoms of hyperactivity, dyslexia, distractability, aggressiveness, and antisocial behavior (Tarter, 1976; Tarter et al., 1985). He also noted that many alcoholics were hyperactive as children and that many hyperactive children have alcoholic parents. Tarter reviewed the evidence to suggest that since MBD may be a precursor to other clinical disorders, there may be common neurobehavioral mechanisms in MBD, alcoholism, sociopathy, depression, and hysteria.

Summary of Deficits Related to Alcohol Abuse

The evidence suggested that chronic alcohol abusers have impairments in specific brain sites which produce performances on

neuropsychological tests at levels found in nonalcoholics 10 years older (Noonberg, Goldstein, & Page, 1985). These performance decrements, when compared to the performances of alcoholic Korsakoff patients and right hemisphere lesioned patients suggested a relatively greater right hemisphere than left hemisphere impairment for chronic alcohol abusers. Other research evidence indicated that frontal, limbic, and diencephalic systems are affected by chronic alcohol abuse. These are systems important to functions of cognition, emotion, arousal and inhibition. Any dysfunction in all or part of such systems would be expected to have some effect on the overall personality functioning of an adult individual.

The research on aspects of emotion and personality was less definitive than research in the neurophysiological and cognitive areas. For alcohol abusers, there was evidence for increased levels of affect such as anxiety, depression, and hypomania. There was evidence that other subpopulations of chronic alcohol abusers are impulsive, indifferent, and antisocial or nonconformists.

The evidence suggesting greater right hemisphere involvement and that suggesting frontal, limbic, and diencephalic involvement is important when considering research to be reviewed below which relates hemispheric lateralization to differential cognitive and affective performance. Neuropsychological impairments resulting from alcohol abuse are likely to be associated with cognitive and affective changes which in turn may alter the abuser's personality functioning.

Hemispheric Specialization

Neurophysiological Functioning

An introduction to the concept of cerebral lateralization is necessary to understand the functional differences between the cerebral hemispheres. An understanding of cerebral lateralization is important since the research on alcohol abuse implicated right hemisphere dysfunction and frontal lobe dysfunction. Too, there is substantial support that the hemispheres are differentially specialized for processing information or experiences. Osmon, Golden, Purisch, Hamneke, and Blume (1979) provided a useful synopsis of cerebral lateralization in their article on diagnosis of lateralized cerebral dysfunction. They summarized right hemisphere functioning as associated with left-body motor and sensory functions, spatial ability, musical ability, and elemental receptive verbal skills. They noted that left hemisphere functioning was associated with right-body motor and sensory functions, coordinated motor activities, verbal processes, and rhythmic and spatial abilities related to verbal functions.

Substantial credit for our current understanding of the function of the brain hemispheres is attributed to Roger Sperry and his colleagues (Sperry, Gazzaniga, & Bogen, 1969). They assessed the relative contributions of each hemisphere in persons who surgically received corpus collosum disconnections to control their epilepsy. Since their earlier studies, much research has been devoted to assessing localized functioning within hemispheres, among both brain damaged and control subjects using various assessment techniques including: psychometric tests (Tyler & Tucker, 1982), lateral eye movements (Schwartz,

Davidson, & Maer, 1975; Tucker, Antes, Stenslie, & Barnhardt, 1978), neuropathology (Alexander, 1941; Courville, 1955), electroencephalograms (EEG) (Flor-Henery, 1974; Gruzelier & Venables, 1974), carotid sodium amytal injections which sedate one cerebral hemisphere (Milner, 1967; Terzian, 1964), computerized axial tomography (CAT) scans of the brain to determine abnormalities (Golden, Graber, Blose, Berg, Coffman, & Bloch, 1981; Graff-Radford, Heaton, Earnest, & Rudikoff, 1982) and cerebral blood flow (Bergland & Ingvar, 1976). The results of this research are important to the understanding of general personality functioning. The hemispheric laterality theory provides a model for understanding how particular deficits or localized brain dysfunction may affect personality traits and corresponding results on personality tests in alcohol abusers.

The research reviewed below on differences in the structure and functioning of the cerebral hemispheres provides evidence of how the brain differentially operates through the use of these two cerebral subsystems.

Cognitive Functioning and Hemispheric Specialization

Left Hemisphere. Based upon studies of brain damaged individuals, those with damage to the left hemisphere showed deficits in fluent verbal output and repetition on verbal tasks (Benson, 1967; Benson & Patten, 1967). Dichotic listening techniques were used to present simultaneous verbal material, which required the subject to differentially perceive information by attending to one auditory channel. The results suggested that persons with left temporal lobe damage show significant performance deficits on processing verbal data (Kimura, 1967;

Sparks & Geschwind, 1968). Gazzaniga and Sperry (1967) investigated left hemispheric involvement in language by presenting words and letters to persons having their corpus callosum severed and found the left hemisphere dominant for verbal tasks. EEG alpha waves in normals, a measure of hemispheric idling, were stronger over the right hemisphere on verbal tasks (Galin & Ornstein, 1972). This indicated the right hemisphere was relatively inactive for this task. Evoked potentials, a measure of brain activity, were higher over the left hemisphere in normals when speech sounds were presented (Morrell & Salamy, 1971). Both studies suggested that the left hemisphere is involved in processing verbal information. Ablation or lesion of the left temporal area, particularly near the hippocampus, resulted in impairment on recall of prose passages and in learning word pairs (Gerner, Ommaya, & Fedio, 1972) as well as impairment in numerical sequencing on a digit sequence task (Milner, 1971).

In comparing the performance of musicians and nonmusicians on analysis of the structure of melodies, Bever and Chiarello (1974) found that discrimination was better in the right ear (left hemisphere) for experienced listeners. The music was presented to subjects in either the right or left ear, only. They interpreted the results to imply that the left hemisphere is dominant for analytic organization of melody structures in experienced listeners.

Tactile recognition of the size and shape of objects and localization of right-side stimulation of the body is a function of the left parietal lobe as reconfirmed in a study by Roland (1976). In his study, subjects with lesions in the left postcentral gyrus region showed performance deficits on size and shape discrimination when

objects were placed in their right hand. The left parietal lobe facilitated the processing of verbal material presented visually to the right visual field (Benson, Segarra, & Albert, 1974) and facilitated comprehension of words denoting spatial relationships (Benson & Wier, 1972).

The left frontal area facilitated an individual's ability to direct actions through verbally mediated instructions and to plan a course of action (Luria, 1966; Zangwill, 1966).

In summary, the left hemisphere controls right side motor and sensory functions, verbal processes, and verbally mediated rhythmic or spatial abilities.

Right Hemisphere. The right hemisphere showed superiority of performance in the following areas: spatial, visual, facial, and musical perception (Benton & Van Allen, 1968; Bogen, 1969; Ornstein, 1978; White, 1969) in addition to processing of nonverbal, visual information (Patterson & Bradshaw, 1975).

The right temporal lobe was important for aspects of nonverbal recognition and memory. Milner (1967) administered the Seashore Measure of Musical Talents to subjects with right temporal lobectomy and their results suggested a marked deficit of tonal memory with frequent errors while those with left temporal lobectomies showed no performance deficits. Other research suggested that the temporal lobes are concerned with the integration of visual experiences with sensory information from other modalities (Walsh, 1978). Patients with right temporal lesions had difficulty in recognizing objects when shown incomplete pictorial representations of such objects and deficits in recognizing anomalies in pictures, for example, anomalies like paintings hanging on a wall of an animal's house (Milner, 1958). Patients

with left temporal lesions did not show such deficits. Lansdell (1968) reported right temporal lesions led to poor performance on visuo-spatial reasoning, for example, Picture Arrangement on the WAIS, as compared to patients with left temporal lesions.

The right parietal lobe was significant for tactile functions of the left side of the body and the ability to detect objects with the left hand. It was also involved in recognition of shapes, faces and angle of lines in space (Hecaen & Angelergues, 1962; Piercy & Smyth, 1962).

Data from Walsh's (1978) study showed that the right occipital lobe receives projections of visual information from the left side of both the right and left visual fields with color perception believed to be near the Calcarine fissure of this lobe. Several studies yielded performance deficits for subjects with posterior parietal-occipital lesions on visual localization between stimuli items (Ratcliff & Davies-Jones, 1972) and on line orientation in space (Hannay, Varney, & Benton, 1976). Subjects in these experiments stated whether the position of two sets of stimuli presented on cards were the same or different.

Patients having right frontal lobe lesions had performance deficits on visuoconstructive tasks, building three dimensional block structures and copying from designs (Benton, 1968). This was in contrast to patients with left frontal lesions who showed no such deficits on these tasks but did on the timed Word Fluency test, where they had to generate words beginning with a specified letter. The frontal lobe plays a role in the planning of visual sequences.

These findings support the notion of right hemisphere specialization for analogical, spatial, musical, and imagery functioning whereas the left hemisphere is specialized for verbal, analytical information processing. Each hemisphere has a form of functioning and organization (Lansdell, 1967; Semmes, 1968; Tucker, 1981) providing alternate ways of cognitively managing information and responses to the environment.

The left hemisphere is associated with verbal, logical, linear cognitive operations for the serial processing of information (Cohen, 1973). With such capacity for differentiated, analytic modulation of processing, there is the expectation of the left hemisphere's expression of emotion to be verbal and detail oriented (Tucker, 1981). The right hemisphere has a significant role in visual-spatial processing of elements to form whole constructs, an integrative processing of information. A review of the right hemisphere's role in processing of nonverbal information as it pertains to the reception and expression of emotion follows below.

Emotion, Personality and Hemispheric Specialization

Subjects used for research regarding the differential hemispheric representation of emotional processing have primarily included patients with unilateral brain lesions, psychopathological groups (affective disorders), and non-brain injured persons undergoing mood inductions.

Unilateral Lesions and Sedation. Our understanding of the ability to comprehend emotions derived from studies of the effects of unilateral lesions, epilepsy, and sodium amytal injections to each of the cerebral hemispheres. Wechsler (1973) showed that damage to the right hemisphere impaired story recall ability when the story contained

emotional content. Likewise, right lesioned patients had difficulty judging emotional tone in a speaker's voice (Tucker, Watson, & Heilman, 1976) and judging the emotional mood of the speaker (Heilman, Scholes, & Watson, 1975). Individuals with right damage also had difficulty expressing emotional tone in their normal voice inflections (Ross & Mesulam, 1979). The result of a study by Flor-Henery (1976) suggested a strong relationship between right cortical functions and subcortical processes; he found that each case of orgasmic epilepsy reported in the literature had a right hemisphere EEG focus. The focus of the temporal lobe seizure was determined by electroencephalographic monitoring of spontaneous seizure activity arising out of subcortical areas and spreading to cortical regions.

Generally, groups of persons with unilateral lesions on opposite sides of the brain showed contrasting moods. Sackeim & Weber (1982) reported that those persons with right side damage showed an indifferent-euphoric reaction characterized by an unusually placid or carefree mood, social disinhibition, and inappropriate humor or puns. These authors also reported in their review that left side lesions were accompanied by a dysphoric reaction characterized by anxiety, despondence, social withdrawal, and self-reproach.

One study exploring hemispheric asymmetry of affective processing did find that subjects with left hemisphere lesions had elevations on MMPI scale 2 (Depression scale) when contrasted with subjects having right lesions; the subjects with left lesions also reported anxiety, depression and self-reproach as evidenced by a 287 configural MMPI pattern (Gasparrini, Satz, Heilman, & Coolidge, 1978). Black (1975) also reported differential MMPI test results in patients with

unilateral brain damage; right damaged patients had a MMPI profile characteristic of an indifference reaction with all scales within normal limits, while left damaged patients had a profile consistent with a catastrophic response, with MMPI scales 8, 2, and 3 elevated. However, a study by Dikmen and Reitan (1974, 1977) did not find differential effects of lesion laterality on such relevant MMPI scales as depression, anxiety or schizophrenia. Gainotti (1972) found that right lesions were accompanied by indifference, joking and minimization of deficits, while left lesions were accompanied by a reaction characterized by an agitative-depression. In a study of left temporal lobe epileptics (Bear & Fedio, 1977), subjects rated themselves more negatively and critically, while they were rated by others as invested in moralistic ideation reflective of a self-critical, intropunitiye style. Right lobe epileptics in the same study did not rate themselves as disturbed though they were rated by others as more severely disturbed and more external in their emotional displays. Other right damaged patients showed reduced concern and denial about their deficits (Bear, 1983).

Psychiatric Disorders. Neuropsychological evaluations were administered to various groups of individuals having psychiatric diagnoses. From these results, there was a trend for a particular form of psychopathology to be associated with hemispheric dysfunction. A primary finding was that left temporal lobe dysfunction was associated with schizophrenia (Bingley, 1958; Davison & Bagley, 1969; Taylor, 1975). Neuropsychological test data with schizophrenics (Flor-Henery, 1974, 1976) indicated a left frontotemporal dysfunction. Other evidence for left temporal dysfunction in schizophrenics derived from

electrophysical studies by Gruzelier and Venables (1974), who found asymmetry in hand skin temperature responses and from auditory task performance (Gruzelier & Hammond, 1976). Schizophrenics were found to have an overactive left hemisphere as noted in an EEG spectral analysis study (Serafetinides, 1972) and in another EEG spectral analysis study (Flor-Henery, 1976).

Other research with patients having affective disorders suggested right hemisphere dysfunction. Yozawitz et al. (1979) found patients with affective disorders performed on dichotic listening tasks in a manner that was similar to the performance of right lesioned patients, namely, poor left ear performance on a dichotic speech test, the Staggered Spondaic Word Test. Also, greater right hemisphere dysfunction was associated with a tendency for patients to report less severe symptoms (Bruder & Yozawitz, 1979), which the authors suggested was a tendency for patients to deny their problems. Two groups of researchers found neuropsychological test evidence for right hemisphere dysfunction in depressives and corresponding evidence for improvement in test performance, especially visuospatial performance, subsequent to administration of Electroconvulsive Therapy (ECT) (Goldstein, Filskov, Weaver, & Ives, 1977; Kronfol, Hamsher, Digre, & Waziri, 1978). There was also evidence that frontal lobe functioning contributes to emotion. For example, higher levels of brain wave activity in the anterior right hemisphere were associated with more depressed affect while symptoms of anxiety and obsessiveness were associated with left frontal activation (Perris & Monakhov, 1979).

Noninjured Controls. Right handed normal subjects were studied to determine the nature of hemispheric activation, as measured by EEG,

associated with depression (Tucker, Stenslie, Roth, & Shearer, 1981). A depressed mood was induced through suggestion prior to subjects working briefly on an arithmetic and imagery task. The EEG results indicated asymmetrical activation in the frontal lobes such that there was relatively greater activity over the right frontal area as noted by alpha desynchrony.

Conjugate lateral eye movement (CLEM) methodology has also been used along with EEG methodology to investigate hemispheric processing of emotion. During investigations using CLEM, the investigator observed the immediate lateral eye movements of the subjects subsequent to various questions or tasks asked of the subject. Direction of CLEM was used as indicator of activation and processing for a cerebral hemisphere, as in the case where left CLEM was an indicator of right hemisphere processing (Schwartz, Davidson, & Maer, 1975). Through the use of CLEM methodology, research results showed right hemisphere processing of emotional content to questions provided to noninjured controls (Schwartz, Davidson, & Maer, 1975), right hemisphere processing of reflective questions by hysterics (Smokler & Shevrin, 1979) and right hemisphere processing by persons utilizing repression as a hysteric cognitive style (Gur & Gur, 1975). Psychopathic behavior was associated with left hemisphere operations and neurotic symptoms with right temporal lobectomy (Taylor, 1972). The traditional finding of lower verbal IQ in males with psychopathic behavior and females with hysteric problems was used as an explanation by Flor-Henery (1974) that such behavior is related to dominant left hemisphere dysfunction.

In neurologically intact persons, the right hemisphere was more active in the following manner: processing of emotional content

(Schwartz, Davidson, & Maer, 1975); in the recognition of facial and emotional aspects of pictures (Ley & Bruden, 1979); and in judging emotional content and tone of voice in auditory passages (Safer & Leventhal, 1977). Thus, there is research to support the view that some aspects of emotion are processed by the right hemisphere. While differentially lateralized contributions exist for specific emotive and cognitive functions, there is growing evidence to suggest that there are also lateralized contributions at higher-order levels of personality organization, involving some associative integration of cognition and emotion into a personality style.

Laterality and Personality

Anxiety-laden, catastrophic, "schizophrenic-like" reactions in brain damaged and psychiatric persons were associated with left hemisphere involvement while despondent, hysteric, and indifferent reactions were suggestive of right hemisphere involvement (Bear & Fedio, 1977; Black, 1975; Bruder, Sutton, Berger-Gross, Quitkin, & Davies, 1981; Bruder & Yozawitz, 1979; Davison & Bagley, 1969; Flor-Henery, 1969; Gainotti, 1972; Gruzelier & Hammond, 1976). Research with normals reflected the same basic findings as with the above two subpopulations, with the left hemisphere involved in anxious, catastrophic reactions and the right hemisphere in hysteric reactions. These alternate subsystems routinely interact to enable individuals to process information and handle emotionally arousing situations.

Individuals developed a characteristic array of cognition, affect, and experience which then regulated the type of information gathered, amount of information gathered, the style of processing used, and the

ultimate behavioral responses (Shapiro, 1965). Shapiro pointed out distinctions between the obsessive-compulsive and the hysteric personality. The obsessive-compulsive utilized a style similar to that used by persons with a left hemispheric mode of functioning while the hysterical style was similar to that used by persons with a right hemispheric mode of functioning.

Tucker and Williamson (1984) also commented upon evidence which suggested that an obsessive cognitive style in normals was reflected in left hemisphere activation. The personality descriptions and compulsive patterns noted among some alcohol abusers (e.g., the MMPI 278 subtype) are consistent with this obsessive cognitive style.

The dichotic listening, EEG, and CLEM test performance data for individuals with right hemisphere lesions was similar to that for individuals with affective disorders and right lobe epilepsy; in contrast, the test performance data for individuals with relatively greater left hemisphere involvement was similar to that of persons with left lobe epilepsy and left lobe hemispheric lesions. There is thus some evidence for consistency in performance and functioning related to personality organization and hemispheric utilization.

Personality and Hemispheric Utilization

The evidence presented suggests that the hemispheres are specialized for different cognitive and affective experiences. Bogen and Bogen (1969) proposed that the hemispheres work together on every experience, but Nebes (1974) suggested that the task demand determined which hemisphere differentially responds and suggested that the hemisphere most suited to the task responds. Ornstein (1978) suggested that the

individual is also free to exert his will in choosing what way he will respond. The personality theory proposed by Ornstein suggested that hemispheric cognition and affect were interrelated and that hemispheric selection was the result of the individual's past learning and genetic formulation.

Activation, Performance, and Cognition and Emotion

Tucker (1981) reviewed strong evidence from laterality studies indicating that emotion and cognition were differentially represented within the two hemispheres. Both emotion and cognition were affected by the type of activation present which in turn affected performance. Likewise, performance also affected emotion and cognition. It becomes important to relate the performance outcomes on personality and laterality measures to an individual's level of activation, which is determined in part by two arousal systems.

There are two arousal systems, reticular and limbic. The limbic system seems to regulate the organism's immediate orientation to stimulus input while the recticular system is involved in the activation of higher cortical functions facilitating readiness to respond. These two neural networks have tracts to the hypothalamus where critical interactions between systems can occur. The research of Goldstein and others (Goldstein, Filskov, Weaver, & Ives, 1977) suggested that arousal systems, at least those involved in the regulation of cortical activity, were lateralized in the human brain and they exerted distinct modulatory effects on an individual's information processing strategies, as observed in depressed patients who showed poor right hemisphere performance (Goldstein et al., 1977).

The lateralized neural systems played a role in the self-reward processes (Herbert, Stephens, & Franklin, 1976). Initial alcohol intake increased norepinephrine, as measured by metabolite levels of norepinephrine, and such increases of norepinephrine corresponded to mood variations in endogenous mania and depression (Jones, Maas, Dekirmenjian, & Fawcett, 1973). Such depression is one of the commonly observed features of alcoholism noted from personality assessment.

Summary of Hemispheric Specialization

The cerebral hemispheres are specialized in their function as suggested by the extensive body of research reviewed above. The right hemisphere is associated with left-body sensory and motor functions, spatial ability, visual memory, musical perception and basic verbal skills related to nonverbal communications. It appears to be particularly vulnerable to effects of depression when individuals experience affective disorders, though lesions there are associated with disinhibition, indifference and euphoria. The left hemisphere is associated with right-body sensory and motor functions, verbal receptive and expressive processes, verbal memory, analytical thinking, math skills, and verbally mediated praxia. Left hemisphere lesions or insult is accompanied by dysphoria, anxiety, and self-reproach. Schizophrenic-related thought disorders are also correlated with left hemisphere dysfunction.

Basic arousal processes produce simultaneous activation of emotive and cognitive processes which are often lateralized in the human brain. This arousal and cognitive-emotive interaction also affects personality dimensions and the overall resultant behavior. Consequently, it is

necessary in research on the effects of chronic alcohol abuse to view the personality variables and performance outcomes from a perspective which takes into account the differential contributions of the hemispheres and the individual's level of arousal in order to understand cognitive-emotional functioning.

Purpose of the Study

Overview

The purpose of the present investigation was to explore the relationship between cognition, memory and attention and personality, affect, and defensiveness of chronic alcohol abusers. A group of persons who did not use alcohol excessively were used as controls, matched with the alcohol abusers on age and education. Particular consideration was given to the lateralized contributions of the cerebral hemispheres to such functioning and characteristics.

Specific aspects of cognitive performance, depression and anxiety, attentional performance, denial and defensiveness, and imagery were explored in depth to determine alcohol's effect upon hemispheric processing, particularly for right lateralized tasks. In addition, chronic alcohol abusers' performance on tasks of imagery, attention, and visuospatial processing were analyzed by level of depression and extent of drinking history.

Performance on right lateralized tasks is of interest since alcohol is a depressant and depressed persons have been shown to have some right hemisphere dysfunction, at least among psychiatric subject groups. Test results have suggested that alcoholics have performance deficits particularly for perceptual visuospatial tasks (WAIS, Block

Design and Digit Symbol; WMS, Visual subtest), for integration of space and time, and for denial-indifference of problems (MMPI, scales F, 3, and 9). The control of all of these functions is attributed to the right hemisphere, including frontal lobes. With respect to self-presentation and personality, some subtypes of alcohol abusers (e.g., the MMPI 49 subtype) are known to minimize, deny, repress or rationalize as ways of managing confrontation. An effort was made in the current study to relate mental set on testing and personality styles to performance on cognitive, emotive, memory and attentional tasks. This relationship is important in understanding possible physiological consequences of alcohol abuse upon personality test profiles, especially when a specific performance deficit is noted in a cognitive-affective area.

Areas of Investigation

A variety of measures were selected in each of the following areas of functioning based upon previous alcoholism research and laterality research: alcohol consumption patterns; aspects of emotion such as depression, anxiety, psychic energy, and sensitivity; aspects of cognition such as attention, psychomotor sequencing, abstract thinking, memory, and visuospatial perception; and self-presentation or defensiveness.

Consumption and Demographic Descriptors

An alcohol use inventory was used to screen subjects for eligibility, to obtain demographic information, and to obtain alcohol usage information. Subjects who had a problem with other substances or who were frequently using other drugs were not accepted into the study.

This screening device also quantified information regarding the individual's recent and chronic drinking practices (Eckardt et al., 1979). Some variables of importance included: age, date of last drink, frequency of drinking, average amount per occasion, maximum drinks per occasion, years of drinking, and drinking related symptoms, i.e. delirium tremens, blackouts, passouts. Information from the subjects was corroborated with other records, such as an inpatient intake summary. Aspects of alcoholic self-reports have previously been found to be reliable and valid (Armor et al., 1976). Sample demographics were also significant for comparing the group of chronic alcohol abusers to the group of controls, particularly on variables of age and education, given the relevance of these two factors in cognitive and emotive functioning.

Consumption variables were useful in assessing the relationship between chronic alcohol abuse and attentional bias and between chronic alcohol abuse and cognitive tasks. Other investigators (Eckardt et al., 1979) found drinking practices correlated with cognitive performance on psychomotor speed and sequencing, cognitive flexibility, abstract thinking, perception and rhythm of speech, and visual retention. Years of extensive drinking and recent heavy usage were associated with cognitive deficits in abstract thinking, psychomotor speed and sequencing, and visual retention.

In the present study, drinkers with a more extensive history of abusive consumption were also expected to have poorer performance on level of self-awareness and elevated scores on measures of depression or agitation. It was also expected that experimental subjects with histories of heavy drinking would have poorer performance, as compared

to those with shorter drinking histories, on visuospatial and emotive imagery tasks, tasks believed to be a function of the right parietal lobe.

Aspects of Emotion

The primary aspects of emotion that were explored in the present study included: depression, anxiety, psychic energy, sensitivity, and emotive imagery.

Depression and Anxiety. The strong relationship between alcohol abuse and affective disorders of depression and manic-depression prompted the selection of an instrument that could assess the above-mentioned characteristics of emotion. The fact that the MMPI was used extensively with addiction populations made the selection of this instrument appropriate. A second personality measure, the Emotions Profile Index, was also used due to the number of personality dimensions which describe personality styles. One other measure was used, the Guy Emotive Imaging Scale, to assess subjects' emotive imagery.

Subjects with certain MMPI personality profile types, 49 and 278, were found more frequently among chronic abusers. Individuals with denial tendencies, agitative-depressive tendencies, and sociopathic-impulsive tendencies were frequently found among the majority of clients who appeared in the alcohol treatment populations.

The MMPI basic scales consist of three validity scales known as L, F, and K, two of which measure defensiveness in test-taking set. Eight clinical scales were developed to discriminate normals from various psychiatric groups. A score on any scale several standard deviations above the mean is suggestive of increased intensity of behavioral

pathology described by each scale. The scales are described briefly: 1) bodily complaints and manipulation; 2) depression, pessimism, dissatisfaction; 3) hysterical reactions, denial, over-dramatization; 4) sociopathic tendencies, impulsivity, rebelliousness; 6) paranoia, rigidity-naivete; 7) trait anxiety, obsessiveness, fearfulness; 8) unusual mentation and perceptions, social alienation; 9) energy, hypomania, grandiosity (scales 5 and 0 are additional nonclinical scales). Common elevations on scales 2, 4, 7 and 9 of the MMPI occurred among excessive alcohol abusers (Clopton, 1978; Goldstein & Linden, 1969; Hoffman, 1976; Whitlock, Overall, & Patrick, 1971). Two of the most common profiles that occurred among alcohol abusers were 278 and 49; the former suggested an agitated depression and the latter suggesed a sociopathy, consisting of conflicts with authority, poor judgment, impulsivity, and high activity.

The Emotions Profile Index (EPI) developed by Kellerman & Plutchik (1968) was another personality measure used in the present study in which a subject responded in a paired-comparison format. This forced-choice personality test was designed to yield information about certain basic personality traits in an individual. Eight dimensions of emotion were assessed: trust, distrust, control, dyscontrol, timidity, aggressiveness, depression, and gregariousness. There was also one bias index. This measure was used to corroborate emotional responsivity with measures from the MMPI.

Plutchik and Platman (1977) studied personality traits on the EPI connoted by labels used for various disorders including those for paranoid, schizoid, hysteroid, sociopathic, and compulsive. Factor analysis of psychiatrists' perceptions yielded a two dimensional space

in which hysterics and cyclothymics were quite similar and in which paranoids, schizoids and compulsives were similar. This configuration of personality types was similar to what others have noted (Flor-Henery, 1974; Tarter, 1976) and these typologies were useful in alcoholism research since MMPI studies showed similar results (Clopton, 1978).

The research on persons who were intact, lesioned or diagnosed as having an affective disorder consistently showed that an intact right hemisphere facilitated accurate interpretation and expression of emotions (Tucker, 1981). Research noted above on emotionality also suggested that persons who differed in their type of emotional expression as observed on testing also had a corresponding cognitive style and pattern of defensiveness on personality tests. Specifically, the results suggested that persons with a hysteric emotional type showed a preference for right hemisphere processing of questions and utilized repression and denial as defense mechanisms (Tucker, 1981). With respect to the left hemisphere and emotion, as mentioned in sections above, persons with high levels of anxiety had performance deficits on verbal tasks (Tucker, Antes, Stenslie, & Barnhardt, 1978) and had infrequent left lateral eye movements. The evidence also suggested that detailed, verbal self-talk, believed to be a function of the left hemisphere, was more effective as an inhibitory strategy of emotional arousal than was visual imagery (Tucker, 1981). Correspondingly, Gasparrini, Satz, Heilman, and Coolidge (1978) found that persons with a left hemisphere lesion had higher scores on the MMPI Depression Scale, scale 2, indicative of a depressive reaction, while none of the right lesioned persons had significant elevations on this same scale.

It was hypothesized in the current study that the experimental group of chronic alcohol abusers would display differences from control subjects on measures of emotion related to depression and anxiety, specifically on MMPI scales 2 and 7 and Emotions Profile Index, Depression scale.

Emotive Imagery. The Guy Emotive Imaging Scale was developed to measure the vividness of one's emotive imagery (Guy & McCarter, 1978). It was used as a measure of right hemispheric processing. It is different from other imagery scales which explore more basic auditory, visual, tactile, and kinesthetic sensory imaging. Six primary emotions were inventoried: interest, enjoyment, surprise, distress, fear, and anger. For each emotion the examinee was asked to rate the vividness of the emotive experience on a seven point scale in each of six situations presented in a story: at a party, in class with a friend, alone, watching a ballgame, and with family. For students, the total score on this scale showed a moderate .50 correlation with the total score on the more familiar Betts sensory imagery questionnaire (Sheehan, 1967), indicating that the two were measures of imagery abilities but that they assessed different imagery phenomena. The Guy EIS has a reliability of .87 on coefficient alpha. The EIS is the only scale known that measures emotive dimensions in this manner.

It was expected that the more depressed experimental subjects would have a lower overall vividness of imagery score from the EIS since imagery tasks tend to be functions of the right hemisphere. Anxious-depressive alcohol abusers were not expected to perform well on this task since others have found poor imagery performance under conditions of depressed mood (Tucker, Stenslie, Roth, & Shearer, 1981).

Aspects of Cognition

The aspects of cognition that were assessed in the present study included: abstract thinking, attention, psychomotor speed and sequencing, memory, and visuospatial perception. Similar measures were used in this study as used by others who found alcohol abusers impaired on abstract reasoning (Fitzhugh, Fitzhugh, & Reitan, 1965; Smith, Johnson, & Burdick, 1971; Tarter, 1973), on perceptual motor speed (Tarter & Jones, 1971) and on attention level (Tarter, McBride, Buonpane, & Schneider, 1977; Wood, Wender, & Reimherr, 1983).

Abstraction and Intelligence. Since it was important to have a global indicator of general intellectual functioning for subjects in this study, the Shipley Institute of Living Scale (Shipley & Burlingame, 1941) was used to obtain that information. It is a timed test requiring a maximum of 20 minutes and it assesses the examinee's vocabulary and abstraction skills. Impairment is determined by the conceptual quotient which measures the extent that the individual's abstract thinking falls short of the individual's vocabulary ability. Abstract thinking generally declines rapidly in conditions prompting mental deterioration. An intellectual score can be obtained from tables based upon studies which have shown the Shipley score was highly correlated with overall intellectual functioning (Paulson & Lin, 1970).

Memory. The Wechsler Memory Scale (Wechsler, 1945) was incorporated into the study for several reasons of which the most important was to assess memory functioning. This scale consists of seven subtests: general information, orientation, mental control, associate learning, logical memory, memory span, and visual reproduction. Two of

the tests were considered to be lateralized, logical memory to the left (Lackner & Teuber, 1973) and reproduction of geometric figures to the right (Benton & Van Allen, 1968). The full scale score was also used to note general level of functioning. Although there was considerable evidence implicating alcohol abuse in human memory deficits, very little information was available with the WMS for chronic alcohol abusers. What was available suggested that deficits on the WMS were discrete and not uniform across subtests (Parsons & Prigatano, 1977). It was known that binge drinking and heavy recent consumption increased the probability of deficits on the WMS in chronic alcohol abusers. As noted in the literature reviewed above, deficits in new learning, visuospatial tasks, and in spatial organization were those noted to be most prevalent for alcohol abusers. Therefore, chronic alcohol abusers were expected to perform more poorly on the logical memory, visual memory, and associative learning subtests.

Attentional Bias. Attentional bias was a measure of perceptual asymmetry which was observed in subjects' performance on laterality tasks (Kinsbourne, 1979). For example, bias was measured by comparing the number of right versus left responses on dichotic auditory tasks or the number of right or left responses on a tactile bisection task. Its use is as a measure of hemispheric activation and processing. Asymmetries of perception are a result of hemispheric specialization and are reflective of lateralized activation. Such activation results in an individual biasing attention to the side of the body opposite the activated hemisphere and differentially processing perceptual input. Right hemispheric activation results in a sensitivity to the left side of the body and improved processing of

functions attributed to the right hemisphere. On listening to tones presented dichotically, trait-anxious normals showed a right ear bias (Tucker et al., 1978) and showed a right visual half-field performance decrement (Suarez & Papsdorf, 1979). A decrement on this task was noted by Bruder and Yozawitz (1979) for right hemisphere performance inaffective disorders.

In the present study, the auditory task was used to measure perceptual asymmetry or attentional bias. This task consisted of tones presented simultaneously to both ears through headphones. The subject's task was to judge in which ear the tone sounded louder and then to bisect a line on the score form in the direction from center on the side in which the tone sounded loudest. The tones were 60 decibels in intensity for one second duration. Two blocks of 20 tone probes were given subsequent to four practice probes. Four random probes in each block were somewhat louder to one ear. It was expected that alcoholics would show some left side neglect in processing on this task, resulting in a phenomenologic shifting of responses to the right in their midpoint estimations.

The tactile line bisection task is another method of measuring attentional bias. It is a tactile analog to the visual line bisection task often administered to detect persons with hemispatial neglect (Bowers & Heilman, 1980). A straight horizontal stick was presented to the blindfolded subject who then had to estimate the midpoint of the stick after running an index finger along the length of the stimulus. Ten different sized sticks were presented in the subjects' left or right hemispace 10 centimeters in front and 10 centimeters either to the right or left of subject midline, where midline is the vertical plane

which defines the subject's left and right hemispace. Within each space, subjects used both their left and right hand for 20 trials each resulting in a total of 80 trials. Responses were recorded in centimeters from stick midpoint where valence indicated the direction of error (positive valences for errors left of midpoint). Following right lesions, patients with hemispatial neglect frequently erred to the side of the lesion (right) as noted by Heilman and Valenstein (1979). In the normal population which was administered this tactile task, Bowers and Heilman (1980) found an opposite effect of pseudoneglect since subjects erred to the left of midpoint. They also noted that the left hand in normals (right hemisphere) had the distinct advantage, particularly when the stimulus was in the subject's left hemispace. Alcohol abusers were also expected to show a perceptual shift in their responses to the right on this task.

Given the previous research on depression and attentional measures, it was also hypothesized that experimental subjects, as measured by MMPI scale 2 (Depression), would show performance deficits on right lateralized tasks when compared to less depressed experimental subjects. The tasks selected were Auditory Attention, right ear bias; Tactile Bisection performance bias; Wechsler Memory Scale, Visual subtest; and Emotive Imagery Scale, Feelings score.

Psychomotor Sequencing. Two brief paper-and-pencil measures of psychomotor integration were utilized in the present study. The Trail Making Test is one of the performance subtests of the Army Individual Test. It is frequently used to assess brain functioning (Reitan, 1955; Sanchez-Craig, 1980; Tarter, 1975). Examiness are asked to connect in a sequential fashion letters (Trail A) or letters and numbers (Trail

B). Total test time for both A and B is less than three minutes. As a test of scanning and sequencing, the Trails Test has differentiated the performance of alcohol abusers and controls (Eckardt, Ryback, & Pautler, 1980; Fitzhugh, Fitzhugh, & Reitan, 1965; Goldstein & Chotlos, 1965; Tarter, 1971). This task was used to measure cognitive sequencing and psychomotor speed in order to assess the extent that experimentals in the current study were impaired relative to controls. Performance on this task was hypothesized as a function of the frontal lobes; performance on this task was useful in understanding the relationship of frontal lobe contributions to emotional functioning given Luria's concept of the frontal lobes in mediating arousal and regulating input as well as responses (Luria, 1969).

Another measure that was incorporated into the study was the Digit Symbol Substitution Test from the performance section of the Wechsler Intelligence Scales (Wechsler, 1958). It is also a timed, 90 second test wherein the examinee must place the appropriate symbol in a box using the number in the top of the target box as the cue to be used in searching for the correct corresponding symbol from the master list at the top of the test form.

The Digit Symbol Substitution test was routinely used in the clinical assessment of brain function (Matarazzo, Matarazzo, Wiens, & Gallo, 1976) and sober alcoholics had performance deficits on this test relative to normals (Eckardt, Ryback, & Paulter, 1980; Tarter, 1975). These measures were also believed to require the visuospatial skills of the right hemisphere and the sequencing skills of the frontal lobes. Alcohol abusers showed trends of differences from controls in their

performance (Eckardt, Ryback, & Paulter, 1980) and others have noted visual scanning deficits on this test (Bertera & Parsons, 1978).

Using the Digit Symbol subtest as a comparative measure with the Trails test and with emphasis upon somewhat more complex cognitive processing, it was expected that the experimental subjects would show a performance deficit on the Digit Symbol test relative to control subjects. The performance results on both the Trails and Digit Symbol tests were used to compare cognitive functioning in this sample group of alcohol abusers to other groups of chronic alcohol abusers utilized in previous research.

Hypotheses

The hypotheses are listed in outline form below as a summary.

1. It was predicted that the subjects would demonstrate significant differences from controls on cognitive abilities measured by the Shipley Conceptual Quotient, Wechsler Memory Quotient, Trails Test time score, and WAIS Digit Symbol subtest.

2a. It was predicted that the subjects would demonstrate significant differences from controls on the following measures of emotion: MMPI, scales 2 & 7, and Emotions Profile Index (EPI), Depression scale.

2b. It was also predicted that highly depressed experimental subjects, as measured by MMPI scale 2 (Depression), would show impaired performance on right lateralized tasks, relative to minimally depressed experimental subjects, such as auditory attention, right ear selections; tactile bisection, hand

performance, WMS, Visual subtest; Emotive Imagery Scale (EIS), Feelings score.

3a. It was hypothesized that the experimental subjects would perform significantly differently from controls on the following measures of attention and laterality: auditory attentional bias, tactile line bisection, Visual subtest of the WMS, and EIS Feelings score.

3b. It was postulated that subjects with a more extensive drinking history as measured by years of drinking and lifetime gallons consumed would show greater impairment than abusers with briefer drinking histories on these right lateralized visuospatial tasks: emotive imagery and WMS, Visual subtest.

4. It was hypothesized that cognitive-affective self-descriptors, related to denial and defensiveness, of subjects would be significantly different from that of controls as noted by the following measures: MMPI scales K, 3, & 6 and by the EPI, Bias scale.

CHAPTER II

METHODOLOGY

Subjects

The current study employed two groups of subjects; one group consisted of 32 recently detoxified persons from a human service treatment agency, while the group of controls consisted of 28 nonalcoholics (less than three drinks per day) with no known neurologic or psychiatric problems. Chronic alcohol abusers had been drinking at least one year to the degree that they obtained inpatient treatment and developed significant problems in major life areas, such as in occupational, social and family functioning. The ability of subjects to complete experimental procedures was determined in a clinical interview; persons with hearing impairments or other obvious impairments were excluded. Subjects in the groups were matched on age and education. Only right-handed males were used in this study due to the low numbers of available female chronic abusers and to eliminate any confounding effects due to gender and handedness.

Materials

Alcohol usage, personality and emotion, cognition, attentional bias, memory, psychomotor speed and abstraction were assessed by employing a battery of testing instruments.

Consumption Measure

An alcohol use inventory was used to screen subjects for eligibility. Subjects who had a significant problem with other drugs or who were frequently using drugs were not accepted into the study. This screening device also quantified information regarding the individual's recent and chronic drinking practices (Eckardt et al., 1979). Some variables of importance included: age, date of last drink, frequency of drinking, average amount per occasion, maximum drinks per occasion, years of drinking, and drinking related symptoms, i.e. delirium tremens, blackouts, passouts. Information from the subjects was corroborated with other records, such as an inpatient intake summary for those persons in inpatient alcohol treatment. Data on age and educational level was also collected. The data collected from alcoholic self-reports had previously been found to be reliable and valid (Armor et al., 1976).

Eckardt et al. (1979) found that consumption variables and drinking practices correlated with cognitive performance. Drinkers with a more extensive pattern and history of abusive consumption were also expected in the present study to have poorer performance on right-lateralized tasks.

Measures of Personality and Emotion

Two personality measures were used to assess differences in personality characteristics between experimental subjects and controls: the Minnesota Multiphasic Personality Inventory and the Emotions Profile Index. One other measure, the Guy Emotive Imaging Scale, was used to assess emotive imaging.

Minnesota Multiphasic Personality Inventory

Subjects with certain MMPI personality profile types were found more frequently among chronic abusers. Individuals with denial tendencies, agitative-depressive tendencies, and sociopathic, impulsive tendencies were frequently found among the majority of clients who appeared in the alcohol treatment populations. The MMPI was used in this study to obtain information on subjects' personality patterns and emotional style.

The MMPI basic scales consist of three validity scales known as L, F, and K, two of which measure defensiveness in test-taking set. The 10 clinical scales were developed to discriminate normals from various psychiatric groups. They are described briefly: 1) bodily complaints and manipulation; 2) depression, pessimism, dissatisfaction; 3) hysterical reactions, denial, over-dramatization; 4) sociopathic tendencies, impulsivity, rebelliousness; 5) masculine and feminine roles; 6) paranoia, rigidity, naivete; 7) anxiety, obsessiveness, fearfulness; 8) unusual mentation and perceptions, social alienation; 9) energy, hypomania, grandiosity; 10) social introversion, social discomfort.

Emotions Profile Index

Another personality measure used in the present study was the Emotions Profile Index (Kellerman & Plutchik, 1968). This is a forced-choice measure on which the subject describes his preferences through a series of paired-comparisons. There are eight dimensions of emotion assessed: trust, distrust, control, dyscontrol, timidity, aggressiveness, depression, and gregariousness. One bias index is incorporated into the EPI to provide an indication of response validity. The

results on the eight dimensions of emotion were used to corroborate emotional responsivity with the MMPI results.

Plutchik and Platman (1977) studied personality traits on the EPI connoted by diagnostic labels used for various personality disorders including those for paranoid, schizoid, hysteroid, sociopathic, and compulsive. Factor analysis of psychiatrists' perceptions yielded a two dimensional space in which hysterics and cyclothymics were quite similar and paranoids, schizoids and compulsives were similar. This configuration of personality types was consistent with what others have noted about these personality subgroups (Flor-Henery, 1975; Tarter, 1976). These typologies were useful in the current alcoholism research since MMPI studies have shown results also consistent with this sub-grouping of personality types (Clopton, 1978). It was expected in the current study that, especially for subjects in the experimental group, personality styles would discriminate subjects' mode of processing experiences and information on cognitive, attentional and imaging tasks.

Specific personality variables from the MMPI and EPI were used to provide an indicator of personality styles. Subjects who were anxious, ruminative, and sensitive were expected to perform differently from control subjects on measures of depression and anxiety, MMPI scales 2 and 7, and EPI, scale D.

Guy Emotive Imaging Scale

The Guy Emotive Imaging Scale was developed to measure the vividness of one's emotive imagery (Guy & McCarter, 1978). It is different from imagery scales which explore more basic sensory imaging. Six primary affects are inventoried: interest, enjoyment, surprise,

distress, fear, and anger. For each emotion the examinee was asked, after taking time to image each emotive experience, to rate the vividness of the emotive experience on a seven point scale in each of six situations presented in a story: at a party, in class with a friend, alone, watching a ballgame, and with family. For students, the total score on this scale correlated .50 with the total score on the more familiar Betts sensory imagery questionnaire (Sheehan, 1967). The Guy EIS has a reliability of .87 on coefficient alpha. The EIS was the only scale known that measures emotive dimensions of imagery in this manner. It was expected that the more hysterical subjects would have a higher overall vividness of imagery score from the EIS since imagery tasks tended to be functions of the right hemisphere. Anxious-depressive subjects were not expected to perform well on this task due to their analytic, detail oriented personality style.

Attentional Bias

In the present study, the auditory tasks consisted of tones presented simultaneously to both ears through headphones. The subject's task was to judge in which ear the tone sounded louder and then to bisect a line on the score form in the direction from center on the side in which the tone sounded loudest. The tones were 60 decibels in intensity for one second duration. Two blocks of 20 tone probes were given subsequent to four practice probes. Four random probes in each block were somewhat louder to one ear.

The tactile line bisection is another form of attentional bias. It is a tactile analog to the visual line bisection task often administered to detect persons with hemispatial neglect (Bowers & Heilman,

1980). Straight horizontal sticks were presented to the blindfolded subject who then had to estimate the midpoint of the stick after running an index finger along the length of the stimulus. The 10 different sized sticks were presented in the subjects' left or right hemispace 10 centimeters in front and 10 centimeters either to the right or left of subject midline, where midline is the vertical plane which defines the subject's left and right hemispace. Within each space, subjects used both their left and right hand for 20 trials each resulting in a total of 80 trials. Responses were recorded in centimeters from stick midpoint where valence indicated the direction of error (positive valences for errors left of midpoint). Following right lesions, patients with hemispatial neglect frequently erred to the side of the lesion (right) as noted by Heilman and Valenstein (1979). In the normal population, which was administered this tactile task, Bowers and Heilman (1980) found an opposite effect of pseudoneglect since subjects erred to the left of midpoint. They also noted left hand superiority in normals (right hemisphere), particularly when the stimulus was in the subject's left hemispace.

Wechsler Memory Scale

The memory scale consists of seven subtests: general information, orientation, mental control, associate, learning, logical memory, memory span, and visual reproduction. The full scale score can also be used to note general level of memory functioning. Although there is considerable evidence implicating alcohol abuse in human memory deficits, very little information is available with the WMS for chronic alcohol abusers. What is available suggests that deficits on the WMS

are not reflected in the fullscale score but only in some subtests (Parsons & Prigatano, 1977). As noted in the literature review, deficits in new learning, visuospatial tasks, and in spatial organization are the most prevalent.

Trail Making Test

Two brief paper-and-pencil measures of psychomotor integration were utilized in the present study. The Trail Making Test is one of the performance subtests of the Army Individual Test. It was frequently used to assess brain functioning (Reitan, 1955; Sanchez-Craig, 1980; Tarter, 1975). On this task, examinees are asked to connect in a sequential fashion letters (Trail A) or letters and numbers (Trail B). Total test time for both Parts A and B is less than three minutes. Subjects were administered both parts of this test with both elapsed time on the tasks and number of errors as the primary measures taken.

Digit Symbol Substitution

Another measure that was incorporated into the study was the Digit Symbol Substitution Test from the performance section of the Wechsler Adult Intelligence Scale (Wechsler, 1958). It is a timed test of 90 seconds duration wherein the examinee must place the appropriate symbol in a box using the number in the top of the target box as the cue to be used in searching for the correct corresponding target symbol from the master list at the top of the test form. This test was routinely used in the clinical assessment of brain function (Matarazzo et al., 1976). Sober alcoholics had performance deficits on this test relative to controls (Eckardt et al., 1980; Tarter, 1975). This measure is also believed to require the visuospatial skills of the right hemisphere and

the sequencing skills of the frontal lobes. The data from this task consisted of the total number of correct symbols provided by the subject within the allotted time.

Abstraction and Intelligence

Since it was important to have a global indicator of general intellectual functioning for subjects in this study, the Shipley Institute of Living Scale (Shipley & Burlingame, 1941) was used to obtain that information. It is a timed test requiring a maximum of 20 minutes and it assesses the examinee's vocabulary and abstraction skills through two subtests. Impairment is determined by the extent that the abstract thinking performance falls short of vocabulary performance. Abstract thinking declines rapidly in conditions prompting mental deterioration. An intellectual score can be obtained from tables based upon studies which had shown the Shipley to be highly correlated with overall intellectual functioning (Paulson & Lin, 1970).

Procedures

Experimental subjects were obtained from the Heartview Foundation, a residential chemical dependency treatment facility in Mandan, North Dakota. These volunteers were given a description of the research project shortly after admission and then completed a consent form indicating their willingness to participate in the project. The examiner subsequently scheduled appointments to administer protocols to these individuals at Heartview; these subjects had already completed several procedures (MMPI, Shipley) upon their admission which consequently shortened the total administration time for procedures.

Control subjects were obtained through advertisements distributed throughout the Bismarck, North Dakota, area. These subjects were matched as closely as possible on age and educational level to experimental subjects. Testing protocols were administered to these subjects subsequent to providing them written information and to obtaining their written consent. Individuals in the control group completed protocols in one session lasting approximately three hours, though they were free to break for periods of rest.

A routine interview was used with all subjects. The purpose of the interview was to screen subjects who had impairments which would have affected their test performance or confounded test results; subjects were screened for hearing problems, psychiatric problems, neuroleptic medication, and recent major trauma or illness. Only right-handed males were utilized in the current study.

Subsequent to the interview, tests were administered in a counterbalanced order. Test materials were assigned a subject number to prevent disclosure of confidential information. All subjects were informed that they could obtain a summary of the study results.

CHAPTER III

RESULTS

Treatment of the Data

The results for each test were scored according to procedures defined for each test. Basic frequency, central tendency and variability statistics were computed for all appropriate variables, notably for demographic, cognitive, affective, and consumption measures. Correlations were also computed for each group of subjects between MMPI scales and attentional bias variables (Appendices J & L) and between MMPI scales and cognitive variables (Appendices K & M). The reader is invited to review the direction and strength of these relationships noted on tables in the appendices.

Subsequently, *t* tests were used as the primary statistical procedure to test differences between groups. A description of the sample groups precedes the report of results used in assessing the investigatory hypotheses.

Description of the Sample Groups

Sixty subjects participated in the present study. Their ages ranged from 21 to 63 years. Educational level varied from 10 years through 22 years. As noted in Table 1, evidence for the matching of the groups on age and education is readily apparent by observing the means of these two variables, 36.9 for the experimental group and 33.9

for the control group (nonsignificant) for age while the means for education were 14.2 and 15.0, respectively (nonsignificant).

Table 1

Mean Demographic and Consumption Variables by Group

Variables	Means[a]		
	Experimentals	Controls	t
Age	36.9	33.9	1.00
Education	14.2	15.0	1.03
Shipley, vocabulary	30.5	30.1	0.20
Shipley, estimated IQ	111.4	113.1	.72
Started drinking	16.8	18.8	1.42
Days abstinent	10.7	18.0	1.18
Lifetime gallons	209.4	18.4	4.89**
Current gallons (6 months)	61.7	5.4	2.71**
Years of drinking	19.9	13.5	2.30**
Dose per occasion (average)	2.5	0.2	5.79**
Frequency of average dosage	256.9	15.8	4.10**

[a]Means are reflective of n = 28 for each group.

*$p < .05$. **$p < .01$.

The two groups did not differ in their mean Shipley vocabulary scores or in Shipley IQ estimates. Appendices E to I contain more detailed comparisons of sample group means and corresponding t values for the personality, neuropsychological, memory and imagery variables.

Tests of the Hypotheses

Cognitive Abilities

To test the initial hypothesis that the experimental group would show significant performance decrements relative to controls on cognitive abilities such as conceptual ability, memory function, sequencing, and psychomotor speed, a statistical test of the difference in means on measures assessing these functions was computed. These values are noted in Table 2 below.

Table 2

Cognitive Functioning by Group Membership

	Means[a]		
Variables	Experimentals	Controls	t
Shipley Abstraction, items	27.4	32.8	3.9**
Shipley Conceptual Quotient	95.5	105.3	3.2**
Memory Quotient (WMS)	104.2	115.9	2.6**
Trails A, time	40.3	26.3	3.9**
Trails B, time	80.2	56.2	3.3**
Digit Symbol (WAIS), items	51.2	65.6	5.4**

[a]Means are reflective of $n = 28$ for each group.

*$p < .05$. $p < .01$.

The two groups differed significantly across all measures of the various aspects of cognitive functioning. The measure with the largest t value in this study was the Digit Symbol test $t(54) = 5.4$, $p < .01$.

This task had been described as involving factors of concentration, speed, and sequencing skill. Abstract thinking and sequencing skills were two other abilities in which chronic alcohol abusers displayed significant performance decrements relative to controls.

Personality and Depression

The second hypothesis examined the performance of subjects on specific aspects of personality. The first prediction was a between groups prediction that there would be significant differences between the control and experimental groups on levels of depression and agitation as measured by scale two (Depression) and scale seven (Psychasthenia) on the MMPI and scale D (Depression) on the EPI. Group comparisons were computed (see Table 3) to test this hypothesis.

Table 3

Personality Measures of Agitation by Group Membership

	Means[a]		
Variables	Experimentals	Controls	t
Depression (MMPI, scale 2)	71.6	53.6	5.3**
Psychasthenia (MMPI, scale 7)	68.1	22.4	2.7**
Depression (EPI, scale D)	46.6	33.0	1.7

[a]Means are reflective of n = 28 for each group.

*$p < .05$. **$p < .01$.

The depression scale from the MMPI, as an objective personality measure, highlighted the significant differences between groups,

t (54) = 5.3, $p < .001$. MMPI scale seven also provided evidence for group differences t (54) = 2.7, $p < .001$. In general, the MMPI scale scores were a more sensitive measure than the EPI; the two groups did not perform significantly differently on the EPI depression scale.

The second part of the second hypothesis stated that the more depressed the experimental subjects, the larger their performance decrement would be on right lateralized tasks. These lateralized tasks consisted of auditory attention (right ear preference), tactile attention (accuracy of hand performance), WMS Visual subtest score, and EIS total Feelings score. Two subgroups of experimental subjects were obtained by taking the 14 most depressed alcohol abusers and least depressed abusers. The depressed subjects had an MMPI scale two (Depression) score greater than or equal to 75, while the less depressed subjects had scores below 70.

Table 4 shows the performance results of these two groups on the right lateralized tasks. Contrary to the hypothesis, the level of depression as reported by chronic alcohol abusers did not impede performance on right lateralized tasks.

Correlations computed to assess the relationship between MMPI Depression scale scores and performance on right lateralized tasks were low and nonsignificant. Only one correlation approached significance for left hand errors on tactile bisection ($r = -.28$, $p < .08$), suggesting that the more depressed chronic abusers tended to make fewer errors with their left hand on tactile bisection. It was also noted that the direction of preference was to the right in the auditory attention task and for hand errors to the right in the tactile line bisection task in the more depressed chronic abusers.

Table 4

Performance on Right Lateralized Tasks for Chronic Alcohol Abusers by Level of Self-Reported Depression

Variables	Depression Level[a] High	Low	t
Feelings, total (EPI)	159.4	153.7	0.6
Auditory Preference (right ear)	18.2	13.4	0.9
Visual Subtest (WMS)	9.2	11.1	1.6
Tactile Bisection, right, errors	11.6	8.4	1.6
Tactile Bisection, spatial preference, right, choices	9.7	9.0	0.4

[a]Means are reflective of $n = 14$ for each group.

*$p < .05$. **$p < .01$.

Attention and Visuospatial Performance

There were two hypotheses regarding the performance of subjects on measures of attention and laterality. The first hypothesis stated that the chronic alcohol abusers would show performance deficits relative to controls on auditory attentional errors, tactile bisection errors, WMS visual subtest score, and EPI total score for imaged feelings.

The results of the comparisons between groups on these measures are displayed in Table 5. The results provided no significant evidence to support the hypothesis of performance deficits for chronic abusers on these laterality measures.

Table 5

Performance on Attention and Laterality by Group Membership

Variables	Means[a] Experimentals	Controls	t
Feelings, visually imaged (EIS)	155.9	182.1	1.5
Visual Subtest (WMS)	10.1	11.6	1.7
Auditory Attention, errors	21.1	18.8	0.7
Tactile Bisection, correct estimates	19.6	22.5	1.0

[a]Means are reflective of n = 28 for each group.

*$p < .05$. **$p < .01$.

It was also hypothesized that chronic alcohol abusers with extensive drinking histories as measured by their lifetime years of consuming alcohol would show greater impairment on visuospatial tasks than chronic abusers with less extensive histories. To accomplish this within group analysis, the chronic abusers were divided into two groups based upon their years of drinking. One group consisted of individuals who had drunk for more than 20 years while those in the alternate group had drunk fewer than 20 years. The two subgroups were compared on the WMS visual subtest and EPI imaged feelings score.

The results in Table 6 provided no significant evidence for the hypothesis that chronic abusers experienced visuospatial deficits as measured by the utilized tests. Again, correlations were computed for Years of Drinking with WMS Visual subtest and EPI Feeling score, since no differences between the groups may have been due to a poor group

split based upon Years of Drinking. Both of the correlations for Years of Drinking with the WMS, Visual subtest (r = -.15, p < .22) and that with EPI Feeling score (r = .05, p < .41) were low and nonsignificant.

Table 6

Visuospatial Performance of Chronic Alcohol Abusers by Extent of Drinking History

Variables	Drinking Duration		
	Long[a]	Short[b]	t
Visual Performance (WMS)	9.6	11.0	1.3
Feelings, Visually Imaged (EIS)	156.8	153.7	0.3

[a]Mean is reflective of n = 15.

[b]Mean is reflective of n = 13.

p < .05. **p < .01.

Denial and Defensiveness

The last hypothesis pertained to between group differences on measures of denial and defensiveness; it was hypothesized that chronic alcohol abusers would score higher than controls in defensiveness as measured by MMPI scales K, 3, and 6 and the EPI Bias scale. The results of these group comparisons are listed in Table 7. The MMPI t-scores on the three respective scales were summated to arrive at one measure of denial from this test.

The groups did not significantly differ in performance on levels of defensiveness and denial; hence, there was no support for the above

hypothesis that chronic alcohol abusers are more defensive in general on these self-report measures.

Table 7

Comparison of Defensiveness by Group Membership

	Means[a]		
Variables	Experimentals	Controls	t
Denial (MMPI)	170.2	169.4	0.1
Bias (EPI)	69.7	62.9	0.9

[a]Means are reflective of n = 28 for each group.

*$p < .05$. **$p < .01$.

CHAPTER IV

DISCUSSION

Cognitive Functioning and Implications

The present study provides substantial evidence that chronic alcohol abusers differ significantly from nonabusing controls on cognitive functioning. As in previous research (Ryan & Butters, 1983; Tarter, 1973), the alcohol abusers in the present study differed from controls in performance on tasks requiring psychomotor speed and dexterity as noted on Digit Symbol scores. They also showed deficits in their abstract thinking and in a task requiring sequencing skills. While these tasks also require some component of visuospatial skill, it is generally considered to be a minor contribution to performance relative to motor speed and sequential thinking.

The results of the present study also substantiate the disruption in memory functioning, which could ultimately lead to a major amnesic syndrome of alcoholic Korsakoff Disease should the chronic abusers continue to drink and not have proper nutrition. The difference of 11 points in MQ scores between chronic abusers and controls is noteworthy; correspondingly, the chronic abusers have a larger, 7 point difference between their estimated IQ and MQ while nonabusers show only a 2 point difference in IQ and MQ (though estimated IQ for both groups was in the above-average range, $\underline{M}$ = 112). Other researchers have found

similar results (Butters, 1979; Goldstein & Shelly, 1971) reflecting relatively intact general intellectual performance though aspects of memory are impaired. In the current study, there are significant differences on four of the Wechsler Memory Scale subtests: Information, Mental Control, Visual, and Associate Learning.

The performance results on cognitive variables raise a number of interesting issues pertaining to onset of deficits, proper assessment of chronic abusers, and recoverability of cognitive-emotive functions. What is somewhat surprising is the extent of the deficits in abstract thinking, sequencing, memory, and psychomotor speed given the relatively young age, average age of 37 years, of the sample of abusers. In the past, the average age of the chronic alcohol abuser was approximately 40 years, though the national mean has declined. The population of chronic abusers in the present study does not fit the stereotype of "skid row" drinkers, nor did they approach the consumption levels of long-term inpatient alcohol abusers who are often used in research. Clearly, chronic alcohol abuse exerts a significant role in cognitive functioning.

A second issue raised by these results is the need to properly assess the extent of cognitive impairment when individuals appear at treatment centers. A significant irony for treatment staff is the fact that chronic alcoholics are not particularly amenable to treatment initially after a brief detoxification! In the current study, the average number of days the chronic abusers were abstinent prior to testing was approximately 10 days, yet they still showed very significant deficits on test results. Other researchers have shown (Eckardt et al., 1979), that chronic alcohol abusers show the greatest

impairments immediately after acute detoxification, three-to-seven days after their last drink. Some studies have shown long-term residual neuropsycholoical testing deficits, even past one year of abstinence (Page & Linden, 1974; Page & Schaub, 1977; Yohman, Parsons, & Leber, 1985). This suggests that the residual effects of alcohol exert their influence longer than was perhaps realized previously, since many people assumed that detoxification was completed when the acute symptoms and gross withdrawal behaviors subsided, usually three days. Fortunately, alcohol abusers improve their performance as the elapsed period of sobriety increases, depending upon age, health, and recent consumption level (Goldman, 1983). The social and economic impact of this second implication affects all of us since the public basically subsidizes alcohol treatment for all individuals who are not private pay parties. With respect to efficiency, most other types of rehabilitative centers do not attempt to provide intensive services when the client has questionable ability to maximally benefit from such services. The present study and other studies on recovery of functions (Goldman, 1983; Yohman, Parsons, & Leber, 1985) suggest that longer-term outpatient therapy may be the ideal treatment modality for many clients since such clients will only be approaching complete detoxification after several months, at which time they might be able to benefit most from therapy services. The third implication of the cognitive performance results pertains to the course of recovery of functions. The current study provides evidence that some memory functions, abstract thinking, and psychomotor speed for the chronic alcohol abusers were impaired for at least 10 days subsequent to discontinuation of drinking. Others have found relatively quick recovery (around two weeks) for verbal learning

(Sharp, Rosenbaum, Goldman, & Whitman, 1977), some short-term memory (Goldman, 1982), and basic sensory-motor skills (Goldman, Whitman, Rosenbaum, & Vandevusse, 1980). However, other areas of function showed a slow course of recovery in short-term memory for older alcoholics (Goldman, 1982), in visuospatial learning (Ellenberg, Rosenbaum, Goldman, & Whitman, 1980) and in spatial sequencing on Digit Symbol (Brandt, Butters, Ryan, & Bayog, 1983). Treatment staff must be aware of what performance level to expect from a client. Therapy staff will provide a disservice to clients if their expectations of the client's functioning are beyond the client's ability. Unrealistic expectations could prompt clients to leave treatment prematurely.

Self-Presentation and Personality Features

The two groups present themselves differently and perform differently on personality measures. The chronic alcohol abusers report very significant levels of depression, anxiety, and agitation on the MMPI. They tend to report lower levels of distress than did controls on the EPI, a test which has substantial face validity. This suggests they may not actually be aware of feeling levels which the MMPI is sensitive enough to detect. Given the small sample size it was not possible to conduct a profile analysis comparing MMPI two point codes. However, the most frequent profile for the chronic abusers is the 24/42 code type (n = 7) followed by the 25/52 code type (n = 4). These results are consistent with those reported by Clopton (1978) and Skinner, Jackson, and Hoffman (1974). The control group presented with more defensive modal code types of K+ (n = 11) and 56/65 (n = 6).

There was no evidence in the current study that chronic alcohol abusers who were significantly depressed showed performance deficits on right lateralized tasks. Others (Bear & Fedio, 1977; Bruder et al., 1981; Tucker, 1981) have found empirical evidence for a mood related effect upon right lateralized tasks. Data from the current research do suggest trends in that direction in tactile attention and in visual memory but not of significant magnitude. Since the current study was not designed to select specifically those subjects high and low on depression, it was not expected that this analysis would be as powerful as in such a design. It is also possible that individuals recover functions in these skill areas reasonably soon after initial detoxification reducing the probability of testable differences on these measures. Another alternative is that the lateralization theory pertaining to right lateralized deficits does not apply to alcohol related performance.

Contrary to prediction, the chronic alcohol abusers did not differ significantly from controls on the personality features of denial and bias. This is an unexpected finding since denial is a common defense utilized by chronic abusers. The sample of controls in the present study was somewhat more defended than one might expect of a typical sample.

Attention and Laterality Performance

There was no significant difference between chronic drinkers and controls on general attentional and laterality tasks. There was also no visuospatial performance deficit by chronic drinkers with a long duration for drinking versus those with a short duration. Others have

found that the alcohol abuser shows spatial performance deficits (Claeson & Carlsson, 1970), dichotic listening impairments (Glosser et al., 1976), and an inability to match faces (Benton & Van Allen, 1968). It is possible that the attention and laterality functions are more subtle and not detectable by procedures used in this study. Others have utilized visuospatial tests that are more novel than the procedure used in this research, which consisted of copying designs. For example, other tests utilize more trials and measure specific spatial aspects (e.g., orientation of lines in space, matching of faces based upon certain features) which may be more intrinsically interesting and require skills not ordinarily used in daily life. While the auditory attention task used only tones, others have used stimuli such as words and clicks, which may facilitate comparison discriminations. Eckardt et al. (1979) found that recent drinking practices, including alcohol dosage, discriminated groups on lateralized measures.

A post hoc analysis of performance on the tactile line bisection task suggests that chronic drinkers performed at a comparable level with their right hand in either right hemispace or left hemispace. Control subjects showed more deviations with their right hand in right hemispace in a direction toward body midline. This finding suggests that abusive drinkers do not show the same tendency to error toward the spatial midline (regression toward the "spatial mean") as do controls; they tended to err to the right of center and to neglect the left side of right hemispace. This is true only when they use their right (dominant) hand. Heilman and Valenstein (1979) summarize the spatial neglect phenomena which commonly occurs in patients with right hemisphere lesions.

Conclusion

The current study identifies a potentially useful application of knowledge derived from the personality and laterality areas and utilizes it in alcohol abuse research. There were a number of implications for the cognitive deficits shown by the chronic alcohol abusers with respect to treatment issues. The current study did not provide evidence that chronic abusers show performance deficits on attention or laterality measures, nor was there evidence that alcohol abusers who varied in level of depression or in years of drinking, had performance deficits on right lateralized tasks. The trends in the data did suggest a possible relationship which can be examined in future studies for additional evidence of lateralized performance dysfunction.

There are a number of considerations with the way the current study was conducted which may be changed in future studies. One consideration concerns the subpopulation constituting the samples. The current sample of alcoholics was not screened to determine the strength of a genetic or social learning influence to their problem. There is substantial merit in determining which drinkers have a family history for substance abuse, as well as for other conditions such as learning disability, hyeractivity as a child, and history for overexcitability. Past research (Tarter, Alterman, & Edwards, 1985) suggests that individuals who have histories for such conditions are more likely to develop an alcohol problem. Concerning the control group, males were volunteers primarily from service organizations. They were not quite as likely to be representative of the population at large. Perhaps a more comparable control group could be obtained through volunteers from a

medical clinic or from businesses which would grant time off for participation.

Several considerations are suggested for future projects concerning the measures. It is likely that a more specific, project-related personality assessment device would discriminate subjects' functioning on a variable of interest. General measures like the MMPI were not designed for purposes of neuropsychologically related research but rather designed for general clinical diagnostic purposes. The same would apply in the area of visuospatial functioning, where in the current study a subtest from a memory scale was used. There are some specific and empirical visuospatial instruments available which may provide a better estimate of functioning.

The directions for related research in the future offer exciting possibilities given the better communication among researchers in alcohol abuse, personality, and behavior neurology/neuropsychology. Additional research in the area of recoverability of functions affected by alcohol abuse and the course of their changes during the period of consumption and months after consumption terminated will be a substantial help for treatment staff and will also provide information on the ability of chronic alcohol abusers to adapt.

APPENDICES

APPENDIX A

CONSENT FORMS

CONSENT FORM

The Human Service Center and Heartview Foundation are participating in a research project to study the influence of frequent usage of alcohol on processes like memory, thinking, and feeling. You are invited to participate in this project; both people who frequently use alcohol and those who infrequently use alcohol are needed. Participants must be right handed males at least 21 years of age with normal hearing and vision. Your participation would be useful and appreciated; it will also give you an opportunity to contribute to important research.

When you agree to participate you will be asked to complete some questionnaires and take several tests. The total time required (excluding persons at Heartview) is just over three hours and all procedures can be completed in one session. You will be allowed to take breaks as you need them. The primary discomfort is length of time since there are no manipulations and you will <u>not</u> be placed in any embarrassing situation.

The results of the questionnaires will be kept confidential (no names will be used on forms) and only be seen by the research team. Participation is voluntary and you may withdraw from the study at any time. A decision not to participate will be respected and will not affect services you receive at this agency now or in the future.

The information gained from this study will allow us to further understand how alcohol may affect people's thoughts and feelings. It also may allow us to improve treatment approaches for clients in the

future. You can see why your participation will be useful; you may also find the tests to be quite interesting. We hope you will join us in this project. ---- Thank you.

I have been assured by Ed Kehrwald, doctoral candidate in clinical psychology at the University of North Dakota, that my participation in this research is voluntary, that I may withdraw at any time, and that my identity and test results will be kept confidential. I understand that if I have any questions in the future about this project I can call Mr. Kehrwald at 255-3090. I also realize I may have a copy of this consent form. I understand that if I should somehow be injured during this research project that medical treatment will be available as it is to members of the general public in similar circumstances. Payment for such treatment will be provided by the participant or your third party payor and not by West Central HSC or Heartview.

I have read all of the above and willingly agree to participate in this study.

Participant	Date	Witness	Date

APPENDIX B

ALCOHOL CONSUMPTION INVENTORY

ALCOHOL CONSUMPTION INVENTORY

Subject #: _____ Date: _____

Age: _____ Time: _____

Education: _____ Line of Work: _____

Avg. Weight: _____

Handedness

Do you consider yourself: RH LH Mixed?
Always this way or forced to change? Same Changed
Both (natural) parents: RH LH Mixed?
Which hand do you prefer for the following:

Writing - R L; Throwing a ball - R L; Batting - R L;

Carve with knife - R L; Screwdriver - R L;

Toothbrush - R L; Dealing Cards - R L; Scissors - R L;

Needle or Tweezers - R L?

	Total	RH	LH	Mixed
Blood: Brothers				
Sisters				
Blood: Sons				
Daughters				

Hearing Problems

Loss of Hearing?
Hearing Aid?
Ear Problems?

Symptoms

Severe Headaches	Anxious/nervous
Seizures	Depressed/blue
Epilepsy	Memory loss
D.T.s or Shakes	Blackouts
Dizziness	Sleep problems

Symptoms (Continued)

Head injury/unconscious

Abnormal blood pressure

Stomach problems

Concentration problems

Medications

Vitamins or Supplement

What?

How long?

Usage

How old were you when you first started drinking regularly?

Date of last drink?

Periods when you stopped drinking? How long?

Have you used any other drugs (pot, speed, barbiturates)?

Pattern: age, beverage drank, frequency, amount per week

Pattern within last six months, if different from above.

Maximum consumed at one time. How often?

Chronic

Yrs. of drinking

Yrs. at current level

Gals. during lifetime

Gals. at current level

Recent

Gm/kg per occasion

Gm/kg per occasion x freq.

Freq. maximum consumed

APPENDIX C

AUDITORY ATTENTIONAL BIAS

LISTENING TASK

Tones will be presented to both ears at the same time. You are to decide in which ear the tone sounds loudest. Then you are to mark your response on the answer line by placing a slash, "/", through the line. The dot on the line is the middle point. If the tone sounds louder in the left ear, put a slash to the left of center. If it sounds louder to the right ear, put a slash through the right side of the line. If it sounds the same to both ears, put a slash through the center dot. There will be a brief pause after each tone presentation so that you can mark down your answer.

Examples:

Tone slightly louder on the left: L_____/_____._____R

Tone very loud to the right: L_____._____/_____R

Tone equally loud to both ears: L_____/_____R

Practices:

1. L_____._____R
2. L_____._____R
3. L_____._____R
4. L_____._____R

1. L_____._____R
2. L_____._____R
3. L_____._____R
4. L_____._____R
5. L_____._____R
6. L_____._____R
7. L_____._____R
8. L_____._____R
9. L_____._____R
10. L_____._____R
11. L_____._____R
12. L_____._____R
13. L_____._____R
14. L_____._____R
15. L_____._____R
16. L_____._____R
17. L_____._____R
18. L_____._____R
19. L_____._____R
20. L_____._____R
21. L_____._____R
22. L_____._____R
23. L_____._____R
24. L_____._____R
25. L_____._____R
26. L_____._____R
27. L_____._____R
28. L_____._____R
29. L_____._____R
30. L_____._____R
31. L_____._____R
32. L_____._____R
33. L_____._____R
34. L_____._____R
35. L_____._____R
36. L_____._____R
37. L_____._____R
38. L_____._____R
39. L_____._____R
40. L_____._____R

APPENDIX D

TACTILE LINE BISECTION PROCEDURES

TACTILE LINE BISECTION INSTRUCTIONS

On this next task we will use the long table. I want you to sit so that the mark there is at the center of your body. I will sit on this side. I am going to set on the table in front of you, either to your right or left side, some sticks, one at a time. I will have you use your index finger of your right or left hand to run along the length of the stick several times to determine its length. Then I want you to estimate where the middle of the stick is located. You will do this while wearing a blindfold so that you cannot see the stick. The sticks are of 10 different lengths.

We will use your right hand for 20 trials on each side and your left hand for 20 trials on each side. Please do not count to yourself as a way to estimate the length by the time it takes you. Please do not attempt to measure the stick by using the span between your index finger and thumb. I want you to estimate the length of the stick only by touch.

Do you have any questions? If you need to take a break, let me know and we can stop. Alright, now let's try some practice attempts on each side using each hand before we get started officially.

(Examiner marks down on the scoring form the distance in centimeters from midpoint that the subject estimates to the right or left of stick center.)

APPENDIX E

MMPI SCALE MEANS BY GROUP

Table 8

Group Comparison of MMPI Personality Attributes

Scale	Means		
	Experimentals	Controls	t^a
MMPI:			
Lie (L)	47.8	49.7	- 0.9
Validity (F)	63.7	54.5	3.7**
K (K)	50.1	58.6	- 3.3**
1 Hypochondriasis (Hs)	58.1	32.9	9.1**
2 Depression (D)	71.3	53.2	5.4**
3 Hysteria (Hy)	60.4	58.5	1.0
4 Psychopathic (Pd)	67.0	45.0	6.7**
5 Masculinity-Femininity (Mf)	59.2	62.6	- 1.2
6 Paranoia (Pa)	64.3	59.3	2.0*
7 Psychasthenia (Pt)	69.0	22.4	13.7**
8 Schizophrenia (Sc)	66.6	24.4	9.5**
9 Hypomania (Ma)	61.2	50.1	3.2**
10 Social Introversion (Si)	58.4	46.4	4.5**
MacAndrews Alcohol Scale (Mac)	59.8	50.4	2.14

[a] df = 54.

*p < .05. **p < .01.

APPENDIX F

EMOTIONS PROFILE SCALE MEANS BY GROUP

Table 9

Group Comparison of EPI Personality Attributes

Scale	Means		
	Experimentals	Controls	t^a
EPI:			
Trust	59.1	65.6	0.8
Dyscontrol	41.9	49.4	1.0
Timidity	64.6	63.6	0.1
Depression	50.5	33.8	2.4*
Distrust	38.6	42.7	0.5
Control	50.0	52.4	0.3
Aggression	39.2	33.8	0.8
Gregariousness	50.4	60.6	1.25
Bias	62.9	69.1	0.8

[a] $df = 54$.

*$p < .05$. **$p < .01$.

APPENDIX G

NEUROPSYCHOLOGICAL VARIABLE MEANS BY GROUP

Table 10

Neuropsychological Variable Means by Group

Variable	Means		
	Experimentals	Controls	t[a]
Auditory Attention			
Right Responses	14.5	12.5	0.6
Left Responses	6.5	6.2	0.1
Shipley			
Vocabulary	30.5	30.1	0.2
Abstraction	27.9	31.2	-2.0*
Conceptual Quotient (CQ)	95.5	103.5	-2.7**
Tactile Bisection[b]			
Right Side-Right Hand	0.21	0.62	-1.4
Right Side-Left Hand	0.73	0.78	-0.2
Left Side-Right Hand	- 0.44	- 0.42	0.1
Left Side-Left Hand	- 0.09	- 0.21	0.4
Sequencing Tasks			
Trails A, Time	39.3	28.0	3.1**
Trails B, Time	77.8	59.8	2.5**
Digit Symbol (WAIS-R)	51.0	63.4	4.5**

[a] $df = 54$. [b] Deviation from midpoint.

*$p < .05$. **$p < .01$.

APPENDIX H

COMPARISON OF WECHSLER MEMORY SCALE MEANS BY GROUP

Table 11

Comparison of Group Means on Memory Functioning

Variable	Means		
	Experimentals	Controls	t[a]
Memory			
Information	5.2	5.8	2.30*
Orientation	4.8	4.9	-0.8
Control	7.3	8.1	-1.8
Passages	8.3	9.4	-1.3
Digits	10.4	11.8	-2.0*
Visual	9.9	11.6	-1.9
Associate Learning	14.0	15.9	-1.8
Total, raw	59.4	67.7	-2.6*
Memory Quotient[b]	101.3	114.2	-2.2*

[a] df = 54. [b] Age corrected quotient.

*p < .05. **p < .01.

APPENDIX I

MEAN EMOTIVE IMAGERY BY GROUP

Table 12

Mean Emotive Imagery by Group for Feelings and Situations

Variable	Means		
	Experimentals	Controls	t^a
Feelings, total	152.1	182.1	-1.6
Enjoyment	29.6	32.7	-1.2
Surprise	27.7	29.2	-0.5
Interest	29.2	31.5	-1.0
Distress	22.9	24.7	-0.7
Fear	19.4	21.6	-1.0
Anger	24.6	25.0	-0.1
Situations, total	153.8	182.8	-1.5
Party	25.2	29.0	-1.2
Work	27.6	30.8	-1.1
Friend	26.4	31.0	-1.5
Alone	24.0	25.3	-0.6
Game	22.1	29.2	-1.9
Family	28.5	27.5	0.4

[a] $df = 54$.

*$p < .05$.

APPENDIX J

CORRELATIONS BETWEEN MMPI SCALES AND ATTENTIONAL BIAS MEASURES FOR NONABUSERS

Table 13

Correlations between MMPI Scales and Attentional Bias Measures for Nonabusers[a]

	Bias Measures					
	Auditory		Tactile			
MMPI Scales[b]	Right	Left	RSRH	RSLH	LSRH	LSLH
L						.35 .07
K				-.43 .03		
Hs						-.32 -.11
Hy		-.35 .08				
pd		-.44 .02				
Mf	-.30 .12					
Ma			.38 .04			-.32 .10
Si				.32 .10		

Note. Top value indicates r and the bottom value denotes p.

[a]Correlations are for values greater than .29.

[b]MMPI scales F, D, Pa, Pt, and Sc did not have any r > .29.

APPENDIX K

CORRELATIONS BY GROUP BETWEEN MMPI SCALES AND COGNITIVE VARIABLES FOR NONABUSERS

Table 14

Correlations by Group between MMPI Scales and Cognitive Variables for Nonabusers[a]

	Shipley		Trails Time		WAIS
MMPI Scales[b]	Abstraction	CQ	A	B	DgtSym
L		-.33	.41	.55	-.58
		.09	.03	.00	.00
K	-.32				
	.10				
Hy	0.30				-.39
	.12				.05
Pd		.45	-.40	-.32	
		.02	.04	.11	
Mf	.40	.36		-.33	.34
	.04	.07		.09	.08
Pa		.30	-.33	-.33	
		.12	.10	.09	
Sc		.43			
		.03			

Note. Top value indicates r and bottom value denotes p.

[a]Correlations in table for values greater than .29.

[b]MMPI scales f, Hs, D, Pt, Ma, and Si had no r > .29.

APPENDIX L

CORRELATIONS BETWEEN MMPI SCALES AND ATTENTIONAL BIAS MEASURES FOR CHRONIC ABUSERS

Table 15

Correlations between MMPI Scales and Attentional Bias Measures for Chronic Abusers[a]

	Bias Measures					
	Auditory		Tactile			
MMPI Scales[b]	Right	Left	RSRH	RSLH	LSRH	LSLH
L						.30 .11
Hs			-.40 .03	-.39 .03		
D			-.44 .01	.33 .07		
Pd			.34 .07			
Pa	.34 .06					
Pt			-.31 .09	-.33 .07		
Si					.34 .05	

Note. Top values indicate r and bottom values denote p.

[a]Correlations in table are for values greater than .29.

[b]MMPI scales F, K, Hy, Mf, Sc and Ma has no r > .29.

APPENDIX M

CORRELATIONS BY GROUP BETWEEN MMPI SCALES AND COGNITIVE VARIABLES FOR CHRONIC ABUSERS

Table 16

Correlations by Group between MMPI Scales and Cognitive Variables for Chronic Abusers[a]

MMPI Scales[b]	Shipley		Trails Time		WAIS
	Abstraction	CQ	A	B	DgtSym
L	.44 .01				
K			-.34 .06	-.42 .02	
Hy				-.36 .04	
Pd			-.54 .00	-.54 .00	.44 .01
Sc					.33 .07
Si	-.31 .09	-.35 .06			
A			.35 .06	.37 .04	
R		-.33 .07			

Note. Top value indicates r and bottom value denotes p.

[a]Correlations in table are for values greater than .29.

[b]MMPI scales F, Hs, D, Mf, Pa, Pt and Ma had no r > .29.

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