1986

Rate of Occurrence Judgments by Recovering Alcoholics Using Self-Relevant Stimuli

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RATE OF OCCURRENCE JUDGMENTS BY RECOVERING ALCOHOLICS USING SELF-RELEVANT STIMULI

by

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A Thesis Submitted to the Faculty of the Graduate School of Loyola University of Chicago in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

May

1986

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance provided by the director of his thesis committee, Dr. Eugene B. Zechmeister. He also thanks the members of his committee, Dr. Alan De Wolfe and Dr. William Reich, for their participation. The present effort would not have been possible without the assistance, support, and insight of Dr. William Filstead and his staff at Lutheran Center for Substance Abuse, Park Ridge, Illinois. Dr. Roy Carlson of De Paul University is also acknowledged for the encouragement and clarifying responses provided to the author from the inception of this project.

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CHAPTER I

INTRODUCTION

A substantial body of experimental evidence suggests that adult humans are highly sensitive to the frequency of occurrence of events. In the verbal learning paradigm that has most often been used to evaluate the abilities of persons to accurately estimate frequencies of presented target items, correlations between actual and estimated frequencies of occurrence have typically been in the high .80's (Zechmeister & Nyberg, 1982). Having proposed the existence of two contrasting sets of cognitive processes, automatic and effortful (or controlled) processes, Hasher and Zacks (1979) proposed further that the ability to encode frequency information should be viewed as the result of an automatic process. Automatic processes are assumed to result in invariance of performance under different conditions of learning, are assumed not to be influenced by usually potent subject variables such as age, level of arousal, previous trials at a task, or educational level (Hasher & Zacks, 1984).

Memory of frequency of occurrence has typically been investigated under the relatively controlled conditions of the psychology laboratory; thus, memory for frequency has typically included studies that have used simple, verbal material and relatively brief presentation times for target items. A few laboratory experiments have used stimuli other than neutral words or nonsense syllables, e.g., pictures of common objects (Hintzman & Rogers, 1973), emotionally charged verbal material (Curt, 1982), self-

reference statements (Rodgers, Kuiper, & Kirker, 1977), and sex role appropriate behaviors (Perry & Bussey, 1979). The relationship between measures of frequency encoding and several subject variables also has been investigated, under controlled laboratory conditions. These have included age (Hasher & Zacks, 1979), learning ability (Goldstein, Hasher & Stein, 1983), depression (Curt, 1982), and learning set (Hasher & Zacks, 1979). Several types of frequency judgments have been used as dependent variables. These have included absolute frequency, relative frequency, and category frequency measures. However, the use of the psychology laboratory, and the choice of procedures and stimulus materials used in investigating frequency encoding, make it difficult to generalize about memory for frequency of occurrence to naturalistic settings.

The present study investigates memory for frequency of occurrence in the context of a larger study, designed to explore life situations and moods encountered by persons treated for substance abuse. The measures of frequency encoding were obtained during the first 90 days after discharge from an inpatient treatment facility. The primary goal of the present study was to determine if the high correlation observed in the laboratory between actual frequency of occurrence and estimates of frequency of occurrence could be observed in the more life-like situation experienced by recovering substance abusers. The subjects' self-reports of moods and experiences were the stimuli for which frequency judgments were made. The present study also addressed the question of whether substance abuse, a variable known to influence learning and memory in other contexts, affects accuracy of frequency estimates.

CHAPTER II

REVIEW OF LITERATURE

Approaches to Judgments of Frequency of Occurrence

Limits in attentional capacity have been a central focus in models of cognitive functioning for some time (Broadbent, 1958; Deutsch & Deutsch, 1963; Keele, 1973; Treisman, 1960). Theorists originally proposed that these limits were most important at one particular stage of processing; however, more recently, Kahneman (1973) emphasized the allocation of attentional requirements to various functions at several different stages of processing. Kahneman proposed that attentional capacity has the following characteristics: (a) attentional capacity is limited; (b) individual differences and intra-individual variations in attentional capacity exist; (c) mental operations differ in the amount of attentional capacity that they require, with early processes such as sensory analysis requiring less attention than operations closer to the response end of the system; (d) variable capacity of attention interacts with encoding demands to influence performance on cognitive tasks.

Building on this view of attentional requirements, Posner and Snyder (1974; 1979), Schneider and Shiffrin (1977) and, more recently, Hasher and Zacks (1979; 1984) proposed that, given large amounts of practice, some complex operations (without regard to the stage of processing where they may occur) become "automatic." Automatic processes presumably occur with only a minimal allocation of attentional capacity,

thus leaving more capacity in the system to be allocated to less routine or novel functions. These "non-automatic" processes are described as effortful or controlled, and include such processes as retrieval strategies, mnemonics, and elaborative rehearsal. Effortful processes are described as having characteristics opposite to those of automatic processes, with all cognitive processes falling on a continuum between the extremes of fully automatic and fully effortful processes. This review will focus on some of the more salient, and controversial characteristics that have been suggested for automatic processes. Effortful processes are discussed mainly to clarify these characteristics, or to place them in the broader context of memory processes.

The criteria by which a process is characterized as being automatic differ among the theorists cited above. Posner and Snyder (1975) define automatic processes as those that meet the following four criteria: (a) they occur with minimal attention; (b) they do not interfere with other, ongoing processing; (c) they do not result in the storage of new information in long-term memory (LTM); and (d) they develop only after large amounts of practice.

Hasher and Zacks (1979) divide automatic processes according to their sources (either learned or hereditary) and consider the last two criteria posited by Posner and Snyder as applying only to learned automatic processes; that is, those acquired by repeated practice. Flavel (1977) proposed that automatic memory processes exist that do not depend on practice, but are inherited, or "wired" into the organism, comparable to Seligman's (1970) "preparedness" concept (e.g., as suggested by one trial taste aversion learning). Hasher and Zacks, like Flavel,

consider encoding of space, and frequency of occurrence attributes as automatic proceses stemming from innate, pre-wired capacities.

Although always conceptualizing automatic and effortful processes on a continuuum, Hasher and Zacks have identified criteria for evaluating their model that draw clear divisions between effortful and automatic processes in five contexts (Hasher & Zacks, 1979). The five areas and the criteria resulting from predicted differential effects on learning of effortful processes versus those of automatic processes are as follows: (a) intentional versus incidental learning conditions (i.e., automatic processes should not be influenced by variations in intentional or incidental learning conditions, while effortful processing should be affected by subjects' intent to learn); (b) instructions and practice (i.e., instructional set or number of previous trials should not influence automatic processes, while effortful processes should be facilitated by both); (c) developmental trends (i.e., after a basic maturational level has been met no differences should occur between young and old in automatic processing, while effortful processing should first increase in efficiency and then gradually decline across the lifespan); (d) interference among operations (i.e., automatic processes will allow other non-automatic processes to proceed simultaneously without disruption, while effortful processes compete for limited attentional capacity); and (e) states altering attentional capacity (i.e., automatic processes, in contrast to effortful processes, should function without decrement under different levels of arousal, states of depression or elation, or changes in capacity due to aging).

Hasher and Zacks used these five criteria to contrast four automatic processes (frequency sensitivity, spatial location encoding, temporal information encoding, activiation of word meaning) with four effortal processes (facilitation of memory via imagery, mnemonics or elaborative devises, clustering and rehearsal). Regarding sensitivity to frequency of occurrence, studies were cited demonstrating that there was no effect on frequency judgment accuracy of incidental verus intentional learning conditions, practice, instructional set, age, and level of arousal or depression, and that there was little impact of individual differences on the ability to accurately estimate frequency of occurrence (Hasher & Zacks, 1979). Several of these studies will be reviewed because of their central relevance to the present study.

Frequency judgments made by children from grades 2, 4, and 6 have been shown to be equally accurate to those made by college students, even when the college students are informed in advance that a frequency test will be given (Hasher & Chromiak, 1975). This developmental invariance in frequency sensitivity extends to late adulthood (Attig & Hasher, 1980; Kausler & Puckett, 1980). Students with significantly different SAT scores who do show marked differences on a memory recall test (effortful process) have been demonstrated to show no significant difference in memory for frequency of occurrence for the same items used in the recall test situation (Zacks, Hasher, Alba, Sandft, & Rose, 1984). Frequency processing of learning disabled children has been demonstrated to be equally accurate as that of children who are proficient learners (Goldstein, Hasher & Stein, 1983). A final example of a variable having

an unexpected lack of effect is that of depression, a variable often resulting in impairment of cognitive functions, but that has no impact on frequency judgments (Hasher & Zacks, 1979).

Findings similar to those for frequency information processing are cited for spatial encoding and temporal encoding, although these did show develomental trends that Hasher and Zacks attributed to task-related variables that require effortful processes. More recently, however, Hasher and Zacks reported results of an experiment that did not support the notion that temporal order encoding was completely automatic and the authors now subscribe to Tzeng's view that allows for both automatic and non-automatic aspects of temporal encoding (Tzeng & Cotton, 1980; Zacks, Hasher, Alba, Sandft, & Rose, 1984). Regarding word meaning activation (an acquired automatic process), they marshalled evidence from dichotic listening tasks to show that this process occurs without awareness. They also cited the Stroop test literature as evidence that the interference effect of word meaning on color naming cannot be inhibited and that this interference effect continues from the early grade school years through old age, thus demonstrating the automaticity of word meaning activation.

In contrast to the developmental invariance and absence of effects of intention or learning set, and of arousal level on automatic processing, effortful processing varies with numerous conditions (Hasher & Zacks, 1981). It has been demonstrated, for instance, that reliance on imagery based memory strategies increases through the elmentary school years, with effects of imagery on memory showing a clear

developmental trend. Mnemonic devices usually require instruction and effort and the effects of such devices on memory depends on the level of instruction, intention, and effort. Clustering strategies can be disrupted by high levels of arousal, the effects of rehearsal increase over the life span until old age, and can be disrupted by depression. In brief, Hasher and Zacks (1979) concluded that there was strong support in the existing literature for their model of a continuum of processes ranging from automatic to controlled or effortful, and for "the existence of a small set of basic cognitive processes that encode certain attributes of information directly into long-term memory throughout the life span and in spite of any alterations in capacity from stress" (Hasher & Zacks, 1979, p. 382). This position, the reader may remember, differs from Posner and Synder's position that automatic processes have no direct impact on LTM.

If Hasher and Zacks are correct and automatic processes, including automatic encoding of frequency information, exist that are capable of adding new information to LTM, then the outputs of these processes can influence decisions that a person makes in spite of the fact that the data are collected incidentally, that is without conscious awareness. For example, Hasher, Goldstein, and Toppino (1977) found that mere frequency of occurrence plays a role in subjects' decisions about the truth or validity of plausible statements, such as "rice is grown in Flordia" or "the population of Greenland is 40,000." The more frequently a person heard these statements the more he/she felt them to be true. The experimenters concluded that subjects used automatically encoded

frequency information in making judgments of the probable truth of a statement. Such information would be "data driven," the result of processes that function independently of the intentions, interests, and higher abilities of the person receiving the information. These memory processes would function in a sharply different way than the memory operations involving imagery, elaboration, and retrieval plans (all effortful process) but, nevertheless, still have a major impact of the subject's final response.

The utility of automatic processs is obvious, as they ensure that important information will be processed and later available to consciousness. They also guarantee that some fundamental aspects of the flow of events are stored, so that the organism can both orient itself in the environment, and retain the information required to learn from experience while, at the same time, leaving maximal attentional resources available for allocation to complex mental processes and novel events or responses (Hasher & Zacks, 1984). Automatically encoded frequency, spatial, and temporal information also may serve an enabling role in retrieval of information, as in reconstructive memory processes. An example might be knowing that a target word was on a list that had been seen twice rather than on a list that had been presented eight times. Here, frequency information might serve as a retrieval cue for the targeted stimulus (Posnansky, 1978; Underwood, 1971).

As suggested earlier, if this model is correct it has important implications for understanding other aspects of cognition (Hasher & Zacks, 1984). For instance, decision making appears to be based on affective

responses, and subjective probabilities that are shaped by rate of occurrence information (Estes, 1976; Zajonc, 1968). Developmental trends in such areas as category formation, word perception, and even sex role typing of behaviors could be examined for influences from frequency-based information. Finally, other cognitive processes such as those found in person perception (use of implicit trait schemata, prototype assignment, and person memory) could be conceptualized as a combination of specific automatic and effortful processes that operate along similar lines as those outlined for more basic processes (Cantor & Mishel, 1979).

Much of the controversy surrounding the concept of automatic processing in memory involves the encoding of frequency information (e.g., Fisk & Schneider, 1984). Three methods have been used to study sensitivity for frequency of occurrence information: (a) the absolute judgment method, wherein subjects estimate the specific frequency that an item occurred in the presentation series; (b) the forced-choice or frequency discrimination method, wherein subjects are asked to identify the member of a set of stimuli that has occurred most frequently; and (c) the frequency ranking method, wherein a set of stimuli are rank ordered by the subject according to rate of occurrence. The first of the above methods is most commonly used. For example, subjects are often merely presented with a series of simple stimuli (words, pictures, etc.), some of which are repeated, and then asked to estimate the frequency of occurrence of each item. Instructions may be varied between groups to create various experimental conditions. For instance, some subjects may be asked to memorize the stimuli for a

recall test, or to look for a particular class of stimuli among distractor fillers, or to try to keep track of frequencies of a particular target stimulus among distractors. The typical findings of such experiments are that subjects make relatively accurate judgments across instruction conditions, with correlations of actual to estimated frequencies being as high as .88 (Zechmeister & Nyberg, 1982).

Subjects are sensitive to differences in frequency of internal as well as external events (imagining the stimulus versus actual presentation of the stimulus) and can accurately discriminate frequency of these types of experiences (Hasher & Zacks, 1979). Moreover, subjects can be highly sensitive to slight alterations in situational designation of the occurrence, or the unit of occurrence, for example, being able to rate accurately the frequency of occurrence of verbatim sentences imbedded in a context that includes sentences differing only in gist (Gude & Zechmeister, 1975).

That frequency judgment accuracy is resilient to changes in subject variables and learning conditions which routinely produce major differences in other psychological and cognitive tasks, is an important empirical finding that supports the claim for automaticity of encoding of frequency information. As reviewed earlier, studies have demonstrated with high consistency that frequency of occurrence judgments are equally accurate in persons of different age groups, various levels of academic ability, differing levels of prior practice at making such judgments; and that this consistency is also seen within the same subject in conditions that would compromise other cognitive abilities. Taken together, these findings strongly suggest that an

automatic system for encoding occurrence rate information that has an impact on LTM does exist, and that the differences among and within individuals seen in most cognitive processes do not apply to this system.

Clearly, Hasher and Zacks have developed a model with impressive empirical support; however, recent studies have made this empirical base seem less secure. For instance, one study (Fisk & Schneider, 1984) investigating automatic categorization of words showed that subjects could accurately categorize words and show little recognition for categorized words on a later test, and have no demonstrable retention of frequency information for the correctly categorized words. These results tend to contradict Hasher and Zacks' contention that frequency information is automatically encoded into LTM. Another recent set of experiments points to the limitations of Hasher and Zack's model in differentiating between mechanisms of encoding that may be automatic and retrieval mechanisms that involve intention and awareness. These effortful mechanisms must be active prior to making even automatically processed information available to the subject. If this is the case, no pure test of the automaticity of memory processes would be possible, since their effects would always be linked to those of effortful processes such as retrieval (Greene, 1984). Greene (1984) also found interference in word recall in a group of subjects under intentional learning conditions. No frequency information encoding was demonstrated by an incidental learning group in the same experiment, thus placing two of Hasher and Zacks' criteria in doubt in regard to the automaticity of encoding of frequency information. Also, as

mentioned above, the full automaticity of temporal encoding has been recently disconfirmed (Zacks, et al, 1984).

An alternative view of memory for frequency of occurrence has been developed by Tvesky and Kahneman (1978). They stress the errors in frequency estimation that derive from the use of cognitive heuristics. One such heuristic is related to the availability of instances of an event. The availability heuristic is a cognitive process:

> for estimating the numerosity of a class, the likelihood of an event, or the frequency of co-occurrences, by the ease with which the relevant mental operations of retrieval, construction, or association can be performed (Tvesky & Kahneman, 1978, p. 1128).

This heuristic is operative at the retrieval stage of information processing, as compared to automatic processing theory's emphasis on the prior stage of information encoding.

That the use of such a heuristic is often appropriate is based on the fact that, other things being equal, the instances of large classes of events are more available to memory than are the instances of smaller classes of events. Biases, however, are introduced by factors which affect availability differently within classes. Tvesky and Kahneman (1978) identify four availability biases: (a) biases due to the retrievability of instances; (b) biases due to the effectiveness of a search set; (c) biases of imaginability; and (d) illusory correlations, where the strength of the association between members of a stimulus pair influences the judgment of the frequency that the pair was presented. An example of this bias was noted by Chapman and Chapman (1967, 1969). They showed that the pair <u>long-tiger</u> was rated as having a higher occurrence than <u>lion-egg</u> despite the fact that both pairs were actually presented on an identical number of trials.

Describing the first of these four biases, retrievability, in more detail will be useful here, since it bears significantly on self-relevancy of information, an aspect of the stimuli to be used in the present study. An experiment by Tvesky and Kahneman (1973) serves as a good example of an experimental variable independent of actual frequency, having significant impact on frequency estimates. In this experiment, familiarity was shown to significantly affect estimates of frequency of category occurrence. Half of the lists presented to subjects contained 19 names of famous females and 20 names of less famous males, while the remaining lists contained 19 names of famous males and 20 names of less famous females. Among the 90 subjects who estimated frequency of men and women in the presented lists, significantly more (80 subjects) mistakenly judged the more fame-laden category to be the more frequently presented gender. Familiarity of the name stimuli apparently affected the availability of recallable instances of a given gender's occurrence on the list, a finding that appears to be contrary to Hasher and Zacks' automatic model of frequency processing.

Theoretical formulations and experiments like those of Tvesky and Kahneman have special relevance for the present study since it is possible that the estimates obtained from the subjects of events relevant to themselves may reflect biases related to demand characteristics, cognitive representation of self, salience of items to the subject, or some other factors not related to frequency of occurrence information. If this is the case, any differences observed between the experimental and control groups on the present study would have to be interpreted

in a different light, for example, by including viewpoints from a personality and cognitive-set perspective. At the very least, experimental approaches like those of Tvesky and Kahneman, Fisk and Schenider, and others, indicate that the controversy over the impact of the automatic processing theory of frequency of occurrence information and its relation to LTM, learning conditions, and subject variables is bound to continue.

Cognitive Impairment in Alcoholics

A recent review of the literature on cognitive impairment in alcoholics and other substances abusers notes that:

> To profit from psychological treatment, an individual must be capable of receiving new information, integrating it with existing stores, and then, hopefully, changing some aspect of his or her behavior. In recent years psychologists have accumulated more and more evidence that alcoholics are deficient in their cognitive processing (Goldman, 1983, p. 1045).

Goldman raises the issue of how treatment might need to be modified when such impairment is taken into consideration. Although consistent patterns on intelligence tests are not found by most researchers (Kleinknecht & Goldstein, 1972), attention to other subject variables in connection with alcohol abuse has shown a consistent pattern on the Wechsler Adult Intelligence Scale: the maintenance of performance on overall I.Q. and on the "hold" verbal subtests, accompanied by clear decline in functioning on the Block Design, Digit Symbol, and Object Assembly subtests (Parsons & Farr, 1981). These variables include age, drinking history, SES, and poly-drug use, among others. On sophisticated neuropsychological batteries, cognitive impairment has been even more consistently demonstrated (Goldman, 1983). For example, alcoholics score in the impaired range on both the Tactual Perception Test (visuo-

on both the Tactual Perception Test (visuo-spatial, tactual abilities, and spatial memory) and the Speech Sounds Perception Test, a test of auditory ability (Butters & Cermak, 1980).

In his review, Goldman traces three major themes emerging in the alcoholism-cognitive impairment literature. The first is a "striking parallel" between neuropsychological functioning of alcoholics and the neuropsychological functioning of elderly non-alcoholics. One aspect of this emergent theme is the apparent resistance to impairment of younger alcoholics, pointing to a "critical age" beyond which alcohol abuse is accompanied by the type of neuropsychological performance that would be more typical of chronologically older persons. This implies a kind of premature aging process caused by alcohol abuse that results in subtle brain damage that accelerates, or increases in its effect, after a certain age is reached (Freund, 1982; Grant, Adams, & Reed, 1980).

Goldman's second theme is that there is a continuity of memory dysfunctions between Korsakoff syndrome patients and alcoholics without the full-blown syndrome (Butters & Cermak, 1980; Oscar-Berman, 1980). The finding of an apparent progression of dysfunction from normals through Korsakoff patients, with deficits increasing with increasing alcohol consumption, has been interpreted by some workers as an effect resulting from the relationship among drinking dose per episode, age of drinker, and memory function. This view posits that the progression of dysfunction often reported in the literature does not rest on any underlying neuropathological substrate but on the intercorrelations among these ubiquitous variables, although some studies have not

confirmed these confounding relationships (MacVane, Butter, Mongtomery, & Farber, 1982).

The third emergent theme outlined by Goldman is related to localization of brain damage in alcoholics. Hypotheses have been advanced emphasizing damage to the right cerebreal hemisphere (Jones & Parsons, 1972), the frontal-limbic diencephalic system (Tarter, 1975), or less localized damage that is instead more diffuse (Wilkinson & Carlen, 1981).

Two studies reported by Brandt and associates exemplify each of these themes (Brandt, Butters, Ryan & Bayog, 1983). Using a large number of alcoholic subjects divided into younger and older alcoholics, significant deficits in performance were demonstrated on verbal and non-verbal short-term memory (STM) tasks when compared to non-alcoholic controls matched for age and education. Detoxified alcoholics were found to be severely impaired on the Symbol-Digit Paired-Associate Learning Test and on the Embedded Figures Test. This study, however, did not demonstrate any sparing of younger alcholics from these cognitive losses, a phenomenon often reported in the literature. The second study reported by Brandt et al. investigated recoverability. With growing consistency, recoverability of neuropsychological functioning during periods of alcohol abstinence and late in a recovery period has been demonstrated (Claiborn & Greene, 1981; Kish, Hagen, Woody & Harvey, 1980). With age, duration of alcohol abuse, and education as covariates, Brandt et al. found that prolonged abstinence led to better recoverability of function as measured by a battery of neuropsychological tests than either short-

term or long-term abstinence. On a test of verbal STM, recoverability appeared to be complete in the prolonged abstinence group. Intermediate recovery on the same task was displayed by the long-term and short-term groups, which were not statistically different from each other. No recoverability was found for any of the groups on the Symbol-Digit Paired-Associate Learning Test or on the Embedded Figures Test. The authors noted that recoverability is not an all-or-none phenomenon. STM seemed to be almost completely recoverable, while LTM and tasks that involved encoding strategies and the ability to form new associations may be permanently impaired by prolonged alcohol abuse. This finding was interpreted by Brandt et al. in the light of the different areas of the brain that might be responsible for STM and LTM processes (cortical versus sub-cortical structures, respectively).

This brief review clearly indicates a consensus that some neuropathological damage exists in alcoholics that helps to account for their usually poorer performance on a wide range of neuropsychological tasks, including those involving memory functions. If memory for frequency of occurrences does not follow Hasher and Zacks' model but, instead, follows the same kind of continuum of performance cited by Goldman (1983), this is reasonable to subject that alcoholics would show significantly lower frequency judgment performance on this kind of task than would non-alcoholics. The result would suggest that differences in frequency judgment performance are sensitive to decreases in cognitive capacity related to chemically induced brain dysfunction.

CHAPTER III

THE PRESENT STUDY

The Context Study

The present study will investigate frequency of occurrence phenomena in the context of a larger study designed to explore life situations and mood states encountered by persons during the first 90 days after discharge from an inpatient substance abuse treatment facility. Investigating frequency of occurrence information in this context will involve fitting the typical experimental paradigm for such studies to the subjects, stimuli, and larger time intervals required by the field conditions of the larger study. Thus, it will be necessary to first describe the larger experimental context in which frequency of occurrence phenomena will be investigated.

The larger study on which the present experiment builds was begun in November 1983, at Lutheran Center for Substance Abuse in Park Ridge, Illinois. This center is a private treatment facility associated with Lutheran General Hospital, located in the same northwest Chicago suburb. The study's purpose was to investigate patterns of recovery in treated alcholics by use of intensive self-report measures and structured interviews. In order to obtain a random sample of the recovering person's moods and experiences, the study utilized long-range pagers that were triggered randomly four times per day between the hours of 8:00 a.m. and 10:00 p.m., seven days per week. Subjects who were scheduled to be "on the beeper" for a given period were to complete a

Daily Activity Report each time they were paged. This report is a self-report measure of mood states, salient thoughts and experiences, situational confidence of abstinence, substance use since the last beep, A.A. and other self-help group activities since the last beep, and responses toward individuals the subject might be relating to at the time of the beep (Appendix A). In addition to these four, daily self-generated "snap-shots" of the subject's ongoing experience, each subject completed an End of the Day Report that summarized his/her perceptions of the entire day.

Clinical subjects for this study were volunteers recruited from the inpatient population who met two criteria: (a) geographic ease of access to the center for periodic interviews and exchanges of experimental materials, and (b) the absence of any clinical judgment on the part of the treatment team that participation would be disruptive of the potential subject's adjustment after discharge. Potential subjects excluded from recruitment due to the second criteria were extremely rare. Subjects were introduced to the experiment's purpose and methods in an information meeting, where the voluntary nature of their participation, confidentiality of subject information, and the independence of the study from the facilities treatment activities were emphasized. Participating subjects received a total of $50 for transportation and other expenses related to their participation. This involved two disbursements, one of $20 at discharge and a second of $30 at the investigator's receipt of all experimental materials at the completion of the 90-day participation. A community sample was

recruited from the surrounding residential area to serve as a non-treatment control group. These subjects received $25 at the end of their two-week participation. An attempt was made to obtain a reasonably representative sample across the age groups and SES groups for the comunity sample, in order to reflect the full range of demographic factors in the population typically served by the center. All subjects participated under a signed consent and all experimental procedures were reviewed and approved by the hospital's Human Subjects Committee.

The clinical subjects were randomly assigned to one of three groups. Subjects in Group I carried the pager each day for the entire 90 days. Subjects in Group II followed the same protocol of filling out self-reports when paged, but carried pagers on a two weeks "on," two weeks "off" schedule. Subjects in Group III served as a clinical control group and did not carry a pager at any time. In addition to day-to-day self-reports, each group had an assigned contact schedule of brief biweekly, on-site interviews, and biweekly telephone contacts conducted by a trained, supervised research assistant.

Subjects in Groups I and II had interviews and telephone contacts on a regular weekly rotating basis. Subjects in Group III were assigned only one telephone contact each month. The purpose of both of these contacts was to correct any practical difficulties related to the study (pager malfunctions, lost activity workbooks, etc.) and to record any signficant perception or experiences volunteered by the subjects that were related to their participation in the study, or to their recovery adjustment. Contacts were made in an open-ended, informal way via the

telephone and pursued more extensively in face-to-face interviews, although an attempt was made to avoid unnecessary probing. Subjects in Groups I and II also completed semi-weekly self-report measures, exchanged materials and arranged their next appointments during each biweekly visit to the facility. All subjects received a more extensive and structured interview at the end of their participation in the experiment. Several standard psychological measures were administered at this time as repeated measures from a larger set of inventories and tests administered before their discharge from treatment.

Having briefly outlined the larger study from which this experiment draws its subjects and stimulus materials, it may be apparent as to how this context allows for the study of memory for frequency of occurrence. A major criterion in choosing stimulus materials for the present study was that they be amenable to objective scoring frequency. The subject's own self-generated ratings on the Daily Activities Reports meet this criterion and were considered stimuli for which frequency of occurrence estimates may be obtained. These estimates could then be compared to the subject's actual use of the response range for each item. For example, the Alert-Drowsy bipolar adjective item on the Daily Activity Report can be divided into three meaningful response ranges: (a) very, to some alert; (b) neither; and (c) some to very drowsy. Each subject's response to this item over two weeks or 90 days must fall into one of these response categories. Subjects can be asked to estimate the relative use of each category in terms of percentages, with 100% being the total number of times they responded to this item over the period of participation in question.

Actual relative frequency can be computed by simply tallying the responses as they occur in the subject's record and computing the actual relative frequencies for each category in percentages. A measure of accuracy or inaccuracy can then be obtained, and the several questions of interest to the typical study of frequency of occurrence studies can be asked of the data. Are the theoretically predicted correlations between actual and estimated relative frequencies observed? Does the degree of accuracy of estimates vary with subject status on variables known to affect other memory processes, such as abuse (present or absent), phase or recovery (late or early)? More generally, are the data consistent with the prevailing models of frequency of occurrence phenomena or, if inconsistent, on what basis can this inconsistency be explained? The present study, then, is partly exploratory in nature, attempting to explore well established experimental findings with novel data that may yield implications for clinical understanding and treatment issues, as well as providing evidence to support basic theoretical formulations regarding memory and learning.

The Present Study

Although frequency judgments were collected for several two-week intervals and for the entire 90 days of participation for subjects in both clinical groups, the present study is limited to an investigation of frequency judgments obtained at the first two-week evaluation, and can be seen as a preliminary to a repeated measures design or an investigation of judgments involving a larger time interval.

The exploratory nature of the present study calls for an open-ended approach to the problems presented by the several theoretical

perspectives that are relevant to frequency judgments and the effects of alcoholism on memory function. It will be possible to view the resulting data within the context of automatic processing theory and availability heuristics by emphasizing the frequency judgment aspect of the study. The emphasis of the grouping variables would make hypotheses grounded in a neuropsychological deficit view of alcoholism relevant, and would lead to the prediction that alcoholics will show cognitive impairment on frequency judgments as has been the case on some other measures of cognitive functioning. The following hypotheses can be tested, given the data to be generated from this study. Each is listed under the appropriate theoretical viewpoint that has lead to its generation.

Automatic Processing Theory Hypotheses

1. Relative frequency judgments and actual relative frequency of occurrence will be highly correlated.

2. Actual frequency of occurrence will produce the only significant effect on estimates (i.e., subject variables, item salience, item evaluative direction, etc., will not produce significant main effects or interaction effects on accuracy measures).

Cognitive Impairment Hypotheses

3. The recovery group will have significantly lower accuracy scores than the control group.

4. Recovery group subjects will perform more poorly than controls on judgments involving complex category judgments since the latter may be more sensitive to subtle deficits. This hypothesis refers to the different category judgments requested from subjects. The first two

questions required that the subject estimate the occurrence of events within spatial categories (i.e., extreme right or extreme left), while the second two questions require that the subject make a more complex judgment of the occurrence of events within a broader range involving evaluative categories (i.e., positive or negative affect). This second task may prove to be more sensitive to subtle cognitive deficit than the first task, which on inspection appears to demand a more primitive memory process.

Availability of Heuristic Hypotheses

5. Items that are rated as intuitively more salient to alcoholics in recovery will produce underestimation and overestimated effects greater than those items not judged to be salient, or abuser-relevant items. Items can be judged as abuser-relevant by means of a set of independent raters, preferably persons who themselves are recovering abusers. These effects would be predicted from the strong associations related to the self-relevancy of the salient items, causing overestimation, and to the psychodynamic, defensive or repressive reaction to other salient items, resulting in underestimation.

CHAPTER IV

METHOD

Subjects

The recovery group consisted of 22 persons of both genders. The community sample also included 22 persons of both genders. Treatment subjects were randomly selection Group I and Group II subjects in the context study. Since Group III subjects never generated the self-report stimuli required for the memory task, they were not included in the present study. All community sample subjects who completed the required protocol were included in the present study.

Stimuli

The stimuli for which judgments were made were the subjects' own self-ratings of their thoughts and feelings over the two-week period between discharge and evaluation. The actual frequency of occurrence of these self-generated stimuli depended ideally on several factors: subject compliance to the experimental protocol, the subjects' actual mood states and experiences, their ability to report them, and the demand characteristics of self-report situations such as the one the context study required.

The actual stimuli are discrete markings on continuously scaled lines, indicating extremes from either end of a bipolar adjective or between high and low poles on items measuring preoccupation with eating, preoccupation with using, confidence of abstinence, and degree of sharing with others (see Appendix A).

Subject Estimates

Several dependent measures were developed from subject estimates. Estimates were collected by means of a paper and pencil instrument titled "Memory Task Moment-to-Moment Beep" (Figure 1). The first section of this sheet is labeled "General Questions" and consists of four questions involving overall frequency judgments of all ratings over a given period. The first two of these questions refer to the occurrence of only the extreme right or left markings. The second two questions refer to the evaluative direction of the markings, either desirable or undesirable. With proud, for example, being toward the positive evaluative direction and on the right-hand side of the response form; while ashamed, the other pole of this item, being toward the negative direction and on the left-hand side of the form. The items were randomly placed and follow no predetermined right-hand orientation for positive or negative evaluative direction. The neither category is considered to be neither positive nor negative in evaluation, and may simply indicate that the respondent did not consider the item relevant at the time of response.

The second section entitled "Mood Questions" is formatted similarly to the Daily Activity Report used by the subjects throughout their participation, with the spatial arrangement, adjective poles, and order of items being the same with the exception of several items being completely eliminated, since they were not of experimental interest. All judgments requested are relative frequency judgments expressed in percentages. These judgments are, in fact, category judgments since a range of markings must be considered as a unit to make the required

Figure 1. Memory Task Moment-to-Moment Beep

Subject ID #_____

Date: _____

Check one: ☐ Total Period ☐ First 2 Weeks ☐ Last 2 Weeks

General Questions:

1. What percentage of the time did you mark (fill out) your book on the EXTREME RIGHT of the mood rating form? ____%

2. What percentage of the time did you mark (fill out) your book on the EXTREME LEFT of the mood rating form? ____%

3. What percentage of the time did you mark the POSITIVE items on the mood rating form? ____%

4. What percentage of the time did you mark the NEGATIVE items on the mood rating form? ____%

Percentage of Responses

Mood Questions	very 0	quite o	some .	neither -	some .	very o	quite 0	
alert		____%		____%		____%		drowsy
happy		____%		____%		____%		sad
irritable		____%		____%		____%		cheerful
strong		____%		____%		____%		weak
angry		____%		____%		____%		friendly
active		____%		____%		____%		passive
lonely		____%		____%		____%		sociable
proud		____%		____%		____%		ashamed
confused		____%		____%		____%		clear
tense		____%		____%		____%		relaxed

	Percentage (%) of Responses	
	Not at all/Somewhat	Quite/Very
How preoccupied were you with eating?	____%	____%
How preoccupied were you with drinking/ using?	____%	____%
How confident did you feel about your ability to resist the urge to drink/ use?	____%	____%
Did you share your feelings with someone close to you?	____%	____%

judgment. The final section of the sheet consists of questions related to preoccupations, confidence, and sharing of feelings. Responses to these items are considered dichotomous for purposes of this task, since no "neither" category occurs.

Procedure

Subjects were adminisered the memory task at the end of their first weeks of participation in the context study. The tests were given at the time of the biweekly or final on-site interviews. The task was administered by trained research assistants following written instructions (Appendix B). These instructions are designed to highlight for the subject that he or she would be using memory rather than some other strategy for producing their estimates. Subjects were given as much time as they wanted for the task. Subjects who felt they could not do the task as instructed were encouraged to attempt it, but were excused from the task if they persisted.

Behavioral observations were made of the subject's order of performing each item. When subjects clearly did not understand the task indicated, for example, by going beyond the 100% constraint on each item, or by giving patently unrealistic estimates for the most extreme marking categories, the experimenter pointed this out to the subject and would again explain the task to the subject, but without modifying the subject's responses.

CHAPTER V

RESULTS

Coding of Responses

Responses to 14 items from the subjects' Daily Activity Reports (Appendix A) were recorded for purposes of the present study. The remaining items on the Daily Actvity Reports were dropped because they were not of interest to the present study, either because they were not codable for relative frequencies, or because their inclusion would have made the memory task unreasonably time consuming for the subjects. The 14 items of interest were of two kinds: mood items and non-mood items. The mood items will be described first, followed by a description of the non-mood items.

The mood item consisted of 10 pairs of adjectives describing mood states or states of arousal. The 10 pairs of adjectives were: alert-drowsy, happy-sad, irritable-cheerful, strong-weak, angry-friendly, active-passive, lonely-sociable, proud-ashamed, confused-clear, and tense-relaxed. The adjective pairs were arranged on the Daily Activity Report so that 5 of the 10 adjectives were a positive connotation (as intuitively defined by the researchers) were on the left-hand side of the form, while the other 5 were on the right-hand side, thus forcing the adjectives with different connotations to be balanced for right-left placement. The 10 adjectives with a positive connotation were: alert, happy, cheerful, strong, friendly, active, sociable, proud, clear and These adjective will hereafter be referred to collectively as positives.

The 10 negative adjectives were: drowsy, sad, irritable, weak, angry, passive, lonely, confused and tense. These adjectives will hereafter be referred to collectively as negatives.

Adjectives within a pair were separated on the Daily Activity Report by seven scale markers. This allowed the subjects to indicate a mood state on any given item by checking the marker that indicated to what extent (very, quite, some, neither) they were experiencing a given mood (as described by an adjective) at the time of the beep. The response marker indicating that the subject experienced neither the positive nor negative mood state described by an adjective pair was located in the middle column of the Daily Activity Report mood section, between the two defining adjective poles. Responses on all 10 mood items that reflected subjects' use of this middle marker will be referred to as neithers when discussed collectively in the remaining text.

Coding of the mood items involved assigning values to each response marker depending on its right-left placement on the bipolar scale. From right to left responses were coded 6, 5, 4, 0, 3, 2, 1. This coding scheme was adopted so that means for mood states could be calculated for certain analyses (for example, an analysis to determine if the average intensity of a mood state was related to accuracy).

Subjects were allowed only one response per bipolar item. Responses falling between two markers were assigned to the nearest response category. Responses that were exactly between categories were assigned to the next higher category. Cases when more than one

response was made to an item on a given beep, or to which no response was made, were coded as missing.

The non-mood items of interest to the present study consisted of four questions: (1) How preoccupied were you with eating? (2) How preoccupied were you with drinking/using? (3) How confident did you feel about your ability to resist the urge to drink/use? (4) Did you share your feelings with someone close to you? Collectively, these questions will be referred to as non-mood items. Individually, they will be referred to (in order listed above) as preoccu. eat, preoccu. using, confident-resist, and shared.

Responses to the non-mood items were made by the subject on a pre-coded line on the Daily Activity Report form. Markers on the line were numbered from 0 to 9, moving from left to right, and indicated responses to a given question from "not at all" to "very much." This coding scheme was maintained for data analysis. The same conventions used on the mood items for handling responses between markers and for multiple responses to an item on a single beep were also used for non-mood items.

Compliance

The research protocol called for each subject to be beeped four times a day for two weeks. For the purposes of the present study, this meant that a perfect compliance to the protocol would result in 784 responses across items for each subject, or 56 responses to each individual item over the 14-day period. Compliance varied little from item to item; subjects rarely completed only some of the items of interest on the Daily Activity Report without completing others.

Because of this consistency, the number of responses to the first mood item, alert-drowsy, was used as an index of overall compliance. The control group responded to this item an average of 44.2 times with a standard deviation of 12.8. The recovery group responded to this item an average of 47.8 times with a standard deviation of 11.8. The control group's average compliance was 79% of perfect compliance, while the recovery group's average was 86% of the same protocol goal. The difference between the two groups on this measure of compliance was not significant when tested with a two-tailed t test, t (44) = .928.

Construction and Description of Relative Frequencies

Subjects' actual responses for the 14 days of participation were tallied within ranges defined by the judgments required by the Memory Task. Percentages were then calculated for the number of actual responses falling into each range from the total number of responses to a given item. This resulted in relative frequencies for each item, expressed in percentages, corresponding to the ranges specified in the Memory Task.

The means and standard deviations of the subjects' relative frequencies for each group and for each item appear in Table 1. Collectively, these relative frequencies of responses on the Daily Activity Reports expressed in percentages will be referred to as frequencies. The term frequency will be used where context makes this usage grammatically appropriate.

In investigating frequencies, t tests were used as a way of describing group differences. Since no hypotheses were entertained in

Table 1

Mean Frequency by Item and by Group

Item	Group				
Positives	Controls		Recovery		P Level
	M	SD	M	SD	
Alert	69.7	23.0	79.4	13.7	
Happy	64.3	20.1	63.8	20.2	
Strong	41.0	30.8	55.2	23.5	
Active	49.6	27.3	59.3	18.6	
Proud	33.4	28.2	49.4	26.9	
Cheerful	51.1	23.6	57.2	18.9	
Friendly	58.6	24.0	58.4	18.6	
Sociable	50.0	22.9	52.1	21.9	
Clear	61.5	33.3	63.6	21.8	
Relaxed	58.5	27.8	45.8	25.6	
Neithers	Controls		Recovery		P Level
Alert/Drowsy	4.5	5.2	3.0	4.6	
Happy/Sad	24.8	18.3	18.1	15.5	
Irritable/Cheerful	27.4	21.5	18.8	12.9	
Strong/Weak	43.1	32.4	25.8	23.4	*
Angry/Friendly	30.8	23.4	20.9	17.5	
Active/Passive	22.5	27.7	13.4	13.7	
Lonely/Sociable	32.1	25.1	17.9	18.1	*
Proud/Ashamed	62.7	31.4	37.1	27.5	**
Confused/Clear	26.9	31.5	14.9	13.9	
Tense/Relaxed	19.1	19.9	12.8	19.0	

Table 1 - Continued

Mean Frequency by Test Item and by Group

Item	Group				
Negatives	Controls		Recovery		P Level
	M	SD	M	SD	
Angry	10.6	7.4	20.7	14.8	*
Irritable	21.4	10.1	23.9	15.5	
Lonely	17.9	20.3	20.0	20.6	
Confused	11.6	10.8	21.6	15.9	*
Tense	22.3	17.1	41.4	21.7	**
Drowsy	25.8	20.2	17.6	14.1	
Sad	11.0	9.2	18.1	16.9	
Weak	15.9	15.5	19.0	13.4	
Passive	27.8	17.3	27.3	18.5	
Ashamed	3.9	5.7	13.4	12.7	*
Non-Mood Items	Controls		Recovery		P Level
	M	SD	M	SD	
Preoccu. Eating	5.7	6.5	7.4	10.3	
Preoccu. Using	2.6	5.3	5.1	9.0	
Confident-Resist.	94.5	8.4	88.3	19.5	
Shared	14.0	14.7	3.3	28.3	**

NOTE: $n = 22$ for all group means.

* $p < .05$.

** $p < .01$.

the represent study for group differences on frequencies, the statistical test is used descriptively, not in a hypothesis testing mode. Because of this descriptive use of statistics that are often used for hypothesis testing, each use is described as either descriptive or hypothesis testing as it appears in the text.

Descriptive comparisons between groups on frequencies resulted in eight significant differences based on a two-tailed *t* test, as reported in Table 1. The recovery group was significantly higher on frequencies of angry, confused, tense, ashamed, and shared. The control group had significantly higher frequencies of lonely-sociable, proud-ashamed, and strong-weak. When considered from the point of view of evaluative direction, significant differences between groups appeared on negatives and neithers, but not on positives. The recovery group had significantly higher mean frequencies of responses on 4 of the 10 negative items. For all of the 10 bipolar items, the control group had higher mean frequencies than the recovery group for neithers, although the differences were significant only in the cases of strong-weak, lonely-sociable, and proud-ashamed. Of the four non-mood items, only share showed a significant difference, such that the recovery group mean was higher than the control group mean.

The groups were not significantly different on any of the items that probe preoccupation with eating and drinking and confidence of ability to resist using. Although the recovery group means were higher for both types of preoccupation, lower for confidence in ability to resist using, these differences were not significant.

Description of Estimates

Subjects' estimates of their actual relative frequencies were recorded on the Memory Task form. No estimates were missing, and no subject rejected the task. For all subjects, each item tallied to the 100% total required by the task, indicating that the subjects understood at least this part of the task and could correctly make calculations required to ensure the 100% total.

The means and standard deviations of the subjects' estimates of their actual relative frequencies by group and by item appear in Table 2. Collectively, these variables will be referred to as estimates. Inspection of a bivariate x-y scatterplot of estimates revealed that subjects tended to frame their estimates in rounded numbers; that is, in terms of multiples of 5 and 10. Descriptive univariate comparisons by means of two-tailed *t* tests resulted in the significant differences reported in Table 2. The recovery group made significantly higher estimates on all the negative items. No significant differences were found between groups on the positive items. Only one neither category difference reached significance (proud-ashamed), with the control group subjects estimating themselves as higher than recovery subjects. Of the remaining four daily responses, only one difference proved to be significant, such that the recovery group subjects' estimates were significantly higher on preoccu. using.

Table 2

Mean Estimates by Item and by Group

Item	Group				
Positives	Controls		Recovery		P Level
	M	SD	M	SD	
Alert	69.2	24.0	69.7	25.6	
Happy	67.6	31.2	62.6	29.8	
Strong	48.2	36.2	54.3	31.5	
Active	58.5	32.4	62.1	27.2	
Proud	33.0	35.0	52.6	36.2	
Cheerful	62.6	29.9	59.1	29.7	
Friendly	70.6	29.3	61.5	28.7	
Sociable	64.1	33.09	53.0	29.4	
Clear	71.6	31.3	63.9	30.3	
Relaxed	58.1	33.4	45.8	33.8	
Neithers	Controls		Recovery		P Level
Alert/Drowsy	7.1	9.8	17.7	23.1	
Happy/Sad	22.6	30.8	21.2	28.7	
Irritable/Cheerful	22.5	28.0	18.7	22.7	
Strong/Weak	38.5	37.4	26.7	33.5	
Angry/Friendly	21.0	28.7	17.1	22.9	
Active/Passive	22.8	33.7	17.3	23.8	
Lonely/Sociable	22.0	29.8	18.9	29.1	
Proud/Ashamed	61.8	38.2	34.5	37.4	*
Confused/Clear	24.2	29.5	15.1	18.7	
Tense/Relaxed	20.7	19.8	41.3	32.0	

Table 2 - Continued

Mean Estimates by Item and by Group

Item	Group				
Negatives	Controls		Recovery		P Level
	M	SD	M	SD	
Angry	8.5	7.9	23.5	25.4	*
Irritable	14.9	15.5	22.2	25.2	
Lonely	13.9	18.4	27.6	25.0	*
Confused	8.4	11.5	21.0	22.4	*
Tense	20.7	19.8	41.3	32.0	*
Drowsy	23.5	19.6	16.3	19.2	
Sad	9.6	10.3	16.1	18.3	
Weak	13.4	14.2	19.0	16.3	
Passive	18.7	16.9	20.6	19.1	
Ashamed	2.5	4.7	12.8	18.5	*
Non-Mood Items	Controls		Recovery		P Level
	M	SD	M	SD	
Preoccu. Eating	10.2	16.2	20.2	30.0	
Preoccu. Using	2.5	4.5	16.8	27.5	*
Confident-Resist.	62.1	47.8	61.0	41.8	
Shared	26.8	26.4	43.1	31.9	

NOTE: n = 22 for all group means.

* $p < .05$.

Measures of Accuracy

Before describing individual measures of accuracy, the concept of accuracy will be explored more specifically so that different operational definitions can be viewed from their respective underpinnings. The literature on memory for frequency of occurrences describes two types of accuracy: absolute accuracy and relative accuracy. Absolute accuracy measures how much a subject's estimates differ from the actual frequency of occurrence. In the present study, difference score measures reflect this kind of accuracy. Relative accuracy measures how well a subject can distinguish higher rates of occurrence from lower rates of occurrence. The present study uses correlational measures to assess relative accuracy. Other measures of relative accuracy, such as rank ordering of targets for frequency, are sometimes used in studies of memory for frequency of occurrence, but were not used in the present study. Measures of relative accuracy may not agree with measures of absolute accuracy. This is because consistent underestimation or overestimation may still lead to high correlation of actual frequency with estimates; that is, consistent distortions may result in high discrimination between items on frequency of occurrence.

A measure that reflects absolute accuracy is the number of hits. A hit is defined as success in reaching a specified (actual) range of frequency. Hit measures will be described at greater length below. Measures can be developed that reflect both kinds of accuracy, for example, when absolute differences between actual and estimated are used to rank order the accuracy of judgments.

To answer the question as to whether two individuals or groups of individuals are more or less accurate in their estimates, both types of accuracy described above must be considered. In the present study, several dependent measures were derived from frequencies and estimates. These included hit measures, correlation measures and difference scores. The definition of each measure, the kind of accuracy it reflects, and its analysis are discussed under separate headings below. Since there are several variables that are used to measure accuracy, and the measures may lead to conflicting findings, a brief review of the evidence for between group differences on each type of measure will be made at the end of each subheading.

Hit Scores

Hits were calculated using the differences between each frequency and its estimate. An estimate was clasified as a hit when the absolute difference from its actual frequency was within a specified range. Decreasing this range increases the level of accuracy needed to score a hit. An analogy to events at an archery range may help make the use of the hit measure clear. A subject making frequency judgments may be compared to an archer attempting to accurately fire arrows at a target. Individual judgments can be compared to individual trials at hitting the bull's eye. As the rings painted around the target's center help to establish how close an arrow has come to the archer's goal, various criteria for a hit within certain ranges of accuracy help to define how accurately a subject has estimated actual rates of occurrence.

Hit measures reflect absolute accuracy rather than relative accuracy

alone. Since a hit can occur by chance alone (the chance rate of occurrence depending on the absolute number that defines a hit, or the width of a ring to follow the above analogy) the binomial test can be used to determine if subject can achieve hits at a rate significantly higher than chance. By defining various criteria for a hit, each requiring increased accuracy, a ceiling definition can be found, above which subjects cannot achieve hits at a rate higher than that expected by chance.

Results on the binomial tests cross groups and by groups for four hit measures, defined by increasing levels of accuracy (plus or minus 10%, 5%, 2.5% and 1%), are reported in Table 3, along with the actual number of trials (judgments) and successes (hits). For subjects across groups, hits occurred at a significantly higher rate than that expected by chance, until a hit was defined as plus or minus 1%. For the groups taken separately, the ceiling above which hits could not be made above the chance expectation was plus or minus 2.5% for each group. The lower ceiling definition for the groups taken separately is probably due to the reduction in the number of trials.

It is likely that the probabilities assigned to chance occurrences of hits in these binomial tests are in error, due to the fact that each trial is not independent of other trials. Whatever miscalculation that may be involved, however, is probably consistent for both groups and for all hit measures, and does not invalidate the rationale for looking for a ceiling of accuracy, or group differences on such measures.

Table 3

Hit Measures by Group.

Definition Range	±10	±5	±2.5	±1.0
Chance Proability	.2	.1	.05	.02
Groups				
Control Group				
Total Hits	415**	263**	167	104
Mean Hits	18.9	12.0	7.6	4.7
Recovery Group				
Total Hits	383**	248**	155	89
Mean Hits	17.4	11.3	7.0	4.0
Combined Groups				
Total Hits	798**	511**	322**	193
Mean Hits	18.1	11.7	7.3	4.4

Note: ** $p < .01$, binomial probability.

T tests were conducted between groups for hits defined according to the various criteria. Since specific hypotheses were entertained concerning hit measures; these t tests are to be considered hypothesis testing in nature. No two-tailed tests reached significance. Under the cognitive deficit hypothesis that recovery group subjects should achieve fewer hits than control group subjects, one significant difference was found when a hit was defined a plus or minus 2.5%, $t = 1.66$ (42); $p < .05$. On each of the other three hit measures, the recovery group showed a lower mean hit rate than did the control group, although these differences did not reach significance.

Judging from the evidence from hit measures, which reflect absolute accuracy, subjects in both groups can accurately estimate the rate of occurrence of their mood states. Some evidence was found for the cognitive impairment hypothesis that recovery subjects would be less accurate at the task than are control subjects; the one significant difference required the use of a specific one-tailed hypothesis.

Difference Scores

Difference scores were derived by subtracting each estimate from its corresponding frequency. Both signed differences and absolute values of differences were used to investigate group performance. Table 4 presents the means and standard deviations of each signed difference variable by group. Table 5 presents the same information for the absolute difference scores. Although difference scores are dependent measures, hypothesis testing by means of univariate tests were not conducted, due to the large number of comparisons. The t tests described here are to

Table 4

Signed Difference Scores by Item and by Group

Item	Group				
Positives	Controls		Recovery		P Level
	M	SD	M	SD	
Alert	0.4	16.5	9.7	21.0	
Happy	-3.3	22.7	1.2	18.6	
Strong	0.72	24.7	1.2	18.6	
Active	-8.9	19.6	-2.8	19.9	
Proud	0.3	20.7	-3.2	17.7	
Cheerful	11.6	18.6	-1.9	18.6	
Friendly	-12.1	21.8	-3.0	18.2	
Sociable	-14.2	23.5	-0.9	20.8	
Clear	-10.1	22.1	-0.3	17.1	
Relaxed	-0.4	19.6	0.0	17.7	
Neithers	Controls		Recovery		P Level
Alert/Drowsy	-2.6	9.4	-14.6	21.8	
Happy/Sad	2.2	23.7	-3.2	19.5	
Irritable/Cheerful	4.9	17.3	0.1	17.6	
Strong/Weak	4.6	23.6	-0.9	17.5	
Angry/Friendly	9.8	19.8	3.7	14.8	
Active/Passive	-0.3	14.2	-3.8	16.3	
Lonely/Sociable	10.1	19.6	-1.0	23.7	
Proud/Ashamed	0.9	26.8	2.6	20.8	
Confused/Clear	2.7	22.0	-0.3	12.7	
Tense/Relaxed	-2.1	24.7	-0.1	13.6	

Table 4 - Continued

Signed Difference Scores by Item and by Group

Item	Group				
Negatives	Controls		Recovery		P Level
	M	SD	M	SD	
Angry	2.1	6.7	-2.7	20.0	
Irritable	6.6	12.9	1.7	20.1	
Lonely	4.0	13.6	2.3	14.6	
Confused	3.2	11.8	0.6	14.1	
Tense	1.7	16.5	0.1	21.7	
Drowsy	2.4	15.0	1.3	10.4	
Sad	1.3	10.5	2.0	9.1	
Weak	2.6	9.8	0.0	14.2	
Passive	9.1	12.3	6.6	16.4	
Ashamed	1.4	4.0	.06	12.4	
Non-Mood Items	Controls		Recovery		P Level
	M	SD	M	SD	
Preoccu. Eating	-4.6	15.4	-12.9	25.4	
Preoccu. Using	0.1	5.8	-11.7	22.6	*
Confident-Resist.	32.4	51.6	27.2	40.0	
Shared	-12.8	25.9	-9.8	37.2	

NOTE: n = 22 for all group means.

* $p < .05$.

Table 5

Absolute Difference Scores by Item and by Group

Item	Group				
Positives	Controls		Recovery		P Level
	M	SD	M	SD	
Alert	13.0	9.7	16.4	16.1	
Happy	18.0	13.5	14.9	10.7	
Strong	17.8	18.31	15.2	10.1	
Active	14.7	15.5	16.4	11.0	
Proud	15.3	13.5	13.8	11.2	
Cheerful	16.9	13.6	14.0	12.0	
Friendly	19.9	14.6	13.8	11.8	
Sociable	20.8	17.5	16.1	12.7	
Clear	15.7	18.3	13.5	10.1	
Relaxed	15.2	11.8	14.4	9.8	
Neithers	Controls		Recovery		P Level
Alert/Drowsy	6.0	7.6	15.4	21.2	
Happy/Sad	18.8	13.9	14.8	12.8	
Irritable/Cheerful	14.6	9.9	13.4	11.0	
Strong/Weak	17.6	16.0	12.3	12.2	
Angry/Friendly	17.7	12.8	10.1	11.3	*
Active/Passive	10.6	9.2	10.6	12.8	
Lonely/Sociable	16.7	14.1	16.4	16.7	
Proud/Ashamed	18.2	19.2	16.8	12.0	
Confused/Clear	15.5	15.5	7.9	9.8	
Tense/Relaxed	17.3	17.3	8.3	10.7	

Table 5 - Continued

Absolute Difference Scores by Item and by Group

Item	Group				
Negatives	Controls		Recovery		P Level
	M	SD	M	SD	
Angry	5.5	4.2	13.0	15.1	*
Irritable	11.0	9.2	13.1	15.0	
Lonely	7.6	11.9	12.3	7.6	
Confused	8.0	9.1	9.6	10.1	
Tense	12.0	11.1	16.9	13.0	
Drowsy	11.0	10.2	8.4	6.1	
Sad	7.8	6.9	7.4	5.5	
Weak	7.5	6.7	10.9	8.7	
Passive	10.6	11.0	15.1	8.7	
Ashamed	2.3	3.5	9.4	7.7	*
Non-Mood Items	Controls		Recovery		P Level
	M	SD	M	SD	
Preoccu. Eating	7.9	13.9	14.3	24.5	
Preoccu. Using	2.9	5.0	12.5	22.2	
Confident-Resist.	40.2	45.5	28.2	39.4	
Shared	20.6	19.9	27.0	26.8	

NOTE: $n = 22$ for all group means.

* $p < .05$.

be viewed as descriptive in nature. The *t* tests comparing the groups on difference scored yielded the signficant differences reported in Tables 4 and 5.

Figures 2, 3, and 4 were developed to show the relationship among frequencies, estimates, absolute differences and signed differences. The plots are organized by the evaluative content of mood items. Each figure represents the 10 mood items along a single evaluative dimension: positive, negative, or neither. Bars represent mean frequency by group. Unconnected large dots represent mean estimates by group. Lines plot the level of absolute differences by group for each variable. Frequencies and estimates are plotted on the outer scale of the figures, which range from 0 to 100 percent. Mean signed differences are reflected in the distance from the end of a bar (mean frequency) and the unconnected dot (mean estimate) for each group. An estimate dot appearing above a group frequency bar indicates that the group on the average overestimated the frequency of that item, and had a negative mean signed difference. An estimate dot in a bar indicates underestimation, and a positive mean signed difference.

These figures demonstrate that both groups tend to overestimate positives (Figure 2) and underestimate negatives (Figure 4). Descriptive *t* tests of mean overestimation and mean underestimation across all 10 items by evaluative direction, led to a trend toward significant differences between groups on overestimation of positives, such that the control group overestimated positive moods more than the recovery group (t (42) = 1.82, $p < .07$). Other measures of underestimation or

Figure 2. Positive Mood Items

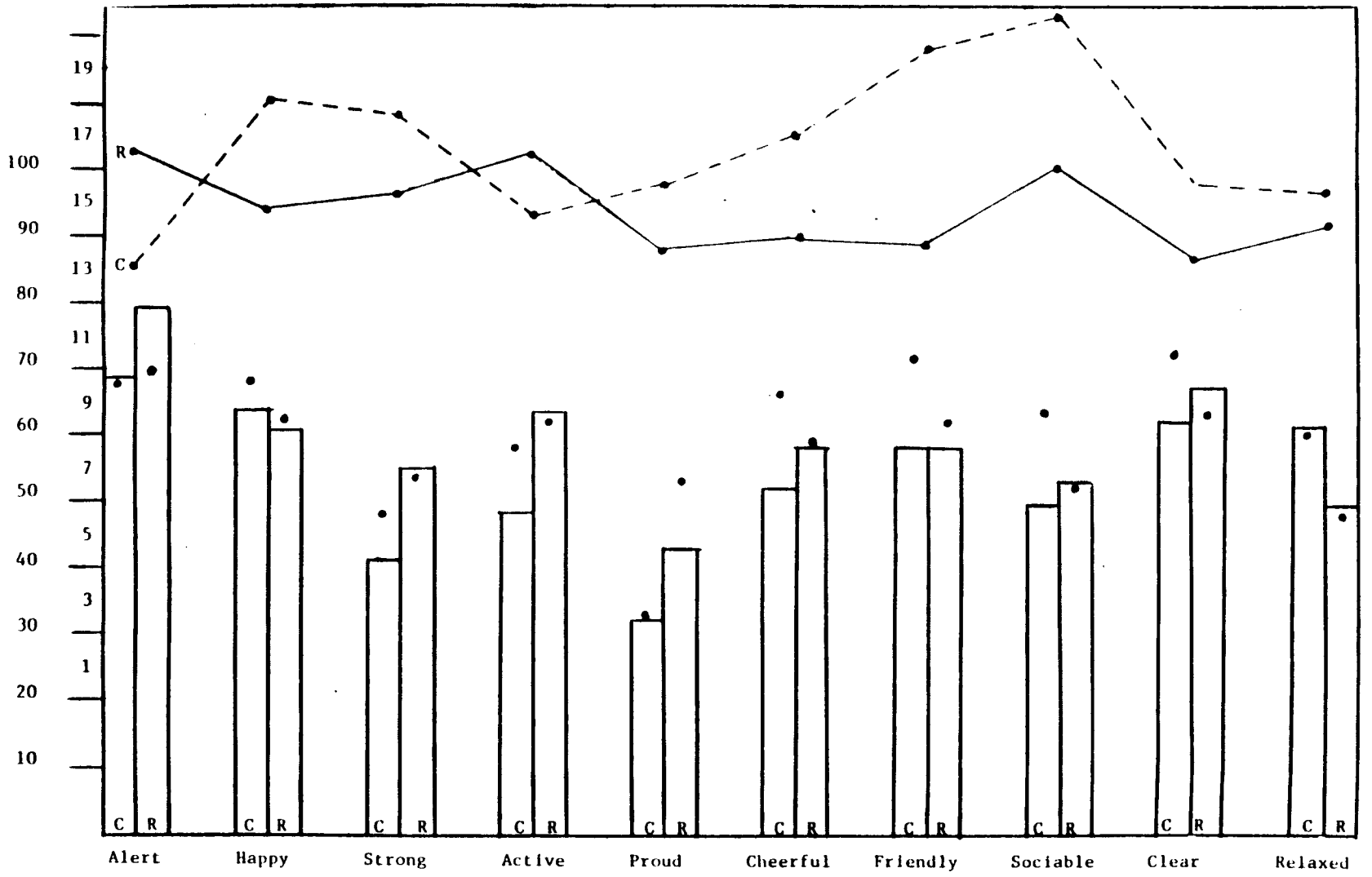


Figure 3. Neither Mood Items

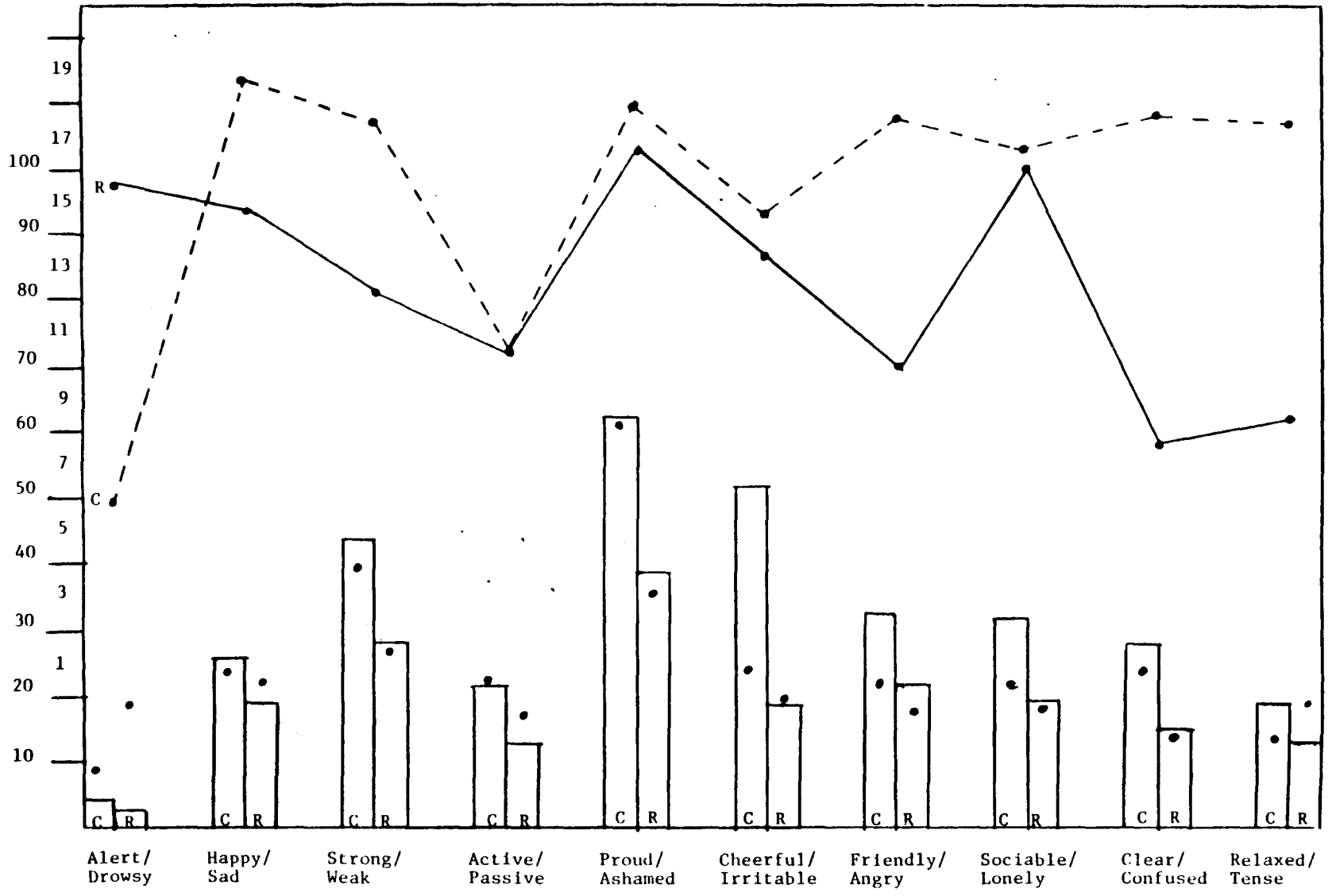
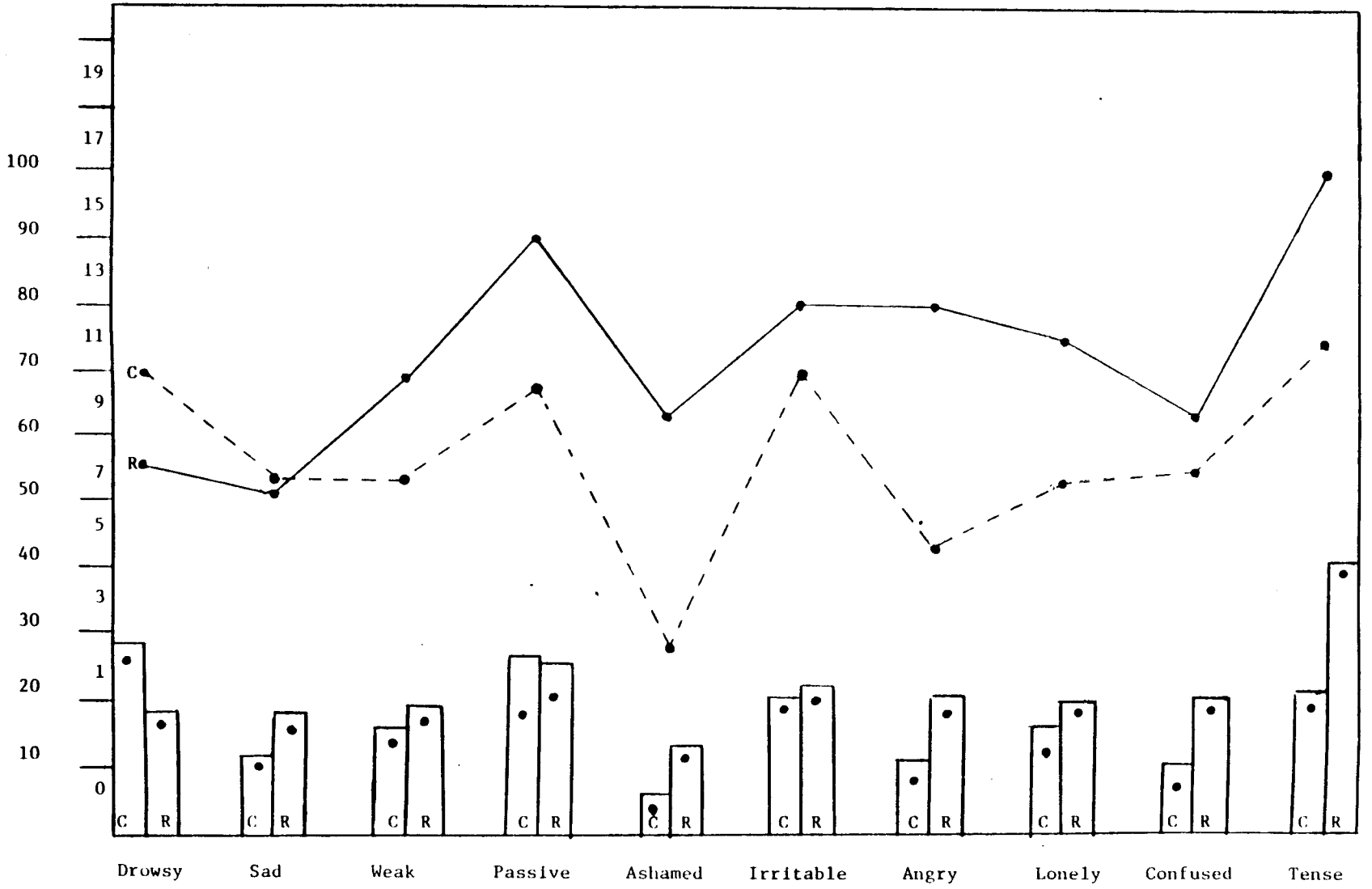


Figure 4. Negative Mood Items



overestimation did not approach significance.

Inspection of the levels of absolute differences across the three figures shows that the recovery group is more acurate than the control group on the positive scale and on the neither scale, but is less accurate than the control group on the negative scale. While both groups exhibit extreme variations in mean absolute differences on negatives, these changes are less pronounced on positives and neithers. Also, the recovery group mean absolute difference is relatively stable in elevation across the free figures, whereas the control group's mean is very different in elevation on the figure for negatives than it is on the other two figures. The control group's accuracy, then, appears more sensitive to evaluative direction that the recovery group's accuracy, which is more stable across evaluative directions.

These relationships were further investigated by calculating each individual's mean absolute accuracy for each evaluative direction, thus creating three composite accuracy variables: mean accuracy on positives, mean accuracy on negatives, and mean accuracy on neithers.

Both groups had the same rank ordering of acuracy for the three mean absolute accuracy measures. In order of descending accuracy, this rank ordering was most accurate on negatives, less accurate on neithers, and least accurate on positives. When t tests were conducted between groups for each mean absolute accuracy measure, the only difference to reach significance was that for negative items, with the control group being significantly more accurate than the recovery group, t (44) = 2.4, $p < .04$. The evidence, therefore, from these measures is that the control

group is more accurate than the recovery group, but that this difference surfaces only when the evaluative direction of items is considered (a *t* test betwen groups on mean absolute accuracy across all three types of item was not significant).

In summary, the evidence from difference scores points to an interaction of group status, evaluative direction and accuracy. Recovery subjects appear to be relatively invariant in their accuracy. Although showing the same overestimation and underestimation effects that are seen in the control group's scores, the recovery group's scores show less systematic inaccuracy. In fact, control group subjects overestimate the occurrence of positive mood states significantly more than do recovery subjects, making them less accurate as measured by absolute differences on positive and mood items. The control group, however, shows higher accuracy on negative mood items. The recovery group subjects also show higher accuracy on negative mood items relative to the other evaluative dimensions, but not as dramatically as do the control subjects.

Discrimination Coefficients

A measure of accuracy of estimates sometimes used in studies of memory for frequency of occurrences is the discrimination coefficient (Flexer & Bower, 1975). A correlation coefficient is calculated between the subject's true and judged frequencies. The result is a measure of relative accuracy, rather than absolute accuracy, reflecting how well subject responses distinguish one rate of frequency from another. An *r* to *z'* transformation is necessary if the resulting correlations are not normally distributed. Since many of the discrimination coefficients

for subjects in the present study were in the high .90s and some approached 1.0, transformations were made of all coefficients using the Fisher *r* to *z'* formula (Hays, 1973).

Overall discrimination coefficients. Discrimination coefficients based on frequencies and estimates for all 34 daily response items were calculated. Table 6 contains summary statistics for this measure by group under the row for all. Other measures in this table are discrimination coefficients that have been computed on frequency and estimate pairs other than all 34 judgments and will be described below. Each measure is followed in Table 6 by the summary statistics for its corresponding z' transformed scores.

Table 6

Discrimination Coefficients by Group.

	Group			
Pairs	Controls		Recovery	
	M	SD	M	SD
All	.79	.12	.78	.15
All (*z'*)	1.17	.39	1.19	.49
Positives	.72	.23	.56	.27
Positives (*z'*)	1.10	.59	.71	.41
Negatives	.61	.35	.62	.33
Negatives (*z'*)	.99	.78	.90	.62
Neithers	.74	.30	.48	.31
Neithers (*z'*)	1.23	.71	.68	.61
Mood Only	.83	.15	.80	.18
Mood Only (*z'*)	1.41	.66	1.31	.59

The discrimination coefficients for each group averaged in the high .70s. Neither the *t* test between groups on the original correlations, nor on the *z'* transformations reached significance. Across judgments the two groups are very similar in their accuracy as measured by the discrimination coefficients. Since both groups were less accurate in their estimates of the non-mood items than of the mood items, as reflected in absolute differences discussed above, discrimination coefficients were calculated based only on the 30 mood items. The resulting coefficients were higher, indicating higher accuracy, but the difference between groups was still not significant.

Evaluative-content-based discrimination coefficients. To investigate the possibility that evaluative direction might be interacting with group status and level of frequency to affect accuracy, two additional discrimination coefficients were constructed: one reflecting accuracy on negative items only, and another reflecting accuracy on positive items only. The control group showed significantly higher relative accuracy on positive items, t (42) = 2.53, $p < .02$. For negatives, however, the control group was slightly and non-significantly more accurate.

These differences again suggest a group by evaluative direction interaction for accuracy. The control group is significantly more accurate on relative measures of accuracy on positives and neithers, but the recovery group has more relative accuracy on negatives. The reader will recall that the situation was reversed for absolute accuracy. The recovery group had higher absolute accuracy on positives and neithers

as measured by mean absolute difference scores, while the control group had significantly higher absolute accuracy on negatives. Together, these measures of accuracy suggest that although both groups systematically overestimated positives and underestimated negatives (resulting in lowered absolute accuracy), the control group was generally more accurate when both types of accuracy were taken into consideration.

In review of the findings on discrimination coefficients, it is clear that both groups show high relative accuracy when accuracy across all items on the Memory Task are considered. This overall accuracy improves if only the mood items are used to assess accuracy. Group differences on overall measures of accuracy were not significant. When discrimination coefficients were constructed on single evaluative dimensions, however, clear group differences did emerge. The control group showed significantly higher accuracy on both the neither items and the positive items.

Spatial and Evaluative Category Judgments

The description and analysis of variables related to the General Questions Section of the Memory Task are discussed separately in this section because they are different in kind than the other 34 judgments made by each subject. All of the judgments in the present study are in a sense category judgments: they all required the subject to sum frequencies over response ranges on the Daily Activity Reports. The judgments discussed in this section, however, require summing frequencies not only across response ranges, but across mood items, using categories not previously introduced explicitly to the subject in the context study.

For example, in order to estimate the percent of responses that occurred on the extreme right-hand side of the Daily Activity Reports, the subject must use information for all 10 mood items. In addition, the subjects were never asked to attend specifically to the right-left placement of their responses. This judgment, then, requires the subject to sum across items and to judge the frequency of implicit events, such as right-left placement.

Four categories that were not explicitly introduced in the context study were introduced in the General Questions Section of the Memory Task. The first two questions requested judgments of the frequency of markings made by the subject on each spatial extreme for all mood items. The second two questions requested judgments of the frequency of markings in the categories of positive and negative described to the subject at the time of the administration of the Memory Task. The spatial category judgments were hypothesized to be less difficult than the evaluative category judgments. Group differences were hypothesized to be more likely to emerge on the evaluative category judgments.

Description of relative frequencies. The relative frequencies for the first two questions dealing with extreme left and right placement of responses were expressed as percentages of extreme left-hand (left) and extreme right-hand (right) responses of the total of all mood item responses. The relative frequencies for the second two questions dealing with evaluative direction of responses were calculated by taking the mean of each subject's relative frequencies for positive items (good) and the mean of each subject's relative frequencies for negative items (bad). The means and standard deviations for these variables and the

resulting difference scores appear in Table 7, below.

Table 7

Spatial and Evaluative Category Judgment Variables

Variable	Group			
	Controls		Recovery	
	M	SD	M	SD
Frequencies				
Right	6.9	11.5	9.5	9.8
Left	6.7	10.6	7.5	8.9
Good	53.8	19.4	58.4	16.6
Bad	16.8	8.2	23.3	13.5
Estimates				
Right	13.2	12.3	16.6	15.4
Left	14.6	12.9	23.9	23.7
Good	66.1	18.0	61.4	22.5
Bad	23.6	14.2	31.5	17.1
Signed Differences				
Right	-6.5	9.1	-9.1	14.7
Left	-7.8	9.0	-14.3	17.9
Good	-12.3	22.1	-2.9	15.7
Bad	-6.8	12.7	-8.2	13.9
Absolute Differences				
Right	7.5	8.3	12.1	12.2
Left	8.6	8.1	15.0	17.2
Good	1.5	16.9	13.2	8.7
Bad	11.4	8.6	13.4	8.8

Description of estimates. Subject responses to questions 1 through 4 in the General Questions were used without coding or transformation. The means and standard devisions of these variables are included in Table 7. Two-tailed *t* tests between groups on these variables yielded no significant differences.

Dependent measures: difference scores. Discrimination coefficients for individual subjects were not used due to the small number of judgments involved. Hit measures were not developed due to the small number of trials making the binomial test unsuitable for reaching any conclusions about relative performance. Instead, difference scores were used to assess accuracy.

Difference scores on category judgments were computed by subtracting the frequency from the estimate for each judgment. The absolute value of each difference was used as a separate variable. Means and standard deviations of these variables are reported in Table 7. None of the group differences were significant using two-tailed *t* tests at the .05 confidence level.

Both groups overestimated frequency on all four questions. This may be related to the absence of any constraint on these judgments; that is, unlike any of the other judgments for the present study, the judgments in the General Questions Section are not directly linked to other judgments. Even taken in pairs of spatial and evaluative judgments, they do not have to (and probably should not) tally to 100%. The groups were very similar in accuracy with the only trend toward a significant difference being revealed in a summed score for absolute accuracy on

spatial judgments (combined accuracy on qustions 1 and 2), t (42) = 1.84, p = .074, with the control group being more accurate.

When t tests for correlated means were performed between each group's accuracy score on spatial judgments and the same group's accuracy score on evaluative judgments, differences between these kinds of judgments are suggested. For the control group, significantly less accuracy was displayed on evaluative judgments than on spatial judgments (t (21) = 2.39, $p < .03$). For the recovery group, however, there was no significant difference in accuracy for these two types of judgments, as measured by summed composite scores.

In summary, the evidence by means of difference scores on accuracy of spatial and evaluative category judgments weakly supports the hypothesized relationships. There was a non-signficant trend toward the control group being more accurate on spatial judgments. The control group was more accurate on spatial judgments than on evaluative judgments as predicted, but this was not true of the recovery subjects. Contrary to the hypothesis that group differences would emerge on evaluative judgments, both groups performed relatively poorly on evaluative category judgments; although the control group was more accurate, this difference was not significant.

CHAPTER VI

DISCUSSION

Different theoretical perspectives were used to generate the hypotheses tested in the present study. These hypotheses required assumptions that at points directly contradict the assumptions of other hypotheses. Because of the absence of a unified theoretical perspective, each hypothesis formulated in Chapter II will be discussed separately in the present section. Each specific hypothesis is presented (sometimes in abreviated form) in bold type, followed by a discussion of the related findings. The second subsection below discusses the results integratively across hypotheses, along with implications for the different theories of memory for frequency of occurrences. A critique subsection follows, discussing the limitations of the present study, as well as threats to its internal and external validity. The final subsection suggests directions for future research in the area of memory for frequency of occurrences.

Specific Hypotheses

Automatic Processing Hypotheses

1. Relative frequency estimates and actual relative frequency of occurrence will be highly correlated. Strong support was found for this hypothesis. Observed correlations were comparable to those reported in other memory for frequency of occurrence studies. For some

single evaluate dimensions, some subjects obtained correlations over .99. Hit measures and difference scores provided strong evidence for high absolute accuracy, in addition to the high relative accuracy.

A possible alternative hypothesis that may lead to reservations about interpreting this high correspondence of estimates to actual frequency as support for automatic processing of frequency information is that it may, in part, be related to the 100% restraint on the majority of the judgments. Although it was demonstrated that the high correlations between frequency and estimates were not solely due to the requirement that most subjudgments tally to 100%, accuracy was generally lower for items that consisted of two rather than three subitems (as with the non-mood items), and lower still for items that consisted of one judgment per item (as with the General Questions). A possible interpretation of these declines in accuracy is that the items that differ in number of subitems from the mood questions are also different in content, format, and/or difficulty of judgment (as was specifically hypothesized for the category judgments in the General Questions Section).

Alternative hypotheses for the declines in accuracy on items with fewer subjudgments may help to clarify the nature of the various judgment strategies that may be available to subjects performing the tasks in this study, although they are less parsimonious and, therefore, less convincing. One such hypothesis is that the multiple subjudgments result in increased accuracy through improved guessing on the remaining subitems, after subitems for which the subject had better frequency information had first been performed. This is possible because the

subject was allowed to determine the order of subjudgments, although not the order of items. The first subjudgments made by a subject on an item, if accurate, would reduce the amount of error possible in the remaining two judgments, at least in the case of the mood items. If the remaining two subitems are merely guessed at (with the remaining percentage points distributed randomly between them), higher accuracy across the entire item would result than would be the case if these items had been guessed at independently. Another possible strategy that uses information on one subitem to improve accuracy on others would consist of performing the second and third judgments on a mood item (and even, perhaps, the first) as a rank orderly task, by distributing more of the remaining percentage points to the subitem thought to be more frequent.

A strategy of using subitem information for subsequent subitems is constructable from an analogy to signal detection theory and related theories of judgment (Helson, 1959). A subjudgment for which some frequency counter information is detected (a clear internal signal) might be used as a perceptual anchor against which to compare and contrast the subitems for which less frequency counter information is held (a weaker internal signal). This hypothesis assumes that the subjects have a subjective perception of frequency counters, and that this perception can be improved through the use of a standard input or perceptual anchor. This improved performance through the use of perceptual anchor has been demonstrated in other physical and social perception judgments, along with contrast and assimilation effects similar to overestimation and

underestimation effects found in the present study (Brickman, Coates, & Janoff-Bulman, 1978; Manis & Moore, 1978).

A way of interpreting the observed high correlations without recourse to either automatic processing theory or the effects of placing multiple subjudgments and restraints on the overall judgments, can be derived from personality theory and theories of personality testing. Instead of using automatically encoded frequency information, the subject may resort to a strategy that takes advantage of the self-generated and self-related nature of the target frequencies. By referring to his or her self-concept (beliefs, expectations, and feelings about self), high correlations might be obtainable on the tasks used in this study, without the subject resorting to what might typically be called memory processes. If it were assumed that the subject was unaware of this strategy, while nonethless resorting to it, the projective hypothesis of personality testing would be relevant to the Memory Task data (Anastasi, 1982). With or without the assumption of awareness, such a strategy, would make the task more like the personality trait inventory than a measure of memory processes.

A related possibility is that subjects weighed the subjective probability of different distributions of percentages when several subjudgments were required, using an implicit personality theory that contained accurate information about what traits could be expected to go together given a certain type of person, the self in the case of the present study (Kelly, 1955). The subject would be using both a self-concept and an implicit personality theory (personally derived but with

a high degree of consensus across persons within a given culture) to estimate what the subject thought should have been recorded on Daily Activity Reports, rather than memory for what was actually recorded. It is conceivable that subjects might be able to provide highly accurate estimates of another subject's frequency, given a concept of the other person based on personal acquaintance or some other source of information, such as merely being told that a person was or was not a recovering alcoholic.

Given these reservations, it is nonetheless parsimonious to view the high correlations of actual to estimated frequency found in the present study as (qualified) evidence for the automaticity of the encoding of frequency information. The qualifications related to viewing the results from the vantage point of personality theory are mitigated when the possible role of automatically encoded frequency information in the formation of concepts (including concepts of self and others) is taken into consideration (Cantor & Mischel, 1979).

2. **Actual frequency of occurrence will produce the only significant effect on estimates.** The omnibus null hypothesis for effects on memory for frequency of occurrence was rejected for the present study. The prediction of no significant effects was rejected for both overall measures of relative accuracy, and for measures of relative and absolute accuracy across specific types of judgments. The demonstrated effects on accuracy included effects of the evaluative direction of judgments, of extremity of responses by evaluative direction, and group interaction effects.

This pattern of results is what would have been expected of a study investigating effortful processes, rather than automatic processes, under Hasher and Zacks' framework. Rather than leading to the disconfirmation of the automatic processing hypothesis, its proponents might argue, the present study is not a good test of the hypothesis because the tasks used to measure memory required (or at least encourage strategies that require) large amounts of effortful processing. These effortful processes include performance of calculations, weighing of probabilities, and recall of crucial mood exemplars. It could be argued that the significant effects demonstrated in the present study were related to these effortful processes that are expected to vary with conditions.

The possibility of such an argument can be viewed as a major criticism of the automatic processing theory. As Green (1984) has pointed out, perhaps no meaningful test of the theory is possible, since it may not be feasible to devise meaningful, ecologically valid tasks that function without effortful processes. Given the support found for the first automatic processing hypothesis above and the lack of support for the second, it appears more parsimonious to acknowledge some automaticity in the encoding of frequency of occurrence information, without endorsing the invariance of such encoding as is advocated by Hasher and Zacks.

Cognitive Impairment Hypotheses

3. The recovery group will have significantly lower accuracy scores than the control group. Discussion of this hypotheses requires

clarification of the conflicting evidence from different measures of accuracy. On overall measures of absolute accuracy (hits) and relative accuracy (overall discrimination coefficients) the recovery group had consistently lower mean accuracy. The only overall measure on which this difference was significant was for a hit measure with success defined as the estimate being within 2.5 points of the actual frequency. The significant difference depended on the one-tailed prediction of this hypothesis.

When accuracy for mood items grouped by evaluative connotation was investigated, ambiguous findings resulted. Because of different degrees of overestimation of positive items and underestimation of negative items, whenever one group had a higher absolute accuracy the other group had the higher relative accuracy and vice versa. The recovery group's mean accuracy was at times higher than the control group's mean accuracy, but this difference in favor of the recovery group was never significant. On three measures of accuracy across evaluative dimensions (relative accuracy for neithers, relative accuracy for positives, and composite absolute accuracy for negatives) the control group was significantly more accurate than the recovery group. This significantly higher accuracy for the control group is consistent with the cognitive impairment hypothesis, and could be interpreted as evidence in support of it.

These findings do not necessarily substantiate the cognitive impairment hypothesis, however. The finding that the groups differ in level of accuracy by evaluative direction implicates factors other than

chemically induced cognitive impairment (the assumption underlying the hypothesis as framed in Chapter II). A rival hypothesis that would account for the lower accuracy of the recovery subjects and the interaction of group status and evaluative direction on accuracy can be framed by attributing the lower accuracy to the effects of depression. This alternative hypothesis will be pursued further in the integrative discussion, since it is relevant to most of the hypotheses entertained in the present study. For the discussion of this specific hypothesis, the alternative hypothesis that the two groups differ on level of depression points out the possibility of other variables (correlated with group status but not identical with alcoholism status) which may account for group differences. Some of the control subjects may themselves be undiagnosed alcholics. The groups may differ in gender, age, personal adjustment, motivation to participate, or other variables that may be relevant to group differences on a cognitive task. This raises the issue of the internal validity of the present study to be discussed in the critique subsection.

4. Group differences will be demonstrated on evaluative category judgments, but not on spatial category judgments. Recovery subjects will have significantly lower accuracy on evaluative category judgments. Evidence was found to support the implication that spatial category judgments are less sensitive to group differences than are evaluative category judgments, and therefore may be less sensitive to cognitive deficits. Each group obtained the highest accuracy scores on a spatial category judgment. For one group, the controls, the

difference between accuracy on spatial items and accuracy on evaluative items was found to be statistically significant.

The main thrust of the above hypothesis, that recovery subjects would not perform as well as control subjects on evaluative judgments (presumably due to less cognitive capacity to perform the task) was clearly not supported. The control group was significantly less accurate on the evaluative judgments than the recovery group. This finding (although consistent with the trend for the control group's accuracy scores to be more sensitive to evaluative content) is inconsistent with viewing the differences between the two kinds of category tasks as related to task difficulty, while also hypothesizing higher cognitive functioning for the control group. The fact that the highest accuracy score for both groups was on a spatial judgment may not indicate any greater task difficulty for the evaluative judgments as cognitive tasks, but may instead reflect lowered accuracy on evaluative judgments due to underestimation and overestimation effects. These effects may themselves result from different response sets or availability heuristics for each group. Such response sets or heuristics would not be expected to significantly interfere with spatial category judgments.

Availability Heuristic Hypothesis

5. **The groups will differ in the degree of underestimation and overestimation of items that should be more salient or relevant to recovering alcoholics.** Items were not empirically determined to be abuser-relevant or more or less salient to alcoholics prior to the present study, due to limited resources. The basic thrust of this

hypothesis, that groups would different in underestimation and overestimation of items, depending on the content of the items, can nonetheless still be tested.

For the non-mood items, which intuitively would seem more salient and relevant to alcholics, both groups showed less accuracy than on the mood items. The small number of these items and the absence of consistent group differences across them makes interpreting them as a group of variables unpromising. In fact, one might expect the subjects in the two groups to have used the scales of these items differently, while using the scales of mood items in a more similar way. This possibility will be further elaborated in the critique of the present study, since it raises the issue of whether any of the self-reports or subject estimates are truly comparable across groups. This is another threat to the internal validity of the present study.

The mood items, however, are larger in number and do show consistent differences in accuracy. It was found that positive events were more related to accuracy for control group subjects than for recovery group subjects. Although both groups underestimated negative moods and underestimated positive mood states, control subjects made significantly higher overestimates of positive moods than recovery subjects. The difference between the groups on underestimation of negative moods was not significant. These findings suggest that it is the salience of items to control subjects that accounts for significant group differences, with the recovery subjects relatively less responsive to the content of items. The pattern of findings in the present study suggests that the positive items were more salient and memorable to the control subjects

than to the recovery subjects. No corresponding type of item more salient to recovery subjects (as established by a stronger effect on their estimates) was demonstrated on the mood items.

Two alternative hypotheses not directly related to alcoholism or recovery status can be suggested to account for the differences in patterns of overestimation and underestimation of items depending on their evaluative content. The first hypothesis is that the groups differ in the mean level of depression, a variable known to affect judgments of items with evaluative, emotional, and self-referential content (Bowers, 1981; Curt, 1981; Nelson & Craighead, 1977). The second hypothesis is that the groups differ in response set, possibly due to different demand characteristics for the two groups. The personal significance and social context of the testing situation may have been very different for the two groups. Demand characteristics may have functioned to influence control group estimates in the direction of presenting a favorable image of themselves to the researchers both in the Daily Activity Reports and the Memory Task. The recovery group estimates, on the other hand, may have been influenced in the direction of presenting an image of self to the researchers that was consistent with the Alcholics Anonymous-oriented treatment that they had received at the testing center.

Both of these alternative hypotheses will be further explored in the integrative discussion, since they have implications for the internal validity of the present study.

Integrative Discussion

Several theories related to memory for frequency of occurrences have been discussed as related to the individual hypotheses developed from them. Support was found for hypotheses under each theoretical umbrella, while others under the same theoretical framework were not confirmed. For the automatic processing hypothesis, evidence was found in favor of the automatic encoding of frequency information without intention or effort, but the hypothesized invariance of such encoding under differing conditions was rejected. The cognitive impairment hypothesis that frequency judgment performance would be negatively related to alcoholism was supported; but the hypothesis implying that this negative relationship to performance would be more dramatic on complex category frequency judgments was not supported. The availability heuristic prediction that recovery subjects and control subjects would differ in degree of underestimation and overestimation depending on the content of items was supported. The recovery group (as was hypothesized) was not the group which showed the strongest effects that might be interpreted as related to salience or relevancy of items (item content effects).

Although the various theories have contradictory assumptions, a unified perspective is possible that accommodates all of them in an attempt to explain the findings of the present study. The remaining portion of this subsection will use the findings of the present study to outline what the principal elements of a more unified persepective would include, and what aspects of the three theories reviewed here

appear unsuited for an attempt to accommodate the three theories to the present findings.

A more unified, eclectic perspective would hold that frequency encoding is automatic, in that it does not require intention or demand large amounts of cognitive capacity. At some point in the response system, however, it would have to be acknowledged that performances based on frequency information become vulnerable to the same influences that affect effortful processes. Whether this stage of vulnerability is at retrieval of encoded information or at the time or encoding may not be empirically determinable.

Recovering alcoholics show less accuracy than controls on judgments of frequency, but these lowered performances may be interpreted as related to a combination of factors, some directly related to the neurological effects of substance abuse, and others not related to chemically-induced brain dysfunction. The lowered performances may be related to aspects of cognitive set, such as self-concept, self-presentation related to demand characteristics, and personal constructs of the alcoholic. Affective sources of lowered performance could lead to both lowered capacity (as in depression or anxiety) and to systematic distortions related to differential availability of mood states. Accommodation to higher levels of emotional extremes might result in anchoring points different from control subjects, creating another source of group differences. Finally, some subtle neurological deficits may correlate with alcoholism but be causally orthogonal to any chemically-induced damage. Hypothetically speaking, this could occur, for instance,

in the case where a genetic factor leads to both suceptibility to addiction and subtle neuropsychological abnormalities.

Depression has been suggested at several junctures in the discussion of specific hypotheses as a variable that might account for many of the group differences reported here. The hypothesis that the two groups differ on main level of depression would be consistent with all of the theories entertained here, with the exception of the criteria of invariance across experimental conditions, which is part of Hasher and Zacks' automatic processing theory. The hypothesis based on this criteria was rejected in the present study. Nonetheless, automatic processing has much to add to an understanding of the ability of humans to judge frequencies of events. It is suggested that any unified perspective on the encoding of frequency information not include this criteria for automaticity, as originally formulated, but should instead view this criteria as a statement of relative invariance. In its present form it is either not true, given the results of the present study, or not amenable to a meaningful test, in that all significant human performances to some degree involve effortful processes.

Although depression and its effects on memory for frequency of occurrences was not the original focus of this study, and a full discussion of the influence of depression on the findings reported here are beyond the scope of the present discussion, a brief review of factors that implicate depression as a relevant variable is in order. A review of the literature focusing on the differences between studies of the automaticity of frequency encoding and studies of the effects of

depression on memory has described the two kinds of studies as differing in stimuli, type of judgment and measure of accuracy (Curt, 1981). Depression studies were typified as using emotionally charged materials, requiring category judgments of the subject, and using absolute measures of accuracy. Frequency studies were typified as using innocuous materials, requiring item frequency judgments of the subjects and using relative measures of accuracy. Both types of studies used some measure of depression as a variable.

The present study, in terms of its materials, methods, and subjects, is well suited to demonstrate the effects of a depressive memory on frequency of occurrence, if such effects exist. It combines all aspects of both types of study described by Curt (1981), except perhaps truly innocuous stimuli, since all the stimuli for the present study were self-relevant and therefore could be assumed to carry some emotional significance for the subject. What is not present is some measure of depression. If, however, the level of frequency for negative mood items can be interpreted as a rough index of depression, it could be argued that the recovery group and the control group are, in fact, a higher depression group and lower depression group, respectively. The higher incidence of depression in a group of recovering alcholics is consistent with reports in the clinical literature. The high incidence of depression among alcoholics has been a cornerstone of some theoretical and treatment approaches to alcohol addiction (Jones, 1968; 1971; Wikler, 1973; Woodruff, Guze, Clayton, & Carr, 1973).

It is probable that depressed and non-depressed persons are in each group, with the recovery group having more depressed persons, and/or more severely depressed persons. The subjects could be described as forming four groups: depressed controls, non-depressed controls, depressed recovery subjects, and non-depressed recovery subjects. Six groups could be formed with severity of depression as another grouping factor. The depressed individual in each group would be expected to have generally lower accuracy of estimates, more reactivity to negative mood items, and less reactivity to positive mood states, as reflected in accuracy measures. Such a situation would mask even stronger underestimation and overestimation effects than those demonstrated in the present study, which used only alcoholism as the grouping factor.

If depression is a variable relevant to group differences found here, the question arises as to whether the depressed condition is a state or trait depression. Based on Bower's (1981) work on the effects of mood on memory, one may speculate that perhaps temporary mood states are influencing accuracy in the present study, in addition to any effects of long-term mood or cognitive dispositions. Bower used hypnosis and reading of emotionally charged self-reference statements to induce happy or sad mood states prior to a memory task. He demonstrated that persons so induced had better recall for material that was similar in evaluative content to their mood state. He has labeled this effect of better recall of mood-congruent material a "mood-state-dependent memory" effect. Salience of material that is similar in content to the induced mood has also been demonstrated by Bower and associated workers, and labeled "the mood congruity effect" (Bower, 1981). Bower frames his work as an

extension of the availability heuristic and defined both mood-state-dependent memory effects and mood congruity effects as "automatic."

Such effects could be integrated into a unified perspective to aid in the explanation of group differences in the present study. If it can be assumed that the mood state at the time of the testing would have been a random sample of mood states from the same population as those recorded on the Daily Activity Reports, there is a high probability that the two groups differed naturally in mood state at the time of testing, with the recovery subjects having, on the average, a more negative set of moods than the control subjects. This alone might account for different degrees of overestimation and underestimation of mood item frequencies observed between the two groups, if frequency judgments are vulnerable to mood-state-dependent effects.

In addition the groups may have, inadvertently, received inductions for different moods states at the time of the testing, by way of the different testing and participation contexts for the two groups. For example, if the ending of participation was experienced by most subjects as a positive event due to a sense of accomplishment, an awareness of having been helpful, or due to the relief from being "on the beeper," control subjects may have been primed by this positive experience to have a mood congruent with positive memories. At the time of the testing, the recovery group would be without an equivalent priming for positive moods. In fact, the recovery group subjects were often scheduled for their interviews on evenings when their outpatient therapy or other treatment activities were scheduled as well, as a matter of

convenience. The anticipated or residual moods related to these activities could have induced mood priming of a different nature from that which may have been experienced by the control group subjects.

A complete investigation of the possible influences of state or trait depression on estimates of frequency of occurrences is clearly beyond the scope of the present discussion. Nevertheless, the importance of integrating both cognitive and affective factors in an approach to understanding memory processes is suggested by the findings of the present study. Both Bower (1981) and Hasher and Zacks (1984) conclude influential articles in cognitive psychology by stressing the importance of investigating cognitive processes in the light of emotional and unconscious processes. The discussion of the present findings might best be concluded by echoing this call, by suggesting that emotional and unconscious factors are relevant to an understanding of memory for frequency of occurrences.

Critique of the Present Study

Although random sampling from the recovery subject pool and stratified sampling of the community sample were used, the present study, nonetheless, has all of the weaknesses and limitations of a correlational design. In the context of a correlational design, the use of terms such as "effect," "interaction," or other terms designating causal relationships, must be seen as tentative, in that correlational designs cannot in themselves demonstrate causal relationships. They are relevant, however, to causal hypotheses, in that they expose them to disconfirmation (Campbell & Stanley, 1966; Kazdin, 1980).

Given this design limitation, other limitations are also present. Several of these are related to the composition of the groups. The groups were not demonstrated to be homogeneous in respect to alcoholism status. A criterion for inclusion in the community sample was that they had no history of treatment for substance abuse. Given this criterion, some use of psychotropic substances would probably be expected by community sample subjects. It is highly possible that some undiagnosed substance abusers or recovered alcoholics served as community sample subjects. Conversely, the recovery group was not homogenous for simple alcohol abuse; poly-drug abuse and eating disorders were also diagnosed for some of these subjects, and may have been present without diagnosis in others. Personality disorders, mood disorders, and other kinds of psychological pathology were also diagnosed in the pool of subjects from which the recovery group subjects were drawn for the present study. This is less problematic, however, and actually adds to the ecological validity of the present study, since these disorders may be casually related to some cases of substance abuse.

The groups were not shown to be equivalent on a large number of variables that might influence performance on the Memory Task. Age, gender, personal adjustment, participation in psychotherapy, motivation for participation in the context study, and education are a few of the possible variables that were not controlled for by selection or by post facto analysis in the present experiment. Any one of these variables, or interactions among them, may have accounted for the observed group differences, rather than alcoholism status.

In addition, self-selection factors were operative in the formation of groups, in that community sample subjects were volunteers recruited via public announcement. Volunteers willing to agree to two weeks of intensive participation in a relatively intrusive self-report study may differ significantly from the typical person. Recovery subjects were recent inpatients as well as volunteers. Persons will to participate in another program in addition to outpatient therapy, and A.A. activities, may differ from those who do not choose to do so. Since all persons taking the Memory Task must have participated for at least two weeks in the context study, differential drop out may have also influenced group composition, since it is reasonable to assume that the pressures for dropping out are not the same for recovering patients as for members of the community sample.

Another hypothesis that threatens the internal validity of the present study is that the two groups may have received different treatments. The groups may differ significantly in the motives for and understandings of their participation in the context study. The groups may have also received different treatments in the form of different testing contexts, and different experimenter biases at the time of testing. For example, researchers involved in the context study were also involved in treatment situations. Recovering subjects may have seen their participation in the study as related to treatment despite explicit denials of this by the researchers. This may have led to placebo effects. Demand characteristics different from those of the control subjects may have been established, such as a response set

designed to please researchers, and through them, therapists. The recovery subjects may have been motivated to express attitudes toward the treatment facility and the therapy received there through responses on both the Daily Activity Reports and the Memory Task estimates. Any of these possibilities might result in group differences not essentially related to alcoholism status.

Several threats to the validity of the present study are related to experimenter effects. The Memory Task was administered for both groups by research assistants. These assistants at times had previous contacts with recovery subjects, while this was usually not the case with the control group subjects. At the time of testing, the recovery subjects could anticipate another 10 weeks of contact with the researchers. The control group was ending contact with the program. This difference in social context for the testing may have influenced estimates. As mentioned in the integrative discussion, mood priming may have inadvertently occurred, resulting in different mood states or intensified mood states that may have influenced each group's estimates differently.

Another problem related to the administration of the Memory Task is the fact that the assistants who administered the task were aware that one hypothesis of the memory study involved lower performance for the recovery subjects than for the control subjects. A subtle bias may have been introduced in the administration of the test. Another possible source of unconscious experimenter bias lies in the fact that all of the data for the present study were coded by the primary researcher, who

was obviously aware of each specific hypothesis. The coding and rounding of responses could have been influenced by a subtle bias. The relative objectivity of the responses makes this source of bias unlikely, however, because no rounding was performed on estimates or measures of accuracy used in analyzes.

Another limitations of the present study is the lack of any empirical foundation for the assumption that the two groups did not differ in the use of the scales used to record experiences. An extreme happy state may be experienced differently by different individuals. The same mood state could be expressed differently by different individuals on the Daily Activity Report. These differences in individual use of the scale may have resulted in significant group differences. This problem in the use of scales for rating mood states may not be as relevant from the point of view of automatic processing theory, since the actual extremity of a response should not have influenced the ability to estimate the frequency of responses. From other theoretical approaches to memory for frequency of occurrences, such as availability heuristics or Bower's mood congruence sub-theory of availability, different uses of the scales between groups would obscure actual levels of mood between groups, and would be a serious confounding of variables.

Suggestions for Future Research

Studies of memory for frequency of occurrences that utilize the self-relevant, self-generated, and evaluatively laden stimuli of the type used in the present study may add to an understanding of the role

of unconscious and emotional factors in the use of frequency information. Empirical investigation of the use of the specific self-report scales and of item salience by the relevant grouping variables would be an important addition to the methods of the present study.

The addition of other grouping variables, such as depression, defensiveness (denial of negative emotions or experiences, for example) organicity, or personality disturbance, and early versus late recovery from addiction, would add to an understanding of the effect of these variables on frequency judgment performance. The degree of confidence in judgments, subject awareness of overestimation and underestimation effects, motivation related effects, and subject reports of cognitive strategies used in performing the tasks should be investigated. In addition to self-reports of cognitive strategies, the subject's relevant behaviors, such as the order of subitem completion, could be recorded and used as predictors of accuracy. Intentional mood priming by experimenters could be added to future designs, along with measures of the subject's mood at arrival at the testing site. In general, variables of relevance to both affective and unconscious processes in addition to variables related to cognitive capacity and cognitive strategy should be investigated for their relationship to the ability to accurately estimate frequencies of self-generated occurrences.

REFERENCES

Anastasi, A. (1982). Psychological Testing. New York: MacMillan Publishing Co.

Attig, M., & Hasher, L. (1980). The processing of frequency of occurrence information by adults. Journal of Gerontology, 35, 66-69.

Bower, G. H. (1981). Mood and memory. American Psychologist, 36, 129-148.

Bower, G. H., & Gilligan, S. G. (1979). Remembering information related to one's self. Journal of Research in Personality, 13, 420-432.

Brandt, J., Butters, N., Ryan C., & Bayog, R. (1983). Cognitive loss and recovery in long-term alcohol abusers. Archives of General Psychiatry, 40, 435-442.

Brickman, P., Coates, D., & Janoff-Bulman, R. (1978). Lottery winners and accident victims: Is happiness relative? Journal of Personality and Social Psychology, 36, 917-927.

Broadbent, D. E. (1958). A mechanical model for human attention and immediate memory. Psychological Review, 64, 205-125.

Butters, N., & Cermak, L. (1980). Alcoholic Korsakoff's syndrome: An information processing approach to amnesia. New York: Academic Press.

Campbell, D. T., & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Boston: Houghton Mifflin Company.

Cantor, N., & Mischel, W. (1979). Prototypes in person perception. In L. L. Berkowitz (Ed.). Advances in experimental social psychology. Vol 12. New York: Academic Press.

Chapman, L. J., & Chapman, J. P. (1969). Illusory correlation as an obstacle to the use of valid psychodiagnostic signs. Journal of Abnormal Psychology, 74, 271-280.

Claiborn, J. M., & Greene, R. T. (1981). Neuropsychological changes in recovering alcoholics. Journal of Studies on Alcohol, 42, 757-765.

Craik, F. I. M. (1977). Age differences in human memory. In J. E. Burren, & K. W. Schaie (Eds.). Handbook of the Psychology of Aging. New York: Van Nostrand Reinhold.

Curt, L. L. (1981). The effect of depressive affect on judgments of frequency of occurrence. Unpublished Master's thesis. Loyola University of Chicago.

Curt, L. , & Zechmeister, E. (1984). Primacy, recency, and the availability heuristic. Bulletin of the Psychonomic Society, 22, 177-179.

Deutsch, J. A., & Deutsch, D. Attention: Some theoretical considerations. Psychological Review, 70, 80-90.

Estes, W. K. (Ed.). (1976). Handbook of learning and cognitive processes: IV. Attention and memory. Hillsdale, NJ: Lawrence Erlbaum.

Fisk, D., & Schneider, W. (1984). Memory as a function of attention, level of processing and automatization. Journal of Experimental Psychology: Learning, Memory and Cognition, 10, 181-197.

Flavell, J. H. (1977). Cognitive development. Englewood Cliffs, NJ: Prentice-Hall.

Flexser, A. J., & Bower, G. H. (1975). Further evidence regarding instructional effects on frequency judgments. Bulletin of the Psychonomic Society, 6, 321-324.

Freund, G. (1982). The interaction of chronic alcohol consumption and aging on brain structure and function. Alcoholism: Clinical and Experimental Research, 6, 13-21.

Goldman, M. S. (1984). Cognitive impairment in chronic alcoholics: Some cause for optimism. American Psychologist, 38, 1045-1054.

Goldstein, D., Hasher, L., & Stein, D. (1983). The processing of occurrence rate information by children of different ages and abilities. American Journal of Psychology, 96, 229-241.

Gude, C., & Zechmeister, E. B. (1975). Frequency of judgments for the "gist" of sentences. American Journal of Psychology, 88, 385-396.

Grant, I., Adams, K., & Reed, R. (1979). Normal neuropsychological abilities of alcoholic men in their late thirties. American Journal of Psychiatry, 136, 1263-1269.

Greene, R. L. (1984). Incidental learning of event frequency. Memory and Cognition, 12, 90-95.

Hasher, L., & Chromiak, W. (1977). The processing of frequency information: An automatic mechanism? Journal of Verbal Learning and Verbal Behavior, 16, 173-184.

Hasher, L., Goldstein, D., & Toppino, T. (1977). Frequency and the conference of referential validity. Journal of Verbal Learning and Verbal Behavior, 16, 107-112.

Hasher, L., & Zacks, R. T. (1979). Automatic and effortful processes in memory. Journal of Experimental Psychology: General, 108, 356-388.

Hasher, L., & Zacks, R. T. (1984). Automatic processing of high priority information: The case of frequency of occurrence. American Psychologist, 57, 1372-1388.

Hays, W. A. (1973). Statistics for the social sciences. New York: Holt, Rinehart and Winston, Inc.

Helson, H. (1959). Adaptation-level theory. In S. Koch (Ed.). Psychology: A Study of a Science, Vol. 1. New York: McGraw-Hill.

Hintzman, D. L., & Rogers, M. K. (1973). Spacing effects in picture memory. Memory & Cognition, 1, 430-434.

Johnson, M. K., Taylor, T. H., & Raye, C. L. (1977). Fact and fantasy: The effects of internally generated events on the apparent frequency of externally generated events. Memory & Cognition, 5, 116-122.

Jones, B. M., & Parsons, O. A. (1972). Specific vs. generalized deficits of abstracting ability in chronic alcoholics. Archives of General Psychiatry, 26, 380-384.

Jones, M. C. (1968). Personality correlates and antecedents of drinking patterns in men. Journal of Consulting and Clinical Psychology, 32, 2-12.

Jones, M. C. (1971). Personality correlates and antecedents of drinking patterns in women. Journal of Consulting and Clinical Psychology, 36, 61-69.

Kahneman, D. (1973). Attention and effort. Englewood Cliffs, NJ: Prentice-Hall.

Kausler, D. H., & Puckett, J. M. (1980). Frequency judgments and correlated cognitive abilities in young and elderly adults. Journal of Gerontology, 35, 376, 382.

Kazdin, A. E. (1980). Research design in clinical psychology. New York: Harper & Row, Publishers.

Keele, S. W. (1973). Attention and human performance. Pacific Palisades, CA: Goodyear.

Kelly, G. A. (1955). The psychology of personal constructs. New York: Norton.

Kish, G. B., Hagen, J. M., Woody, M. M., & Harvey, H. M. (1980). Alcoholics' recovery from cerebral impairment as a function of duration of abstinence. Journal of Clinical Psychology, 36, 584-589.

Kleinknecht, T. A., & Goldstein, S. G. (1972). Neuropsycholgical deficits associated with alcoholism. Quarterly Journal of Studies on Alcohol, 33, 999-1019.

Lichtenstein, S., Slovic, P., Fischoff, B., Layman, M., & Combo, B. (1978). Judged frequency of lethal events. Journal of Experimental Psychology: Human Learning and Memory, 4, 551-578.

Mac Vane, J., Butters, N., Montgomery, K., & Farber, J. (1982). Cognitive functioning in men social drinkers: A replication study. Journal of Studies on Alcohol, 43, 81-95.

Morris, M., & Moore, J. C. (1978). Summarizing controversial messages: Retroactive effects due to subsequent information. Journal of Personality and Social Psychology, 30, 62-68.

Nelson, R. E., & Craighead, W. E. (1977). Selective recall of positive and negative feedback, self-control behaviors, and depression. Journal of Abnormal Psychology, 86, 379-388.

Oscar-Berman, M. (1980). Neuropsychological consequences of long-term chronic alcoholism. American Scientist, 68, 410-419.

Parson, O. A., & Farr, S. P. (1981). The neuropsychology of alcohol and drug use. In S. Filskov & T. Boll (Eds.). Handbook of Clinical Neuropsychology. New York: Wiley.

Perry, D. G., & Bussey, K. (1979). The social learning theory of sex differences: Imitation is alive and well. Journal of Personality and Social Psychology, 37, 1699-1712.

Posnansky, C. J. (1978). Age and task-related differences in the use of category size information for the retrieveal of categorized information. Journal of Experimental Child Psychology, 26, 373-382.

Posner, M. I., & Snyder, R. R. (1979). Attention and cognitive control. In R. S. Solso (Ed.). Information Processing and Cognition: The Loyola Symposium, 108, 356-388.

Roger, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. Journal of Personality and Social Psychology, 35, 677-688.

Schneider, W., & Schiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. Psychological Review, 84, 1-66.

Seligman, M. E., P. (1970). On the generality of laws of learning. Psychological Review, 77, 406-418.

Tarter, R. E. (1975). An analysis of cognitive deficits in chronic alcoholics: A review. International Journal of Addiction, 10, 327-368.

Treisman, A. M. (1960). Contextual cues in selective listening. Quarterly Journal of Experimental Psychology, 12, 242-248.

Tvesky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. Cognitive Psychology, 5, 207-232.

Tvesky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. Science, 185, 1124-1131.

Tzeng, O. J. L., & Cotton, B. (1980). A study-phase retrieval model of temporal coding. Journal of Experiemental Psychology: Human Learning and Memory, 6, 705, 716.

Underwood, G. J. (1971). Recognition memory. In H. H. Kendler & J. T. Spence (Eds.). Essays in Neobehaviorism: A Memorial Volume to K. W. Spence. New York: Appleton-Century-Crofts.

Wikler, A. (1973). Dynamics of drug dependence: Implications of a conditioning theory for research and treatment. Archives of General Psychiatry, 28, 611, 616.

Wilkinson, D. A., & Carlen, P. L. (1981). Chronic organic brain syndromes associated with alcoholism: Neuropsychological and other aspects. In Y. Israel, et al. (Eds). Research Advances in Alcohol and Drug Problems, Vol. 6. New York: Plenum Press.

Woodruff, R. A., Guze, S. B., Clayton, P. J., & Carr, D. (1973). Alcoholism and depression. Archives of General Psychiatry, 28, 97-100.

Zacks, R. T., Hasher, L., Alba, J. W., Sandft, H., & Rose, K. C. (1984). Is temporal order encoded automatically? Memory & Cognition, 12, 387-394.

Zechmeister, E. B., & Nyberg, S. E. (1982). Human memory: An introduction to research and theory. Montery, CA: Brooks/Cole Publishing Co.

APPENDICES

APPENDIX A - DAILY ACTIVITY REPORT

Date: _____ Time Beeped: _____ Time Filled Out: _____

As you were beeped . . .

What were you thinking about? _____

_____

Where were you?_____

What was the MAIN thing you were doing? _____

_____

	Not at all			Some-what			Quite			Very
How much choice did you have in selecting this activity?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
Did you feel in control of your activity?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
How guilty did you feel?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
How vulnerable did you feel?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
How self-conscious were you?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
How much were you concentrating?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
How satisfied did you feel with yourself?	+----	+----	+----	+----	+----	+----	+----	+----	+----	+----
	0	1	2	3	5	6	7	8	9	

Describe your mood as you were beeped:

	Very	Quite	Some	Neither	Some	Quite	Very	
Alert	0	o	.	-	.	o	0	Drowsy
Happy	0	o	.	-	.	o	0	Sad
Irritable	0	o	.	-	.	o	0	Cheerful
Strong	0	o	.	-	.	o	0	Weak
Angry	0	o	.	-	.	o	0	Friendly
Active	0	o	.	-	.	o	0	Passive
Lonely	0	o	.	-	.	o	0	Sociable
Adequate	0	o	.	-	.	o	0	Inadequate
Free	0	o	.	-	.	o	0	Constrained
Excited	0	o	.	-	.	o	0	Bored
Proud	0	o	.	-	.	o	0	Ashamed
Confused	0	o	.	-	.	o	0	Clear
Tense	0	o	.	-	.	o	0	Relaxed
Fat	0	o	.	-	.	o	0	Thin

Describe your physical state as you were beeped:

	none	slight	moderate	severe
Hunger	+----+----+----+----+----+----+----+----+			
Tired, slowed down	+----+----+----+----+----+----+----+----+			
Aches & pains	+----+----+----+----+----+----+----+----+			

At the time you were beeped:

Who were you with?

( ) alone
( ) spouse
( ) brother(s), sister(s)
( ) friend(s): number ___
( ) male ( ) female
( ) mother
( ) father
( ) strangers
( ) coworkers
( ) other(s) _____

Describe how you feel about one of the persons you were with:

(If alone and thinking about someone, describe feelings about that person.)

	very			middle			very	
Close to	+----+----+----+----+----+----+----+----+							Distant from
Inferior to	+----+----+----+----+----+----+----+----+							Superior to
Friendly Toward	+----+----+----+----+----+----+----+----+							Angry with
In control of	+----+----+----+----+----+----+----+----+							Controlled by
Supported by	+----+----+----+----+----+----+----+----+							Rejected by

(Identify the person you are referring to: _____.)

	Not at all		Somewhat		Quite		Very	
How preoccupied were you with eating?	+----+----+----+----+----+----+----+----+----+							
How preoccupied were you with drinking/using?	+----+----+----+----+----+----+----+----+----+							
Do you feel your eating has been out of control since last report?	+----+----+----+----+----+----+----+----+----+							
How confident did you feel that you could resist the urge to binge eat?	+----+----+----+----+----+----+----+----+----+							
Did you share your feelings with someone close to you?	+----+----+----+----+----+----+----+----+----+							
	0	1	2	3	4	5	6	7	8	9

Indicate your alcohol intake since the last report:

Beer		Wine		Liquor	
No. of Units	Oz. Per Unit	No. of Units	Oz. Per Unit	No. of Units	Oz. Per Unit
____	cans (12 oz.)	____	glasses (10 oz.)	____	shots (1-1/2 oz.)
____	cans (16 oz.)	____	fifths (26 oz.)	____	drinks (1-1/2 oz.)
____	bottles (12 oz.)	____	quarts (32 oz.)	____	pints (16 oz.)
____	glasses (10 oz.)	____	liters (33-1/2 oz.)	____	fifths (26 oz.)
				____	quarts (32 oz.)

Indicate your drug use (what and how much) since the last report:

_____

Indicate your foot intake since the last report:

Type	Quantity	No. Binges ___	No. Binges ___
_____	_____		
_____	_____		
_____	_____		

****

Great thoughts, Day dreams, Nasty cracks, Cartoons and Jokes . . .

_____

_____

_____

_____

APPENDIX B - MEMORY TASK INSTRUCTIONS

NOTE: Use this answer sheet and a blank booklet to get the person oriented to the task.

KEY POINTS:

1. Want to get the subject to think about how he/she filled out the booklet, not how they felt then or now about the items. Many subjects may use their recollection of feelings to "jog" their memories as to how they filled out the book.

2. These responses are in terms of percentages of 100%.

3. After you explain the task, see if they can tell you what they are going to be doing.

4. "General Explanation": We are trying to understand how people remember and what ways people may or may not use to remember things.

   What we'd like you to do is help us in the memory test. There are no right or wrong answers. All we will ask you to do is remember some aspects of what you have been doing in regards to the patient workbook.

   We are going to concentrate on trying to find out how you filled out ("marked") the book; not how you were feeling. This memory task is only related to how you filled out the qustions.

5. Under the heading of General Questions:

   The first two (#1 and #2) refer to a special dimension of memory. All these questions are getting at is how often the mark was to the right or left of the page.

   Question #2 and #3 are related to the positive and/or negative dimension of the item. This is the emotional/feeling aspect of the task.

   Help the subjects understand these two related, but by very distinct tasks. Repeat it or have them repeat it before they do the task. You can refer to the mood rating scale on the page itself or to the unanswered page in the booklet.

6. When the subject actually gets to the mood items that are scaled like the booklet, make it clear that the (brackets) over the various responses are calling for a summary of those marks.

The total repsonse should equal 100%. They can answer the questions any way they choose (e.g., figuring out % positive, then neutral, and then negative or whatever sequence they choose).

7. The final four questions ask for two ratings that cut across these dimensions. Again, these are summaries of their marks and the total has to equal 100%.

   Refer to the blank booklet to orient subject, if necessary.

8. Some subjects, when given the instructions, will feel it is impossible to do. Encourage them, provide extra time, suggest that whatever they can do will be helpful.

   If subject persists, then excuse him/her from the task.

SCHEDULE OF SUBJECTS

1. Presently Active Subjects

Gp I	Book 6		Overall Assessment
Gp II			Overall Assessment

2. New Subjects as of 5/21/84

Gp I	Book 1	Book 6	Overall Assessment
Gp II	Book 1	X	Overall Assessment

3. Community Sample

   Book 1

These forms will be located in a folder in Lil's desk (marked "Memory Study") and will be in the appropriate folders when subjects return.

A red dot will remind you that the task needs to be done on a given subject.

WJF/gj

APPROVAL SHEET

The thesis submitted by Henry Jay Richards has been read and approved by the following committee:

Dr. Eugene Zechmeister, Director
Professor, Psychology, Loyola

Dr. Alan De Wolfe
Professor, Psychology, Loyola

Dr. William Reich
Associate Professor, Psychology, Loyola

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirement for the degree of Master of Arts.

6/25/86
Date

Director's Signature