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Effects of Chronis Consumption of Caffeine on Memory for Prose in Young and Elderly Adults

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Effects of Chronic Consumption of Caffeine on Memory for Prose in Young and Elderly Adults

by

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This Thesis submitted by Malva Waters in partial fulfillment of the requirements for the Degree of Master of Arts for the University of North Dakota has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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This Thesis meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Dean of the Graduate School

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TABLE OF CONTENTS

LIST OF TABLES

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ABSTRACT

Caffeine is one of society's most widely used central nervous system stimulants. Most studies involving caffeine and memory have tested the recall of young subjects following acute administration of caffeine. This study was designed to determine the effects of chronic use of caffeine on memory for prose in young and elderly adults. Forty-nine young and forty-nine elderly subjects read four expository prose passages from the computer screen and orally recalled each story. Recalls were tape recorded and later scored for presence of idea units. Chronic consumption of caffeine had no significant effect on recall of prose passages. It is speculated that this result may be due to tolerance effects which develop with habitual caffeine consumption.

INTRODUCTION

Caffeine is unique among central nervous system stimulant drugs. Not only is its use socially acceptable, but it is found in a large variety of beverages (coffee, tea, colas, cocoa), foods containing chocolate, prescription medications and over-the-counter preparations such as analgesics, cold preparations, stimulants and appetite suppressants. One must make a concerted effort in order to avoid the daily ingestion of caffeine.

Total world caffeine consumption in 1981 was estimated at 120,000 tons or 70 mg/day per person. Caffeine from coffee accounts for about 54% of consumption throughout the world - tea accounting for about 43%. Per capita intake of caffeine in the United States averages about 200 mg daily (Rall, 1980; Pilette, 1983), and although consumption of coffee has decreased in the U.S. since 1960, the popularity of soft drinks has risen rapidly. Tea and cocoa are consumed less commonly in the U.S. than coffee and soft drinks, but can also provide high doses of dietary caffeine. (Wells, 1984).

Caffeine is a member of the family called xanthines which also includes theophylline and theobromine (Pilette, 1983). It is an alkaloid and a purine derivative, structurally similar to the purines adenine and guanine (Wells, 1984). The chemical name for caffeine is 1, 3, 7 - trimethylxanthine, and it is the methyl group on position 1 which is associated with central nervous system stimulation (Pilette, 1983). The mechanism by which caffeine exerts its CNS effects is not completely clear. Cellular actions of caffeine include translocation of intracellular calcium, increasing accumulation of cyclic nucleotides -

particularly cyclic AMP, and blockade of adenosine receptors (Rall, 1980). Inhibition of phosphodiesterase, an enzyme which aids in the breakdown of cyclic AMP could lead to its accumulation and to enhanced responsiveness of norepinephrine-containing neurons. Inhibition of adenosine receptors may antagonize the effects of adenosine, a naturally-occurring behavioral and biochemical depressant. (Hirsh, 1984). Studies with mice have shown significant increases in adenosine receptors following chronic caffeine treatment, with the greatest changes found in the cerebellum and brain stem (Marangos, Boulenger and Patel, 1984). Inhibition of adenosine at the receptor sites could decrease the natural depression of neural activity resulting in a stimulant effect.

Caffeine appears in body tissues within five minutes of consumption and peak blood levels are reached within 30 minutes. The half-life of caffeine in the plasma varies from 2.5 to 4.5 hours and the length of time necessary for total body clearance ranges from overnight to several days. (Gilbert, 1976). Caffeine is eliminated from the body principally by metabolism in the liver, and subsequent excretion in the urine. The primary metabolites of caffeine found in the urine are 1-methyluric acid and 1-methylxanthine. (Rall, 1980; Pilette, 1983).

The effects of caffeine on human behavior are varied. Wells, (1984), in a recent review of research on caffeine, states that there appears to be a dose range at which caffeine acts as a mild stimulant. Beyond this dose, which may vary from person to person, the drug may cause a toxic reaction which includes agitation, psychic disturbance and decreased intellectual performance. Persons who are habituated to

caffeine may experience headaches and irritability upon withdrawal. It is generally agreed that caffeine consumption in small to moderate doses can lead to decreased drowsiness, elevated mood, lessened fatigue, and more rapid and clearer thinking. At high doses, caffeine can produce symptoms which resemble anxiety - nervousness, irritability, agitation, tremors, rapid breathing, and insomnia. At toxic levels, symptoms such as hyperesthesia (abnormal sensitivity of the senses), tinnitus (ringing or buzzing in the ears), and flashes of light may occur, and in doses exceeding 10 grams, grand mal seizures and respiratory failure may result in death (Gilbert, 1976; Rall, 1980; Pilette, 1983).

In a study using twenty healthy male volunteers, Lieberman and Wurtman (1987), were the first to show that the low to moderate caffeine levels found in foods and medications significantly improve some types of intellectual functioning. Caffeine in as low a dose as 32 mg, which elevated plasma concentrations by 0.5ug/ml, significantly improved auditory vigilance and visual reaction time. Rall (1980) has found that 85 to 250 mg (1-3 cups of coffee) produces increased capacity for sustained intellectual effort, decreased reaction time and improved association of ideas. Habitual consumers of caffeine may develop tolerance and caffeine effects may be much more pronounced in non-users or light users than in heavy users. (Hirsh, 1984).

Chronic ingestion of high doses of caffeine may result in caffeinism, a state of acute or chronic toxicity. Symptoms include restlessness, nervousness, excitement, insomnia, flushed face, diuresis and GI disturbances. The symptoms may occur in some people who ingest as little as 250 mg of caffeine per day. Others may require much higher

doses (DSMIII-R, 1987). Caffeinism may be misdiagnosed as anxiety neurosis and heavy caffeine users may show clinical depression (Greden, 1978). If the symptoms are due to caffeine, they begin to subside 4-10 days after caffeine intake is stopped or greatly reduced. (Pilette, 1983). Twenty to thirty percent of respondents in surveys by Gredin (1978) reported consuming 500-600 mg of caffeine per day. Pharmacologically, symptoms of caffeinism would be quite likely to occur above this point. As much as one-fourth of the population would seem to be at risk for caffeinism. Caffeine has also been linked in the medical literature to such disorders as heart disease, peptic ulcer, hiatus hernia, fibrocystic breast disease, birth defects, bladder cancer, and cardiac arrhythmia (DSMIII-R, 1987; Pilette, 1983).

Gilliland and Andress (1981), assessed the caffeine consumption of 1500 college students by a questionaire which rated various sources of caffeine in "coffee cup equivalents" (CCE) with 1 cup containing 150 ml of fluid. Subjects were divided into four consumption levels: abstainers, low consumers (less than 1 CCE/day), moderate consumers (1 CCE/day or more, but less than 5 CCE/day), and high consumers (5 or more CCE/day). Grade point average was found to be significantly higher in abstainers as compared with the high consumer group. Also, the majority of incomplete grades was received by high and moderate consumers. Gilliland stated that the differences between moderate and high consumer groups was not as great as would be expected. This suggests that the detrimental effects of caffeine consumption on academic performance may occur at lower levels than expected.

One approach to understanding how caffeine ingestion can influence intellectual functioning is to assess the effects of caffeine on memory. After 300 mg of caffeine or a lactose placebo, subjects in an early experiment by Hull (1935) learned nonsense syllable lists by the anticipation method. After ingestion of drug or placebo, they relearned two lists from the previous day and two new series to a criterion of two perfect repetitions. Caffeine affected neither the number of trials needed to attain criterion nor retention. Caffeine did significantly increase the number of anticipatory intrusions and the length of displacements. File, Bond and Lister (1982) found that short-term memory was not affected three hours following doses of 125 or 250 mg of caffeine. Their subjects listened to lists of words and were asked to engage in both free and cued recall. Rapoport, Jensvold, Elking, Buchsbaum, Weingarter, Ludlow, Zahn, Berg and Neims (1981) reported no significant differences in memory in boys or adult males 50 minutes after ingesting 3 or 10 mg/kg of caffeine. Memory was assessed by a list of 10 words from a single category displayed on cards one word at a time for 10 seconds at 1-second intervals. The list was followed by a 6-digit number. Subjects were allowed two minutes to write down the number and as many words as they could recall.

A study by Gilliland (1980) assessed male and female subjects' performance on a test of verbal ability after being given 0, 2 or 4 mg of caffeine per kilogram of body weight. The test contained verbal analogies, sentence completions and antonyms. Subjects completed one form of the test as a pretest, ingested caffeine or placebo and 30 minutes later, completed the posttest - a second form of the same test.

Extroverts (as measured by the Eysenck Introversion/Extroversion scale, 1967), demonstrated pretest-posttest improvement which increased as the dose of caffeine increased. Introverts' performance increased at 2 mg, but decreased with 4 mg of caffeine.

In a series of experiments, Revelle, Humphreys, Simmon and Gilliland (1980), studied caffeine and impulsivity, using the introversion/extroversion scale to define the subjects' level of trait arousal. Caffeine had a differential effect upon subjects completing a GRE practice test depending upon the subjects' self reported level of trait arousal and time of day of testing. Caffeine impaired the performance of low impulsives (high trait arousal) and improved performance of high impulsive (low trait arousal) subjects when testing occurred in the morning. However, when testing occurred in the evening this pattern was reversed. In a subsequent experiment, (Revelle, et al, 1980) high and low impulsive subjects were allowed to choose whether they would participate in the morning or in the evening. Short term memory was measured using a 68-item analogies test. Again, performance of low-impulsive subjects was hindered by caffeine in the morning, but helped in the evening. Caffeine helped high impulsives' performance in the morning, but impaired it in the evening.

Humphreys and Revelle (1984) have presented a theoretical model in which they suggest that heightened arousal reduces the available resources for processing information in short term memory. They assert that the detrimental effect of heightened arousal occurs because under conditions of high arousal, information is available in short term memory for a shorter amount of time than usual, adversely affecting the

processing of that information. In order to study the prediction of Humphreys and Revelle (1984) that increasing doses of caffeine reduce the ability to process information in short term memory, Hager, Petros, Beckwith, Erickson and Arnold (1986), designed a study to test the effects of caffeine on recall of prose. One-hundred-forty young adults were divided into high and low impulsive groups and given 0, 2 or 4 mg of caffeine per kg of body weight. Following a 30 minute absorption period, the subjects heard tape recorded prose passages presented at three different rates. After listening to each story, subjects wrote as much of the story as they could remember. The recalls were later scored for the presence of idea units. Subjects recalled significantly more idea units after ingestion of 2 mg/kg of caffeine than after 0 or 4 mg/kg. More important idea units were recalled better than less important idea units and recall increased with slower rates of presentation.

Erickson, Hager, Houseworth, Dungan, Petros and Beckwith (1985) examined the effect of caffeine on free recall of supraspan word lists. High and low impulsives (47 male, 60 female) were given 0, 2 or 4 mg caffeine per kg of body weight. Eight word lists were presented from cassette tape at a slow (1 word/3 sec) or fast (1 word/sec) rate. Oral recall was obtained following each presentation. Females given 4 mg/kg showed impaired recall at the slow rate, while males showed no significant effect of caffeine. In an extension of the Erickson, et al (1985) experiment, Arnold, Petros, Beckwith, Coons and Gorman (1987) used four presentation rates instead of two - one slower (1 word/2 sec) and one faster (1 word/5 sec). Eighty-two male and 75 female subjects

were given 0, 2 or 4 mg caffeine/kg of body weight. Females in this study were free of oral contraceptives and were tested within the first five days of their menstrual cycles. Caffeine was found to facilitate recall in females. In addition, caffeine impaired recall in males at the lower dose and improved recall for males at the higher dose. Use of more subjects and controlling for endogenous hormonal variation in females may help explain descrepitant results between Erickson, et al (1985) and Arnold, et al (1987).

In a study by Terry and Phifer (1986), thirty-three college students were given either placebo or 100 mg of caffeine. Memory was assessed using the Auditory-Verbal Learning Test (AVLT), an instrument using recall of word lists on single and multiple trials to measure memory. Subjects who received caffeine recalled fewer words than did control subjects, both after single presentation of lists and across repeated trials.

Following administration of either 0, 2 or 4 mg/kg of caffeine, Sternhagan (1987) had 78 high or low impulsive males listen to three expository and three narrative prose passages which had been divided into idea units. After hearing the passages, subjects wrote their recalls which were then scored as to the presence of the idea units recalled. Subjects remembered more idea units from narrative than from expository stories and more ideas of high importance than low importance. Recall was higher for subjects in the low impulsive group than in the high impulsive group and no significant effects of caffeine were found.

In summary, studies with young adults seem to indicate that the interaction of caffeine with short term memory is complex and may be related to a number of variables such as level of arousal, time of day, gender, and phase of menstrual cycle. Divergent results in caffeine studies related to memory may not be contradictory, but related instead to variations in subjects and methods along with the influences of other interacting variables. One variable which has received little attention is that of habitual use of caffeine. Loke and Meliska (1984) assigned college students to higher or lower caffeine user groups based on a caffeine usage survey. Subjects then ingested placebo, 195 or 325 mg of caffeine, and performed visual vigilence and reaction time tests. Although no main effects of caffeine were found, high caffeine users made more false alarms and fewer hits than the low caffeine users. Loke concluded that the user factor (High Caffeine User versus Low Caffeine User) was the most potent experimental variable. Daily caffeine intake and resulting tolerance would very likely affect a subject's level of arousal and could certainly be an important factor leading to inconsistant research results.

Another potentially important yet neglected variable in understanding the effects of caffeine on memory is age. Many investigators have found an age-related decrement in recall of prose. For example, Rice and Meyer (1986) tested 422 adults in three age groups - young (18-32 yrs), middle (40-54 yrs) and old (62-80 yrs) and found that a decrease in quantity of prose recall appears with increasing age, though verbal ability was found to be a better predictor of recall than was age. Cohen (1979) found that older subjects (65-79 yrs) extracted

and retained gist information from prose less well than younger subjects (20 -29 yrs) even though both groups were highly educated. Taub and Kline (1978) found that an opportunity for review of materials lead to better recall for both young and old and that age related differences in prose recall were not significant until trial 3 of the experiment, with young subjects showing better recall. Smith, Rebok, Smith, Hall and Alvin, (1983) found no age differences in recall of standard or scrambled stories, but the elderly recalled interleaved stories (those with combined nodes of two story episodes) less well than the young. Under both immediate and delayed recall conditions, Dixon (1982) found that younger adults remembered text materials better than both middle aged and older adults.

Petros, Tabor, Cooney and Chabot, (1983) divided 53 adults into groups according to age and education. Subjects listened to tape recorded stories, then recalled the stories and rated their idea units in terms of importance. Younger adults recalled more idea units than older adults and subjects with more education recalled more than the less educated. Recall increased as the importance of idea units increased. In a subsequent study, Petros (1989), presented both narrative and expository prose passages at different rates to younger and older adults of low or high verbal ability. Older adults recalled less than younger adults and age differences in recall were larger for adults with lower verbal ability and for expository texts.

Hultsch (1971), Dixon, Simon, Nowak, and Hultsch (1982) and Smith, et al, (1983) explain age-related deficits in recall of prose as relating to older adults' using organizational strategies less

efficiently than younger adults, while Craik and Simon (1980), Cohen (1979) and Petros, et al. (1983, 1989) attribute age deficits in recall of prose to an age-related decline in short-term memory processing capacity. One possibility is that a decline in short term memory in the elderly could be related to high levels of habitual caffeine consumption. In this case, according to the model of Humphreys, et al., (1984), the high level of arousal resulting would effectively reduce processing capacity in short term memory.

There is a surprising lack of information in the literature relating the variables of caffeine, memory and aging. In a study using Rhesus monkeys, Bartus (1979) tested young (5-6 yrs) and aged (15-20 yrs) monkeys in a delayed response procedure to assess the effects of central nervous system stimulants on short term memory. The procedure utilized an apparatus which flashed a green light on one of 9 panels followed by retention intervals of varying lengths. The monkey then responded by pushing one of the 9 panels and was rewarded for the correct response. Four doses of caffeine were administered to each monkey over a two week period: 2, 4, 8 and 16 mg/kg of body weight. Each monkey was treated intramuscularly 30 min prior to the start of the behavioral session. Caffeine impaired the performance of both age groups, even at relatively low doses. Aged monkeys were more adversely affected on tasks with longer retention intervals. No age by treatment interaction was found.

The present study examined the effects of age and habitual caffeine consumption on memory for prose. Normal caffeine use was assessed by a self-report questionaire. If habitual use of large quantities of

caffeine impaired short term memory, then both the young and elderly consuming high doses of caffeine were expected to remember less in a prose recall task when compared with their respective low-user groups. If short term memory capacity declined with age, as was suggested by available research reviewed above, the elderly were expected to exhibit greater memory impairment than the young. In addition, if consumption of caffeine interacted with age deficits in recall, then the elderly consuming high doses of caffeine were expected to show greater memory impairment than the elderly consuming less caffeine or the young in either caffeine group. Finally, all groups were expected to recall more of the short than the long prose passages and more important than less important idea units regardless of treatment.

METHOD

Subjects

Ninety eight adults (43 males and 55 females) served as participants in the study. Forty nine of the subjects were University students, ages 18 to 30 who received course credit for their participation. Forty nine were older adults ranging in age from 60 to 75 who were selected from senior citizen groups in the community. The young females were tested within the first five days of the menstrual cycle and were free of oral contraceptives.

Design

A 2x2x2x2x3 factorial design was used which involved three between subjects factors - age (young, old), gender, and caffeine consumption (high, low). Within subjects factors included passage type (long, short) and level of importance of text units (levels 1, 2, and 3).

Materials

Four expository stories - two short (207 - 227 words) and two long (406 - 425 words) were used (see Appendix A). All stories were of 7th - 8th grade reading difficulty. All stories had a Dale-Chall (1948) readability score of 6.55. The expository passages each described the attributes or properties of an object.

Each story had previously been divided into idea units which were rated by an independent group of 33 college students, who divided the stories into units, each containing one simple idea. An additional group of college students, numbering 42-56, rated the units of each

story for their importance using a 3-point scale. Using this rating procedure, approximately equal numbers of the idea units in each story were designated as high (level 3), medium (level 2) or low (level 1) in thematic importance. The long expository passages had 12-17 idea units at each level, while short passages had 7-8 idea units at each level. (For more detail of the rating procedure see Brown and Smiley, 1977).

A vocabulary subtest from the Wechsler Adult Intelligence Scale-Revised (WAIS-R) (Wechsler, 1981) was administered in order to measure verbal ability. Other questionnaires completed included the Beck Depression Inventory (Beck, 1967), a 21-item self-report inventory consisting of four alternative statements which are scored 0-3 for severity of depression; the Activation - Deactivation Adjective Check List (AD-ACL, Thayer, 1967), a self-report measure of transient (state) levels of activation or arousal; the Wahler Physical Symptoms Inventory (WPS) (Wahler, 1983) which measures the presence and frequency of 42 physical symptoms; and the Eysenck Personality Inventory (Eysenck, 1967) which measures personality in terms of extroversion-introversion. Each subject completed a caffeine questionnaire (Adapted from Greden, see appendix), designed to measure typical amount of caffeine consumption as well as use of alcohol and cigarettes. Demographic data included education, age and occupation as well as a subjective rating of health.

Procedure

All subjects were tested individually between 8:00 am and 12:00 pm in a private experimental room. Each subject was seated before an Apple II computer, was presented with a practice story and then told that they would be reading four short stories from the computer screen at their own rate. They were asked to recall the stories orally after reading each passage. The presentation order of the stories was counterbalanced within each age group. Stories were presented one idea unit at a time, moving across the screen in paragraph form. Idea units were removed from the screen and replaced with dotted lines as each new idea unit was presented. At the end of each paragraph the screen was cleared and the following paragraph's first idea unit appeared in the upper left hand corner of the screen. Subjects pressed the return key to expose each successive idea unit. The amount of time between presses of the return key was recorded by the computer and used as a measure of reading time for the corresponding idea unit.

Subjects were asked to read at their normal rates and were unable to review what was previously read. Subjects attempted oral recall immediately after reading each story. They were asked to recall as much of the story as possible and not to worry about exact wording or sequence of events. Recalls were tape recorded and later transcribed for scoring purposes.

RESULTS

Oral recall protocols were scored for presence of gist of idea units by a scorer unaware of subjects' age group or level of caffeine consumption. Fifteen percent of protocols were randomly selected and re-scored by a second rater. The percent of idea units agreed upon by the two raters ranged from .912 to .942 with a mean of .931.

Memory for each passage was expressed as the proportion of idea units recalled at each level of importance. A 2 (age) x 2 (gender) x 2 (caffeine consumption) x 2 (passage length) by 3 (importance level) analysis of variance was used for data analysis with alpha set at .05.

No main effects for habitual consumption of caffeine were found, $F(1,90) = .021$, $p = > .50$. A significant main effect of gender, $F(1,90)=5.701$, $p =.02$, indicated that males' overall recall was significantly better than females': mean proportion recall was .450 and .398 respectively. A significant main effect for passage length, $F(1,90) = 300.77$, $p<.001$, indicated that short stories were recalled significantly better than long stories. Mean proportional recalls were .341 for long passages and .507 for short passages.

A significant main effect of level of importance of idea units, $F(2,180) = 187.15$, $p <.01$, indicated that ideas of high importance were remembered better than those of lesser importance. Mean proportional recall for idea units of high, medium, and low levels of importance were .531, .421 and .319 respectively. A Neuman-Keuls analysis (alpha set at .05) indicated that recall scores increased as level of importance increased (high > medium > low).

A significant passage length by level of importance interaction, $F(2,180) = 74.86$, $p < .01$, indicated that short passages are remembered significantly better than longer passages at all levels of importance. (see Table 1) However, the size of the passage length effect was larger for medium and low levels of importance than for high levels of importance. For high levels of importance, long stories were remembered 91% as well as short stories; for medium levels of importance, long stories were remembered 51% as well as short stories, and for low levels of importance, long stories were remembered 57% as well as short stories.

TABLE 1

RECALL AS A FUNCTION OF PASSAGE LENGTH AND IMPORTANCE LEVEL

	Importance level		
Length	High	Medium	Low
Short	.556	.558	.406
Long	.506	.285	.233

A significant four way interaction of age, gender, consumption, and level of importance was found, $F(2,180) = 3.381$, $p = .024$. A Neuman-Keuls analysis (alpha set at .05), indicated that young females in the high consumer group had significantly greater recall of idea units of low importance than young females in the low consumer group. Also, elderly females in the high consumer group recalled significantly less at medium and low levels of importance than young females in the

high consumer group, while young females in the low consumer group had significantly greater recall of idea units of medium importance than elderly females in the low consumer group. (See Table 2). No significant differences in recall were observed for males in either the high or low caffeine consumption groups.

TABLE 2

RECALL AS A FUNCTION OF AGE, GENDER, CAFFEINE CONSUMPTION AND IMPORTANCE LEVEL

MALES

High Consumption				Low Consumption			
	Importance level				Importance level		
Age	High	Med	Low	Age	High	Med	Low
Young	.593	.430	.314	Young	.588	.458	.368
Elderly	.545	.432	.364	Elderly	.550	.434	.325

FEMALES

High Consumption				Low Consumption			
	Importance level				Importance level		
Age	High	Med	Low	Age	High	Med	Low
Young	.524	.440	.374	Young	.518	.441	.277
Elderly	.471	.365	.254	Elderly	.460	.371	.277

Individual Differences

In order to determine whether recall effects may have been confounded by individual differences related to recall performance, a series of 2 (age) x 2 (consumption) x 2 (gender) ANOVAS were conducted using the various individual difference measures as dependent variables (Table 3).

TABLE 3

INDIVIDUAL DIFFERENCE SCORES AS A FUNCTION OF AGE, GENDER, AND CAFFEINE CONSUMPTION (Standard deviations in parentheses)

	YOUNG				ELDERLY			
	High Cons		Low Cons		High Cons		Low Cons	
	M	F	M	F	M	F	M	F
AGE	20.50 (2.37)	23.57 (4.52)	20.31 (3.45)	20.58 (3.20)	66.55 (3.75)	67.14 (4.44)	66.30 (4.22)	68.79 (4.48)
CONS	464.80 (140.38)	502.93 (263.40)	144.23 (59.99)	101.25 (56.60)	493.18 (183.99)	502.29 (226.60)	105.70 (77.41)	117.43 (53.42)
BDI	5.60 (5.36)	9.07 (6.74)	3.54 (2.90)	5.92 (6.78)	6.27 (6.44)	5.21 (3.73)	6.40 (3.72)	4.93 (3.58)
Wahler	.64 (.29)	.92 (.52)	.71 (.32)	.73 (.39)	.99 (.64)	.71 (.59)	.75 (.40)	.65 (.62)
AD-ACL								
G Deact	17.70 (4.00)	24.43 (21.74)	17.54 (4.67)	17.83 (2.52)	16.64 (4.43)	17.71 (4.58)	21.30 (2.79)	20.07 (6.15)
Hi Act	13.30 (4.35)	17.29 (23.97)	11.77 (3.88)	10.58 (3.34)	10.64 (3.17)	10.14 (2.38)	9.80 (3.77)	11.14 (3.57)
Gen Act	16.50 (4.20)	21.14 (22.86)	20.15 (5.10)	13.83 (4.88)	21.27 (4.36)	19.43 (5.75)	18.90 (5.30)	17.64 (6.05)

TABLE 3 continued

	YOUNG				ELDERLY			
	High Cons		Low Cons		High Cons		Low Cons	
	M	F	M	F	M	F	M	F
De Sle	11.80 (4.10)	19.79 (23.16)	10.85 (4.20)	14.50 (4.66)	7.73 (2.97)	6.79 (2.91)	7.80 (3.26)	8.14 (3.53)
WAIS	47.30 (7.20)	46.86 (9.11)	52.23 (4.15)	42.50 (5.13)	52.82 (6.48)	52.79 (11.28)	55.80 (7.27)	51.14 (9.84)
EISENCK IE	13.80 (5.41)	14.57 (2.80)	15.31 (3.90)	16.68 (2.90)	9.55 (4.18)	10.07 (3.20)	10.90 (3.64)	10.57 (4.72)
LIE	3.00 (1.25)	2.86 (1.51)	1.92 (1.55)	2.33 (1.83)	3.91 (0.94)	5.00 (1.66)	3.20 (1.40)	4.07 (1.82)
SOCIAB	7.30 (3.47)	8.00 (2.57)	8.70 (2.18)	9.75 (1.82)	6.00 (3.87)	6.21 (2.58)	5.20 (3.12)	5.86 (3.88)
IMP	4.90 (1.91)	5.36 (1.45)	4.92 (1.71)	5.33 (1.83)	3.09 (1.76)	3.21 (1.89)	4.60 (2.59)	4.14 (1.66)
SMOK Y=1 N=0	.20 (.42)	.36 (.50)	.15 (.38)	.08 (.29)	.18 (.41)	.14 (.36)	.00 (.00)	.07 (.27)
DRINK Y=1 N=0	.90 (.32)	.64 (.50)	.77 (.44)	1.00 (.00)	.82 (.41)	.64 (.50)	.80 (.42)	.64 (.50)

There were no significant differences between high and low caffeine consumers on the Wahler Physical Symptoms Inventory (Table 5, Appendix C) or on the AD-ACL General Deactivation (Table 6, Appendix C), High Activation (Table 7, Appendix C), and General Activation scales (Table 8, Appendix C). In addition, there were equivalent numbers of drinkers and non-drinkers at all levels of consumption. (Table 9, Appendix C)

A significant interaction of age and gender was found when using the score on the BDI as the dependent variable, $F(1,90) = 4.056$, $p = .048$. Females ($m = 6.28$) scored significantly higher on the BDI than males ($m = 5.45$) and the young ($m = 6.03$) scored higher than the elderly ($m = 5.70$), with young females ($m = 7.50$) scoring significantly higher than other groups. There was no main effect or interaction with caffeine consumption on BDI scores. (Table 10, Appendix C)

When using the AD-ACL Deactivation Sleep scale as the dependent variable, a significant effect of age was found, $F(1,90) = 1.809$, $p = .001$. Young subjects ($m = 14.233$) scored significantly higher than elderly subjects ($m = 7.614$), suggesting significantly lower levels of trait arousal in the young. No main effect or interaction with caffeine consumption on AD-ACL Deactivattion Sleep scores was found. (Table 11, Appendix C)

When WAIS vocabulary scores were examined (Table 12, Appendix C), significant effects of age, $F(1,90) = 12.94$, $p = .001$, gender, $F(1,90) = 5.109$, $p = .027$, and an interaction of gender by consumption, $F(1,90) = 4.476$, $p = .036$, were noted. WAIS vocabulary scores of the elderly ($m = 53.14$) were significantly higher than those of the young ($m = 47.22$), while males ($m = 52.04$) had significantly higher scores than females ($m = 48.32$). Further, in the low caffeine consumption group, males ($m = 54.02$) had significantly higher scores than females ($m = 46.82$). In the high consumption group WAIS scores were not significantly different for males and females (49.82 vs 50.06)

The IE Scale of the Eysenck Personality Inventory (Table 13, Appendix C) showed an age-related difference, $F(1,90) = 36.98$, $P =$

<.001, with young (m= 15.09) scoring significantly higher than the elderly (m = 10.27). This indicates that young subjects tended to be significantly more extraverted than elderly subjects. No main effect or interaction with caffeine consumption was found with Eysenck IE scores.

The LIE scale of the Eysenck (Table 14, Appendix C) revealed significant differences with age, $F(1,90) = 23.18$, $P = <.001$ and consumption $F(1,90) = 6.61$, $p = .012$ with elderly (m = 4.05) scoring higher than young (m = 2.53) and with high caffeine consumers (m = 3.69) scoring higher than low consumers (m = 2.88). These results indicate that the elderly had a significantly greater tendency to "fake good" than the young; in addition, high caffeine consumers also had a greater tendency to "fake good" than low caffeine consumers. (M=3.69 for high consumers vs 2.88 for low consumers).

When using the SOC scale of the Eysenck (Table 15, Appendix C), a significant difference of age was found, $F(1,90) = 18.38$, $p = <.001$. Young (m = 8.44) scored significantly higher than the elderly (m = 5.82), indicating a significantly greater tendency toward sociability in the young. There was no main effect or interaction of caffeine consumption on Eysenck SOC scores.

The IMP Scale of the Eysenck (Table 16, Appendix C), when used as a dependent variable, showed a significant main effect of age, $F(1,90) = 13.24$, $p = <.001$, with young (m = 5.13) scoring higher than the elderly (m = 3.76). The young were significantly more impulsive than the elderly. No main effect or interaction of caffeine consumption on Eysenck IMP scores were found.

When smoking was used as a dependent variable (Table 17, Appendix C), a non-significant trend was found, $F(1,90) = 3.80$, $p = .055$, with more smokers being in the high ($m = .220$) than in the low ($m = .077$) consumption group.

In sum, the analyses of individual differences between the groups showed age related differences with depression scores, vocabulary scores, the Deactivation/Sleep scale of the Activation/Deactivation check list and all four of the scales measured by the Eysenck Personality Inventory: Introversion/Extroversion, Sociability, Impulsivity and Lie. Young subjects tended to score higher on depression, extroversion, sociability and impulsivity than elderly subjects. Elderly subjects had higher vocabulary scores, were less sleepy at the time of testing and tended to a greater extent to falsify responses when answering the Eysenck Personality Inventory. Caffeine consumption differences were found only in relation to WAIS vocabulary scores and the LIE scale of the Eysenck Personality Inventory. In the low consumer group, males had higher vocabulary scores than females. High caffeine consumers had a greater tendency to falsify results on the Eysenck Personality Inventory than low caffeine consumers.

Analysis of Covariance

Since the individual difference ANOVAS revealed significant differences related to consumption of caffeine which could have confounded interpretation of the original ANOVA, two separate analyses of covariance were performed, using WAIS vocabulary scores and Eysenck Impulsivity scores as covariates.

Following the ANCOVA with WAIS vocabulary scores (Table 18, Appendix C), the pattern of effects was changed, with young subjects having significantly higher recalls than elderly subjects, $F(1,89)=11.135$, $P=.002$. Adjusted mean recalls for young subjects were .460 while those for the elderly were .388. This finding indicates that when verbal ability was taken into account, elderly subjects recalled significantly fewer idea units than the young subjects. The earlier failure to find differences in recall between young and elderly groups was probably the result of differences in verbal ability. Still, caffeine consumption had no impact on these results. Further, previously described gender differences in recall disappeared.

When ANCOVA was performed with the Impulsivity Scale of the Eysenck Personality Inventory as the covariate, (Table 19, Appendix C), the pattern of effects remained the same except that a significant effect of age also became apparent, $F(1,89) = 4.322$, $p = .041$, confirming the age-related difference in recall when level of impulsivity was taken into account. However, caffeine consumption had no apparent effect upon impulsivity.

DISCUSSION

The results of this study show primarily that chronic consumption of caffeine had no effect on memory for expository passages. In a four-way interaction involving age, gender, caffeine consumption, and level of importance, young females consuming high amounts of caffeine remembered ideas of low importance better than young females consuming low amounts of caffeine. In addition, in the high caffeine consumer group, young females remembered ideas of both medium and low importance better than elderly females. Also, in the low caffeine consumption group, young females had better recall of ideas of medium importance than elderly females. Finally, high caffeine consumers tended to falsify responses on the Eysenck Personality Inventory more often than low caffeine consumers. Expected results for passage length and level of importance were found, with short stories being remembered better than long, and with idea units of high importance being remembered better than those of lesser importance. When the effects of vocabulary and impulsivity were removed using analysis of covariance, traditional age-related differences in recall emerged, with young subjects showing greater proportional recall of expository passages at all levels of importance.

Several interesting differences which had no relation to caffeine consumption were also found. Young females scored higher on the Beck Depression Inventory than any other group. Young subjects scored higher than the elderly on Extroversion, Sociabilility, and Impulsivity subscales of the Eysenck Personality Inventory. Elderly subjects had

higher WAIS Vocabulary scores, were less sleepy at the time of testing, and tended more often to falsify responses to the Eysenck Personality Inventory.

One possible explanation for the finding that chronic caffeine consumption had no general effect on memory is that chronic caffeine consumers may habituate to the effects of caffeine. Hirsh (1984) states that tolerance to the effects of caffeine may develop in habitual caffeine consumers and that non-users may show more pronounced responses to ingestion of caffeine than those who consume higher amounts on a regular basis. Goldstein (1984) found that students who normally consumed higher amounts of caffeine were less likely to lose sleep when drinking coffee at night and did not experience nervousness with ingestion of additional caffeine when compared with students who normally consumed little or no caffeine. Robertson, Wall, Workman, Woosley & Oates (1981) found that cardiovascular and autonomic nevrous system effects of acute caffeine ingestion were no longer present after 3 days of caffeine administration of 250 mg three times per day. It could be, therefore, that although some investigators have found memory differences with acute administration of caffeine (e.g., Arnold, et al., 1987; Erickson, et al., 1985), these differences are diminished by tolerance effects in chronic caffeine consumption.

A second explanation could be that although various performance differences have been demonstrated between high and low caffeine consumer groups (Revelle, 1980, Gilliland, 1981, Lieberman, 1987, Swift, 1988), memory for prose passages is not affected by chronic caffeine consumption.

Finally, it is possible that failure to find effects of chronic caffeine consumption on memory is due to a poorly designed study, faulty group selection or a related problem in methods. These do not seem to be valid criticisms, since expected results of passage length, level of importance, and age differences in vocabulary scores were obtained.

The finding that caffeine enhanced the recall of idea units of medium and low importance in young females seems to indicate that caffeine may, under some circumstances, enhance memory of trivial details in a learning task. Sternhagen (1987), who studied males only, found no such effect. Arnold, et al., (1987) found that acute doses of caffeine facilitated recall for supraspan word lists in young females and speculated that effects of caffeine on females may depend, in part, on estrogen levels. Further research with females is needed to help clarify gender differences.

Short stories were remembered better than longer stories. This result agrees with those of Sternhagan (1987) and Klein (1989) who both found that college students remembered short prose passages significantly better than longer passages. This finding would be expected, since it is widely accepted that recall of a smaller amount of material is accomplished more easily (Kintsch & van Kijk, 1978). The finding that ideas of greater importance were remembered better than those of lesser importance agrees with the work of Petros, et al. (1983, 1989), Sternhagan (1987), Klein (1989), and Brown & Smiley (1977).

The fact that females reported higher depression scores than the males agrees with findings of Nolen-Hoeksema (1987), in which a review of both treated patients and community samples indicated that the rate

of depressed females to males in the United States is about 1.8 to 1. It is interesting that the young females in this study scored higher on depression than all other groups. This result does not agree with two studies demonstrating no sex differences for depression among college students (Hammen & Padesky, 1977; Stangler & Printz, 1980). One possible explanation for this discrepancy is that the female students in the present study were tested during days 1-5 of the menstrual cycle, a time of lowered estrogen production. It would be interesting to test young females for depression at other phases of the menstrual cycle. There was no interaction between caffeine consumption and level of depression under the conditions of this study.

Although young subjects were more impulsive than the elderly, it is interesting to note that no interaction was found between caffeine consumption and impulsivity. Sternhagan (1987), found that although high impulsive males remembered less than low impulsive males when using expository stories, there was no caffeine by impulsivity interaction. On the other hand, Revelle (1980) demonstrated an impulsivity by caffeine by time of day interaction. For high impulsive subjects, caffeine facilitated performance in the morning, but impaired performance in the evening. However, caffeine impaired performance in the morning and facilitated performance in the evening for low impulsive subjects. Failure to find significant effects of caffeine and impulsivity for subjects tested in the morning in this study could be due to differences between chronic and acute caffeine consumption. The studies by Sternhagen and Revelle involved having subjects ingest 0, 2, or 4 mg. of caffeine. The present study involved chronic caffeine

consumption only. It is possible that no caffeine consumption by impulsivity interaction was found because the subjects had habituated to the effects of caffeine.

Significant group differences were found with WAIS vocabulary scores: the elderly scored higher than the young, while males scored higher than females. The differences in vocabulary between age groups masked the traditional differences in memory; when these differences were removed using analysis of covariance, the expected age differences in memory for prose passages emerged, with the young remembering significantly more than the elderly. In addition, previously described gender differences in recall disappeared, indicating that former differences in recall between males and females were due to differences in verbal ability. These results agree with those of Petros, et al. (1983), who found that younger adults remembered more than elderly adults in a prose memory task and that subjects from all groups favored the main ideas in their recalls. Smith (1983), in a study of story structure and adult age differences in recall found results which support models of age-related differences in memory when material must be organized or placed in a hierarchy. Rice & Meyer (1986) found that a decrease in quantity of recall appears with increasing age, although the magnitude of age deficits in memory is ameliorated with increasing verbal ability.

An interesting incidental finding in this study involves caffeine consumption differences between age groups. While subjects in young and elderly groups were matched for amount of caffeine consumed, the sources of caffeine differed markedly between groups. While elderly subjects

derived about 87% of caffeine consumed from coffee or tea, young people obtained only about 55% of their caffeine from this source. Thirty nine percent of caffeine consumed by the young and only 6% of that consumed by the elderly came from caffeinated soft drinks. Forty seven percent of young subjects mentioned in the questionaire that they did not drink coffee or tea because they "did not like the taste". Another incidental finding was an age difference in responses regarding coffee on the Caffeine Questionaire. Consumption of coffee was assessed by two different questions -- one more general ("during an average day, how much coffee do you drink?"), and one more specific ("on the average, how many cups of coffee do you drink at each of the following times: before breakfast, with breakfast, etc?"). Twenty-nine percent of each group gave answers on the general question which differed significantly from the answer on the specific question. The young tended to provide lower estimates of their consumption of caffeine on the general question and then increase the amount of caffeine consumed when answering more specifically (average increase = 71.5 mg/day). The elderly tended to provide higher estimates of their caffeine consumption on the general question. The average decrease when answering the more specific question for the elderly was 122 mg/day.

The findings of this study provide a baseline for further research in the area of caffeine, memory, and aging. While chronic consumption of caffeine had no effect on memory for prose passages under the conditions of this study, it could be important to examine the effects of acute administration of caffeine on memory for prose in both young and elderly as a function of chronic consumption of caffeine. Also,

because of the finding that young females scored higher on depression in the first five days of the menstrual cycle, it would be interesting to examine differences in depression scores in young females at different phases of the menstrual cycle in relation to caffeine and memory. Since it is possible that estrogen levels may influence effects of caffeine on memory, comparisons with young females taking oral contraceptives might also show interesting results. Another way to approach a study such as this would be to actually measure estrogen levels in females and compare these to effects of caffeine and memory.

APPENDICES

Appendix A

Four Expository Stories

SN

1. SNAILS ARE FASCINATING LITTLE CREATURES.

2. THERE ARE SEVERAL DIFFERENT TYPES OF SNAILS

3. THAT VARY IN THEIR SIZE, SHAPE, AND COLOR.

4. SNAILS ARE PRIMARILY FOUND IN THE OCEANS AND SEAS.

5. HOWEVER, IN WARMER REGIONS OF THE WORLD SOME SNAILS ARE ALSO FOUND ON LAND.

6. SNAILS HAVE BEEN AROUND FOR A LONG TIME

7. AND HAVE BEEN UTILIZED FOR SEVERAL DIFFERENT PURPOSES.

8. THE VARIOUS TYPES OF SNAILS DIFFER WIDELY IN THEIR COLORS.

9. THE BRIGHTEST COLORED SNAILS ARE THE MOST POPULAR WITH COLLECTORS.

10. THE COLOR OF A SNAIL DEPENDS ON WHAT IT EATS.

11. MOST SNAILS EAT PLANTS.

12. NEARLY EVERY SNAIL HAS A SPIRAL SHELL,

13. WHICH IT CARRIES ON ITS BACK.

14. THE SHELL IS MADE FROM A HARD LIME

15. THAT SERVES AS PROTECTION FOR THE SNAIL FROM ENEMIES.

16. THE SHELL ALSO SERVES AS PROTECTION AGAINST EXTREME VARIATIONS IN HOT AND COLD WEATHER.

17. FINALLY, THE SHELL KEEPS THE SNAIL FROM DRYING OUT.

18. ALL THROUGH THE AGES PEOPLE HAVE UTILIZED SNAIL SHELLS FOR MANY PURPOSES.

19. IN ANCIENT TIMES THE SHELL WAS USED AS CURRENCY.

20. MORE RECENTLY, SOME SNAIL SHELLS HAVE BEEN GROUND UP

21. AND USED IN THE PRODUCTION OF CERTAIN MEDICINES.

22. WHILE OTHER SNAIL SHELLS HAVE BEEN USED TO MAKE JEWELRY.

23. FINALLY, SOME PEOPLE HAVE USED SNAIL SHELLS TO DECORATE THE INSIDE OF THEIR HOUSES.

BM

1. ONE OF THE MOST INTERESTING RIDDLES ABOUT BIRD MIGRATION IS THE QUESTION OF HOW DO BIRDS KNOW WHICH DIRECTION TO FLY.

2. MANY OF THE BIRDS IN THE WORLD MIGRATE EACH YEAR.

3. SOME BIRDS TRAVEL THOUSANDS OF MILES.

4. UNFORTUNATELY, THERE IS NO WAY TO TELL WHAT SIGHTS, SMELLS, OR OTHER SIGNALS GUIDE A BIRD TO THE SAME WINTERING PLACE YEAR AFTER YEAR.

5. ONE EXPLANATION OF BIRD MIGRATION BELIEVES THAT BIRDS NAVIGATE DURING THEIR MIGRATION BY USING LANDMARKS

6. SUCH AS RIVERS AND MOUNTAIN RANGES,

7. AND ONLY PIECE THE TRIP TOGETHER AS THEY GO.

8. HOWEVER, THIS EXPLANATION CANNOT ACCOUNT FOR THE RESULTS OF EARLY STUDIES DONE WITH SEA BIRDS.

9. IN THESE STUDIES SEA BIRDS WERE REMOVED FROM THEIR NEST ON AN ISLAND OFF THE COAST OF ENGLAND,

10. MOVED TO BOSTON, MASSACHUSETTS,

11. AND THEN WERE SET FREE.

12. IN TWO WEEKS, THESE BIRDS HAD RETURNED TO THEIR NEST

13. AFTER CROSSING THE FEATURELESS ATLANTIC OCEAN.

14. ANOTHER EXPLANATION OF HOW BIRDS FIND THEIR DIRECTION DURING MIGRATION

15. BELIEVES THAT MANY BIRDS DEPEND ON THE POSITION OF THE SUN AND STARS,

16. AND POSSIBLY CUES THEY RECEIVE FROM THE EARTH'S MAGNETIC FIELD.

17. BIRDS ALSO DEPEND ON CHANGES IN BAROMETRIC PRESSURE, WIND DIRECTION, AND ODORS.

18. EVEN LOW FREQUENCY SOUNDS CAUSED BY WIND, THUNDER, OR DISTANT OCEAN SURF ARE USED.

19. FURTHERMORE, SCIENTISTS HAVE FOUND THAT DIFFERENT BIRDS SEEM TO USE THESE DIRECTION CUES IN A DIFFERENT ORDER.

20. MIGRATION MOSTLY TAKES PLACE AT NIGHT.

BM continued

21. HOWEVER, THOSE BIRDS THAT FLY DURING THE DAY ARE LIKELY TO USE THE SUN AS A DIRECTIONAL CUE TO GUIDE THEIR MIGRATION.

22. THESE BIRDS WOULD FIRST FIND THE POSITION OF THE SUN,

23. AND THEN ADD IT TO THEIR OWN CIRCADIAN RHYTHMS,

24. OR INTERNAL CLOCKS,

25. IN ORDER TO REMAIN ON THEIR PROPER COURSE.

26. STUDIES WITH PIGEONS CLEARLY SHOW THAT THE SUN AFFECTS THE DIRECTION THEY TAKE DURING MIGRATION.

27. THE MAGNETIC FIELD OF THE EARTH SERVES AS ANOTHER AID FOR BIRDS DURING MIGRATION,

28. ESPECIALLY IF THE SUN IS BLOCKED.

29. IN ONE STUDY, PIGEONS WERE EQUIPPED WITH A BAR MAGNET

30. THAT WAS SUPPOSED TO DISRUPT THEIR ABILITY TO READ THE EARTH'S MAGNETIC FIELD.

31. WHEN THE SUN WAS BLOCKED DUE TO WEATHER,

32. THE PIGEONS WHO WERE EQUIPPED WITH THE BAR MAGNETS BECAME DISORIENTED AND COULD NOT STAY ON COURSE.

33. ONE THEORY OF HOW PIGEONS MIGHT DETECT THE EARTH'S MAGNETIC FIELD DEALS WITH THE DISCOVERY OF MAGNETITE,

34. A MAGNETIC MATERIAL,

35. IN THE HEADS OF PIGEONS.

36. SCIENTISTS THINK THAT MAGNETITE MAY BE PART OF A SENSE ORGAN

37. THAT GIVES BIRDS THEIR ORIENTING SKILLS.

38. THEY ARE NOW QUESTIONING IF BIRDS ARE BORN WITH THESE SKILLS

39. OR IF THEY LEARN THEM.

EA

1. THE CHOICE OF THE AMERICAN EAGLE AS OUR NATIONAL BIRD WAS A GOOD ONE

2. BECAUSE THE BIRD IS THE SYMBOL OF FREEDOM, VALOR, AND STRENGTH.

3. THE NATIVE BALD EAGLE IS A VERY HANDSOME BIRD.

4. THEIR DARK BROWN BODIES AND WINGS CONTRAST SHARPLY WITH THEIR PURE WHITE HEAD AND TAIL FEATHERS.

5. A LARGE ADULT FEMALE BALD EAGLE CAN WEIGH OVER 14 POUNDS.

6. ALSO, THE BIRD HAS AN OPEN WING SPAN OF OVER 90 INCHES

7. AND A BODY LENGTH OF OVER A YARD.

8. THE ADULT EAGLE HAS A FEW NATURAL ENEMIES OTHER THAN MAN.

9. THEY CAN PREY ON ALMOST ANY ANIMAL IN SIGHT.

10. ALTHOUGH THEIR FAVORITE FOOD IS FISH,

11. EAGLES WILL ALSO KILL AND EAT OTHER BIRDS AND SMALL MAMMALS, LIKE RABBITS.

12. ONE REALLY IMPRESSIVE FEATURE OF THE BALD EAGLE IS THE QUALITY OF THE NESTS THEY BUILD.

13. THEY USUALLY BUILD THEIR NESTS IN TALL TREES,

14. NEAR WATER WHEN POSSIBLE,

15. AND RETURN TO THE SAME NEST EVERY YEAR.

16. EACH YEAR EAGLES WILL ADD ANOTHER FOOT TO THE HEIGHT OF THE NEST

17. UNTIL IT ATTAINS ENORMOUS PROPORTIONS.

18. THE NESTS ARE TYPICALLY CONSTRUCTED FROM STICKS, BRANCHES, AND OTHER AVAILABLE MATERIALS.

19. THE SHEER BULK OF THE NEST ACCOUNTS FOR ONE OF THE EAGLE'S FEW NATURAL ENEMIES,

20. WHICH IS THE WEATHER.

21. HIGH WINDS CAN BRING DOWN THE MASSIVE NEST BEFORE THE EAGLE'S EGGS ARE HATCHED

22. OR WHILE THE BABY EAGLES ARE STILL UNABLE TO FLY.

MR

1. THERE IS AN IMAGINARY COUNTRY CALLED MOR.
2. THE GEOGRAPHY OF MOR IS VERY ROUGH.
3. THE COUNTRY LIES ON THE WESTERN COAST OF A SOUTHERN CONTINENT.
4. ITS COASTLINE IS LONG
5. AND IT HAS GOOD NATURAL HARBORS.
6. A MOUNTAIN RANGE IS FOUND ON THE EASTERN BORDER.
7. THE TALLEST MOUNTAIN STANDS OVER 15,000 FEET.
8. AT THE BASE OF THE TALLEST MOUNTAIN IS THE CAPITAL CITY
9. IN WHICH MOST OF THE PEOPLE LIVE.
10. THE CLIMATE OF MOR IS VERY SEVERE.
11. THE WEATHER IS TROPICAL AT SEA LEVEL.
12. IT IS HOT AND HUMID ELEVEN MONTHS OF THE YEAR.
13. THE TWELFTH MONTH IS THE RAINY SEASON ON THE COAST.
14. IT IS COLD IN THE MOUNTAINS OF THE COUNTRY.
15. SNOW CAPS ARE FOUND ON THE TALLEST MOUNTAIN ALL YEAR.
16. MOR'S ECONOMY IS BASED ON MANY DIFFERENT INDUSTRIES.
17. TUNA FISHING IS THE MOST IMPORTANT FISHING INDUSTRY TODAY.
18. WHALING WAS ONCE A MAJOR PART OF THE FISHING INDUSTRY,
19. BUT NOT ANY LONGER.
20. THE MINING INDUSTRY ALSO PLAYS AN IMPORTANT PART IN MOR'S ECONOMY.
21. THE MINING INDUSTRY WAS STARTED BY FOREIGN INVESTORS
22. AND HAS BEEN BUILT IN THE LAST TWENTY YEARS.
23. THE MOUNTAINS ARE RICH IN COPPER AND IRON ORE.
24. THE MOUNTAINS ARE NOT ONLY A SOURCE OF MINERALS, HOWEVER, COFFEE CROPS ARE GROWN IN THE MOUNTAINS AND ARE A MAJOR PART OF THE COUNTRY'S EXPORTS.

MR continued

25. THE COUNTRY ALSO MAKES SOME GOOD WINES.

26. MOR IMPORTS MANY PRODUCTS TO KEEP UP ITS ECONOMY.

27. MANY AGRICULTURAL PRODUCTS, LIKE GRAIN AND VEGETABLES, ARE IMPORTED.

28. DAIRY PRODUCTS ARE ALSO BROUGHT IN FROM OTHER COUNTRIES.

29. THESE PRODUCTS ARE IN SHORT SUPPLY

30. BECAUSE MOR DOES NOT HAVE LAND THAT CAN BE USED FOR FARMING OR GRAZING.

31. PETROLEUM AND HEAVY MACHINERY ARE ALSO IMPORTED,

32. BECAUSE THEY ARE NEEDED TO KEEP UP THE MINING INDUSTRY.

33. MOR HAS A STRONG DEMOCRATIC GOVERNMENT.

34. THE PRESENT GOVERNMENT HAS A SIMPLE ORGANIZATION.

35. AN ELECTED PRESIDENT HEADS THE GOVERNMENT.

36. THE PRESIDENT CHOOSES TWENTY PEOPLE FOR HIS CABINET.

37. THESE PEOPLE ARE RESPONSIBLE FOR RUNNING DIFFERENT PARTS OF THE COUNTRY,

38. LIKE THE MILITARY AND THE TREASURY.

39. THE GOVERNMENT ALSO HAS AN ELECTED SENATE.

40. THE SENATORS ARE A LEGISLATIVE BODY,

41. WHICH SERVES AS A SYSTEM OF CHECK ON THE EXECUTIVE DUTIES OF THE PRESIDENT.

42. MOR'S POPULATION IS VERY DIVERSE.

43. THE FIRST INHABITANTS OF MOR WERE FISHERMEN.

44. THEIR DESCENDANTS ARE FISHERMEN STILL.

45. THE PROPERTY OF THE FISHING INDUSTRY BROUGHT MANY PEOPLE TO MOR.

46. THE DEVELOPMENT OF THE MINING INDUSTRY BROUGHT STILL MORE PEOPLE.

47. THE POPULATION HAS GROWN SINCE THE START OF THE MINING INDUSTRY.

48. THE PEOPLE OF MOR TODAY ARE FROM MANY DIFFERENT CULTURAL AND NATIONAL BACKGROUNDS.

Appendix B

Questionnaires

CONSENT FORM

Effects of Caffeine on Memory for Prose

You are invited to participate in a study that is designed to identify the effects of long-term use of caffeine on prose memory for adults. If you voluntarily decide to participate, you will be asked to fill out a caffeine consumption questionnaire to determine your typical consumption of caffeine, educational level, and ratings of health. This will be followed by the administration of a vocabulary test, the Beck Inventory and the AD-ACL which tests for activity level and personality traits. After the completion of these forms, you will be seated in front of a laboratory computer, where you will be presented with a practice story followed by four experimental stories which you will be reading from the computer screen at you own rate. Immediately after completing each story, you will be instructed to recall as much of the story as possibly by speaking into a tape recorder; you need not worry about the sequence and exact wording. These procedures will take about one hour to complete.

Any information collected in this study which may be used to identify you will be held in strictest confidence and will be used for research purposes only. Your decision whether or not to participate will not prejudice your future relations with UND or the psychology department. If you decide to participate, you are free to discontinue participation at any time.

Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw after signing this form is you choose to discontinue your participation from this study.

_____ _____

Signature Date

_____ _____

Signature of Investigator Date

You will be offered a copy of this form to keep. If you have any questions at any time, feel free to call Dr. Bill Beckwith at 777-3451 or Malva Waters at 777-4348.

Name_____

CAFFEINE QUESTIONNAIRE

This questionnaire is designed to obtain information about how caffeine affects you. The following questions measure your average caffeine consumption from coffee, tea, medications, and cola drinks. Several questions also pertain to your use of other medications, alcohol, and tobacco. This information will assist physicians in understanding the effects of caffeine, and how its use relates to the intake of other medications.

THIS SURVEY IS COMPLETELY CONFIDENTIAL. IT IS INTENDED FOR RESEARCH ONLY.

There are no right or wrong answers. If this survey is to be of any *value, your honest responses to these questions are essential. If none of the answers seems perfect, check the one that is closest. PLEASE DO NOT LEAVE ANY QUESTIONS UNANSWERED.

Thank you for your participation in this survey.

PLEASE PUT A CHECK OR AN "X" BY YOUR ANSWER.

1. AGE

_____ 16-20 years
_____ 21-25 years
_____ 26-30 years
_____ 31-35 years
_____ 36-40 years
_____ 41-50 years
_____ 51-60 years
_____ 61 years or older

2. SEX

_____ Male
_____ Female

3. MARITAL STATUS

_____ Single
_____ Married
_____ Separated
_____ Divorced
_____ Widow or Widower

4. As far as you know, do the following beverages or medications contain some caffeine?

	YES (1)	NO (2)	DON'T KNOW (8)
Kool-Aid	____	____	____
Aspirin	____	____	____
Coffee	____	____	____
Tylenol	____	____	____
Mountain Dew	____	____	____
Vanquish	____	____	____
Water	____	____	____
Chocolate	____	____	____
Excedrin	____	____	____
Empirin	____	____	____
Pepsi-Cola	____	____	____
Coke	____	____	____
Diet Coke	____	____	____
Tab	____	____	____
Sprite	____	____	____
Ginger Ale	____	____	____
Tea	____	____	____
No-Doz	____	____	____
7-Up	____	____	____
Squirt	____	____	____
Dexatrim	____	____	____
Dristan	____	____	____
Pepsi-Free	____	____	____
Like	____	____	____

5. HOW MANY YEARS OF EDUCATION HAVE YOU HAD?

_____ Grade School
_____ Partial completion of high school
_____ High School graduate or "GED" equivalent
_____ Partial completion of college
_____ College graduate
_____ Some graduate education after completing college (M.S., Ph.D., M.D., etc.)

6. IN YOUR JUDGEMENT, HOW GOOD IS YOUR PRESENT PHYSICAL HEALTH?

_____ Excellent (1)
_____ Good (2)
_____ Fair (3)
_____ Poor (4)

7. As best as you can remember, at what age did you begin drinking coffee regularly?

_____ AGE

Check if never have_____
Please specify why not.

_____
_____
_____

IF YOU DO NOT DRINK COFFEE SKIP TO QUESTION 13

---

8. During an average day how much coffee do you drink?

_____ about 1 cup per day or less	1
_____ about 2 to 3 cups per day	2
_____ about 4 to 5 cups per day	3
_____ about 6 to 9 cups per day	4
_____ about 10 to 13 cups per day	5
_____ more than 14 cups per day	6

9. If you were to drink a cup of coffee shortly before bedtime, would you have trouble falling asleep?

_____ Yes	1
_____ No	2
_____ Don't know	8

10. When you skip drinking coffee in the morning, how frequently do you develop a headache? (Check one box only.)

Almost Always (1)	Usually (2)	Seldom (3)	Never (4)	Don't know (8)

11. What type of coffee do you drink most of the time? (Check one only.)

_____ regular instant coffee	_____ decaffeinated coffee
_____ regular perked coffee	_____ other: Please specify
_____ regular fresh-drip coffee	_____

12. On the average, how many cups of coffee do you drink at each of the following times? (Fill in each entry with an appropriate number, or zero)

_____ before breakfast	_____ between lunch an dinner
_____ with breakfast	_____ with dinner
_____ between breakfast and lunch	_____ after dinner
_____ with lunch	

13. As best as you can remember, at what age did you begin drinking tea regularly?

____AGE

Check if never used_____

Please specify why not.

_____

_____

_____

_____

IF YOU DO NOT DRINK TEA SKIP TO QUESTION 16

---

14. How much tea on the average do you drink each day?

|_| about 1 cup per day or less 1

|_| about 2 to 3 cups per day 2

|_| about 4 to 5 cups per day 3

|_| about 6 to 9 cups per day 4

|_| about 10 to 13 cups per day 5

|_| more than 14 cups per day 6

15. What type of tea (hot or iced) do you drink most of the time?

_____ loose leaf tea

_____ bagged tea

_____ decaffeinated tea

_____ instant tea

_____ herbal tea

_____ other: please specify

_____

16. The following questions are intended to determine your options about coffee or tea. (Check the box to the right of each statement which most closely represents your feelings.) (CHECK ONE BOX ONLY)

Coffee or tea drinking...	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree nor Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
1. Makes me see "spots in front of my eyes.					
2. Relieves my headaches.					
3. Gives me energy.					
4. Calms my nerves.					
5. Improves my sex life.					
6. Causes a "ringing in my ears.					
7. Makes me urinate more frequently.					
8. Interferes with my sex life.					
9. Gives me palpitations. ("skipped heart beats")					
10. Makes me "lightheaded."					

Coffee or tea drinking...	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree nor Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
11. Makes my heart beat noticeably faster.					
12. Causes me to feel as if I cannot catch my breath.					
13. Makes my palms perspire.					
14. Causes a "tingling" sensation in my hands and feet.					
15. Makes me feel happy when I am sad.					
16. Makes me feel less depressed					
17. Speeds up my thoughts.					
18. Increases my social activity.					

Coffee or tea drinking...	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree nor Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
19. Makes me sleepy.					
20. Makes me irritable.					
21. Helps me think more clearly.					
22. Keeps me awake.					
23. Gives me headaches.					
24. Makes me anxious.					
25. Confuses my thinking.					

Coffee or tea drinking...	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree nor Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
26. Slows me down.					
27. Gives me a feeling of well-being.					
28. Is habit-forming for me.					
29. Gives me diarrhea.					
30. Makes my hands shake.					
31. Makes me have sexual thoughts.					
32. Makes my stomach ache					
33. When I completely stop drinking coffee and tea it gives me headaches					

17. As best as you can remember, at what age did you begin drinking soda regularly?

_____AGE

Check if never used_____

Please specify why not.

_____

_____

_____

_____

IF YOU DO NOT DRINK SODA SKIP TO QUESTION 20

18. During an average day, how much soda do you drink?

_____about one 12 ounce (1 glass) serving per day or less 1

_____about two to three 12 ounce servings per day 2

_____about four to five 12 ounce servings per day 3

_____about six to nine 12 ounce servings per day 4

_____about ten to thirteen 12 ounce servings per day 5

_____more than fourteen 12 ounce servings per day 6

19. What kind of soda do you drink regularly? (CHECK ONE BOX ONLY)

|_| caffeinated 1

|_| decaffeinated 2

|_| If you don't know, what brand do you usually drink?_____ 8

20. How much chocolate on the average do you consume each week?

_____I do not eat chocolate 1

_____about one 2 ounce serving per week (1 chocolate bar weekly) or less 2

_____about two to three 2 ounce servings per week 3

_____about four to five 2 ounce servings per week 4

_____about six to seven 2 ounce servings per week (1 chocolate bar daily) 5

_____about eight to fourteen 2 ounce servings per week 6

_____more than fourteen 2 ounce servings per week 7

21. If you drink hot or cold chocolate beverages, how much on the average do you drink each week?

_____I do not drink hot or cold chocolate beverages 1

_____about one cup per week or less 2

_____about 2-3 cups per week 3

_____about 4-5 cups per week 4

_____about 6-9 cups per week 5

_____about 10-13 cups per week 6

_____more than 14 cups per week 7

22. How many cigarettes on the average do you smoke each day?

_____I do not currently smoke cigarettes 1

_____Less than 1 pack per day 2

_____1, but less than 2 packs per day 3

_____2, but less than 3 packs per day 4

_____3 or more packs per day 5

IF YOU DO NOT CURRENTLY SMOKE CIGARETTES, SKIP TO QUESTION 24

23. Does smoking change your use of coffee, tea, chocolate, cola or other sources of caffeine?

_____My caffeine intake greatly increases 1

_____My caffeine intake increases 2

_____My caffeine intake remains about the same 3

_____My caffeine intake decreases 4

_____My caffeine intake greatly decreases 5

_____I have no caffeine intake 6

24. How much beer on the average do you drink during the week?

_____I do not drink beer 1

_____1-6 cans or bottles per week 2

_____7-12 cans or bottles per week 3

_____13-18 cans or bottles per week 4

_____More than 18 cans or bottles per week 5

25. How much wine on the average do you drink during the week?

_____I do not drink wine 1

_____Less than 3 glasses per week 2

_____More than 3 glasses but less than 1 quart per week 3

_____1-2 quarts per week 4

_____2-4 quarts per week 5

_____More than 4 quarts per week 6

26. How much "hard" liquor on the average do you drink during the week?

_____I do not drink "hard" liquor 1

_____Less than 3 shots per week 2

_____4-6 shots per week 3

_____7-10 shots per week 4

_____11-20 shots per week 5

_____1-2 fifths per week 6

_____2-4 fifths per week 7

_____More than 4 fifths per week 8

IF YOU DO NOT DRINK ALCOHOLIC BEVERAGES, SKIP TO QUESTION 28

---

27. Does the use of alcoholic beverages (beer, wine, and hard liquor) change your intake of coffee, tea,chocolate, soda and other sources of caffeine?

_____My caffeine intake greatly increases 1

_____My caffeine intake increases 2

_____My caffeine intake remains about the same 3

_____My caffeine intake decreases 4

_____My caffeine intake greatly decreases 5

_____I have no caffeine intake 6

28. Do feelings of daily stress (for example, family or work problems, prolonged illness, or financial difficulties) change your intake of coffee, tea, chocolate, soda and other sources of caffeine?

_____My caffeine intake greatly increases 1

_____My caffeine intake increases 2

_____My caffeine intake remains about the same 3

_____My caffeine intake decreases 4

_____My caffeine intake greatly decreases 5

_____I have no caffeine intake 6

29. If your caffeine intake increases when you are stressed, why do you think this is so?

_____

_____

30. If you use any of the pain medications listed below, how many tablets or teaspoons of each do you take during a week?
(FILL IN EACH BOX WITH AN APPROPRIATE NUMBER, OR ZERO OF NONE)

_____I do not use pain medications

_____Anacin per week

_____APC (aspirin, phenacetin, caffeine)per week

_____Aspirin compounds (not plain aspirin) per week

_____Bromo seltzer teaspoons per week

_____Cafergot per week

_____Cope per week

_____Darvon Compound per week

_____Easy-Mens per week

_____Empirin Compound per week

_____Excedrin per week

_____Fiorinal per week

_____Midol per week

_____Migral per week

_____Pre-Mens Forte per week

_____Vanquish per week

_____Other pain medication per week: Please specify:

_____

31. If you use any of the following non-prescription diet-aids, how many tablets or capsules of each do you take during an average week?
(FILL IN EACH BOX WITH AN APPROPRIATE NUMBER, OR ZERO IF NONE)

_____I do not use any non-prescription diet-aids.

_____Dexatrim per week

_____Resolution per week

_____Prolamine per week

_____Dietac per week

_____Control per week

_____Other diet-aids per week:
Please specify_____
_____

32. If you use any of the following cold or allergy medications, how many tablets or capsules of each do you take during an average week?
(FILL IN EACH BOX WITH AN APPROPRIATE NUMBER, OR ZERO IF NONE.)

_____ I do not use any cold or allergy medications.

_____ Sinarest per week

_____ Dristan per week

_____ Coryban D per week

_____ Coricidin (including Coricidin D)

_____ Triaminicin per week

_____ Other cold or allergy medications per week : Please specify:
_____
_____

33. If you use any of the following non-prescription stimulants, how many tablets or capsules of each do you take during an average week?
(FILL IN EACH BOX WITH AN APPROPRIATE NUMBER, OR ZERO IF NONE.)

_____ I do not use any non-prescription stimulants.

_____ No-Doz per week

_____ Vivarin

_____ Appedrine per week

_____ Caffedrine per week

_____ Tirend per week

_____ Other stimulants per week:
Please specify: _____
_____

34. If you use "minor tranquilizers" such as Valium, Librium, Ativan or Xanax, how frequently do you take them during an average week?

_____ I do not use minor tranquilizers. 1

_____ Once a week or less 2

_____ 2 to 3 times a week 3

_____ 4 to 5 times a week 4

_____ 6 to 7 times a week 5

35. If you use antidepressants such as Tofranil, Imipramine, Elavil, Ludiomil of Sinequan, how frequently do you take them during an average week?

_____ I do not use antidepressants. 1

_____ Once a week or less 2

_____ 2 to 3 times a week 3

_____ 4 to 5 times a week 4

_____ 6 to 7 times a week 5

36. If you use sleeping medications or night-time hypnotics such as Dalmane, Seconal, Chloral Hydrate or Nembutal, how frequently do you take them during an average week?

_____ I do not use sleeping or hypnotic medications. 1

_____ Once a week or less 2

_____ 2 to 3 times a week 3

_____ 4 to 5 times a week 4

_____ 6 to 7 times a week 5

Wahler Physical Symptoms Inventory
1983 edition
by H.J. Wahler, Ph.D.

Name:_____ Age:_____ Sex: M F Date:_____

WHAT YOU ARE TO DO:

Below is a list of physical troubles. Please indicate how often each of these bothers you. Do this by circling the number to the right of each trouble which shows how often you are bothered by that trouble. Keep in mind that the LARGER the number the MORE OFTEN the trouble bothers you. Please DO NOT SKIP any troubles. You may take as much time as is necessary.

	Almost Never	About Once a Year	About Once a Month	About Once a Week	About Twice a Week	Nearly Every Day
1. Nausea (Feeling like throwing up).	0	1	2	3	4	5
2. Headaches.	0	1	2	3	4	5
3. Trouble with ears or hearing.	0	1	2	3	4	5
4. Neck aches or pains.	0	1	2	3	4	5
5. Feeling hot or cold regardless of the weather.	0	1	2	3	4	5
6. Arm or leg aches or pains.	0	1	2	3	4	5
7. Shakiness.	0	1	2	3	4	5
8. Swelling of arms, hands, legs, or feet.	0	1	2	3	4	5
9. Stuttering or stammering.	0	1	2	3	4	5
10. Difficulty sleeping.	0	1	2	3	4	5
11. Losing weight.	0	1	2	3	4	5
12. Backaches.	0	1	2	3	4	5
13. Intestinal or stomach trouble.	0	1	2	3	4	5
14. Difficulty with urination (Passing water).	0	1	2	3	4	5

	Almost Never	About Once a Year	About Once a Month	About Once a Week	About Twice a Week	Nearly Every Day
15. Heart trouble.	0	1	2	3	4	5
16. Trouble with teeth.	0	1	2	3	4	5
17. Numbness, or lack of feeling in any part of the body.	0	1	2	3	4	5
18. Aches or pains in hands or feet.	0	1	2	3	4	5
19. Fainting spells.	0	1	2	3	4	5
20. Excessive perspiration.	0	1	2	3	4	5
21. Abnormal blood pressure.	0	1	2	3	4	5
22. Paralysis (Unable to move parts of the body).	0	1	2	3	4	5
23. Trouble with eyes or vision.	0	1	2	3	4	5
24. Burning, tingling, or crawling feelings in the skin.	0	1	2	3	4	5
25. Skin trouble (Rashes, boils, or itching).	0	1	2	3	4	5
26. Feeling tired.	0	1	2	3	4	5
27. Muscular weakness.	0	1	2	3	4	5
28. Dizzy spells.	0	1	2	3	4	5
29. Muscular tensions.	0	1	2	3	4	5
30. Any trouble with the senses of taste or smell.	0	1	2	3	4	5
31. Difficulty breathing (Short of breath, asthma, etc.).	0	1	2	3	4	5
32. Twitching muscles.	0	1	2	3	4	5
33. Poor health in general.	0	1	2	3	4	5

	Almost Never	About Once a Year	About Once a Month	About Once a Week	About Twice a Week	Nearly Every Day
34. Excessive gas.	0	1	2	3	4	5
35. Difficulty swallowing.	0	1	2	3	4	5
36. Seizures (Convulsions or fits).	0	1	2	3	4	5
37. Gaining weight.	0	1	2	3	4	5
38. Difficulty with appetite.	0	1	2	3	4	5
39. Bowel trouble (Constipation or loose bowels).	0	1	2	3	4	5
40. Vomiting.	0	1	2	3	4	5
41. Chest pains.	0	1	2	3	4	5
42. Hay fever or other allergies.	0	1	2	3	4	5

Please write down any important physical symptoms not listed above which trouble you:

_____

_____

_____

EYSENCK PERSONALITY INVENTORY

Form A

By H. J. Eysenck
and Sybil B. G. Eysenck

Subject Number _____ Age _____ Sex _____

INSTRUCTIONS

Here are some questions regarding the way you behave, feel and act. After each question is a space for answering "Yes", or "No". Try and decide whether "Yes" or "No" represents your usual way of acting or feeling. Circle either "Yes" or "No" next to each question. Work quickly, and don't spend too much time over any question: we want your first reaction, not a long drawn-out thought process. The whole questionnaire shouldn't take more than a few minutes. Be sure not to omit any questions. Now turn the page over and go ahead. Work quickly, and remember to answer every question. There are no right or wrong answers, and this isn't a test of intelligence or ability, but simply a measure of the way you behave.

1. Do you often long for excitement?..... Yes No

2. Do you often need understanding friends to cheer you up?..... Yes No

3. Are you usually carefree?..... Yes No

4. Do you find it very hard to take no for an answer?..... Yes No

5. Do you stop and think things over before doing anything?..... Yes No

6. If you say you will do something do you always keep your promise, no matter how inconvenient it might be to do so?..... Yes No

7. Does your mood often go up and down?..... Yes No

8. Do you generally do and say things quickly without stopping to think?..... Yes No

9. Do you ever feel "just miserable" for no good reason?..... Yes No

10. Would you do almost anything for a dare?..... Yes No

11. Do you suddenly feel shy when you want to talk to an attractive stranger?..... Yes No

12. Once in a while do you lose your temper and get angry?..... Yes No

13. Do you often do things on the spur of the moment?..... Yes No

14. Do you often worry about things you should not have done or said?Yes No

15. Generally do you prefer reading to meeting people?..... Yes No

16. Are you feelings rather easily hurt?..... Yes No

17. Do you like going out alot?..... Yes No

18. Do you occasionally have thoughts and ideas that you would not like other people to know about?..... Yes No

19. Are you sometimes bubbling over with energy and sometimes very sluggish?..... Yes No

20. Do you prefer to have few but special friends?..... Yes No

21. Do you daydream a lot?..... Yes No

22. When people should at you, do you shout back?..... Yes No

23. Are you often troubled about feelings of guilt?..... Yes No

24. Are all your habits good and desirable ones?..... Yes No

25. Can you usually let yourself go and enjoy yourself a lot at a lively party?..... Yes No

26. Would you call yourself tense or "highly-strung"?..... Yes No

27. Do other people think of you as being very lively?..... Yes No

28. After you have done something important, do you often come away feeling you could have done better?..... Yes No

29. Are you mostly quiet when you are with other people?..... Yes No

30. Do you sometimes gossip?..... Yes No

31. Do ideas run through your head so that you cannot sleep?..... Yes No

32. If there is something you want to know about, would you rather look it up in a book than talk to someone about it?..... Yes No

33. Do you get palpitations or thumping in your heart?..... Yes No

34. Do you like the kind of work that you need to pay close attention to?..... Yes No

35. Do you get attacks of shaking or trembling?..... Yes No

36. Would you always declare everything at the customs, even if you knew that you could never be found out?..... Yes No

37. Do you hate being with a crowd who plays jokes on one another?.. Yes No

38. Are you an irritable person?..... Yes No

39. Do you like doing things in which you have to act quickly?..... Yes No

40. Do you worry about awful things that might happen?..... Yes No

41. Are you slow and unhurried in the way you move?..... Yes No

42. Have you ever been late for an appointment or work?..... Yes No

43. Do you have many nightmares?..... Yes No

44. Do you like talking to people so much that you would never miss a chance of talking to a stranger?..... Yes No

45. Are you troubled by aches and pains?..... Yes No

46. Would you be very unhappy if you could not see lots of people most of the time?..... Yes No

47. Would you call yourself a nervous person?..... Yes No

48. Of all the people you know are there some whom you definitely do not like?..... Yes No

49. Would you say you were fairly self-confident?..... Yes No

50. Are you easily hurt when people find fault with ou or your work?..... Yes No

51. Do you find it hard to really enjoy yourself at a lively party? Yes No

52. Are you troubled with feelings of inferiority?..... Yes No

53. Can you easily get some life into a rather dull party?..... Yes No

54. Do you sometimes talk about things you know nothing about?..... Yes No

55. Do you worry about your health?..... Yes No

56. Do you like playing pranks on others?..... Yes No

57. Do you suffer from sleeplessness?..... Yes No

BECK INVENTORY

SUBJECT#_____
DATE_____

On this questionnaire are groups of statements. Please read the entire group of statements for each number. Then pick out the one statement in that group which best describes the way you feel today, that is, RIGHT NOW! Indicate on your answer sheet the letter of the statement you have chosen. If several statements in the group seem to apply equally well, indicate each one. BE SURE TO READ ALL STATEMENTS IN EACH GROUP BEFORE MAKING YOUR CHOICE.

1. A I am so sad or unhappy that I can't stand it.
   B I am blue or sad all the time and I can't snap out of it.
   C I feel sad or blue.
   D I do not feel sad.

2. A I feel that the future is hopeless and that things cannot improve.
   B I feel I have nothing to look forward to.
   C I feel discouraged about the future.
   D I am not particularly pessimistic or discouraged about the future.

3. A I feel I am a complete failure as a person (parent, husband, wife).
   B As I look back on my life, all I can see is a lot of failures.
   C I feel I have failed more than the average person.
   D I do not feel like a failure.

4. A I am dissatisfied with everything.
   B I don't get satisfaction out of anything anymore.
   C I don't enjoy things the way I used to.
   D I am not particularly dissatisfied.

5. A I feel as though I am very bad or worthless.
   B I feel quite guilty.
   C I feel bad or unworthy a good part of the time.
   D I don't feel particularly guilty.

6. A I hate myself.
   B I am disgusted with myself.
   C I am disappointed in myself.
   D I don't feel disappointed in myself.

7. A I would kill myself if I had the chance.
   B I have definite plans about committing suicide.
   C I feel I would be better off dead.
   D I don't have any thoughts of harming myself.

(OVER)

8. A I have lost all of my interest in other people and don't care about them at all.
   B I have lost most of my interest in other people and have little feeling for them.
   C I am less interested in other people than I used to be.
   D I have not lost interest in other people.

9. A I can't make any decisions at all anymore.
   B I have great difficulty in making decisions.
   C I try to put off making decisions.
   D I make decisions about as well as ever.

10. A I feel that I am ugly or repulsive-looking.
    B I feel that there are permanent changes in my appearance and they make me look unattractive.
    C I am worried that I am looking old or unattractive.
    D I don't feel that I look any worse than I used to.

11. A I can't do any work at all.
    B I have to push myself very hard to do anything.
    C It takes extra effort to get started at doing something.
    D I can work about as well as before.

12. A I get too tired to do anything.
    B I get tired from doing anything.
    C I get tired more easily than I used to.
    D I don't get any more tired than usual.

13. A I have no appetite at all anymore.
    B My appetite is much worse now.
    C My appetite is not as good as it used to be.
    D My appetite is no worse than usual.

Vocabulary Subtest - WAIS-R

1. BED
2. SHIP
3. PENNY
4. WINTER
5. BREAKFAST
6. REPAIR
7. FABRIC
8. ASSEMBLE
9. ENORMOUS
10. CONCEAL
11. SENTENCE
12. CONSUME
13. REGULATE
14. TERMINATE
15. COMMENCE
16. DOMESTIC
17. TRANQUIL
18. PONDER
19. DESIGNATE
20. RELUCTANT
21. OBSTRUCT
22. SANCTUARY
23. COMPASSION
24. EVASIVE

25. REMORSE

26. PERIMETER

27. GENERATE

28. MATCHLESS

29. FORTITUDE

30. TANGIBLE

31. PLAGIARIZE

32. OMINOUS

33. ENCUMBER

34. AUDACIOUS

35. TIRADE

AD ACL

Date and time_____

Each of the words on the back describes feelings or moods. Please use the rating scale next to each word to describe your feelings <u>at this moment.</u>
EXAMPLES:

relaxed vv v ? no — If you circle the double check (vv) it means that you <u>definitely feel</u> relaxed <u>at the moment.</u>

relaxed vv v ? no — If you circle the single check (v) it means that you <u>feel slightly</u> relaxed <u>at the moment.</u>

relaxed vv v ? no — If you circle the question mark it means the word does not apply or you <u>cannot decide</u> if you feel relaxed <u>at the moment.</u>

relaxed vv v ? no — If you circle the no it means that you are <u>definitely not</u> relaxed <u>at the moment.</u>

Work rapidly, but please mark all the words. Your first reaction is best. This should only take a couple of minutes.

vv v ? no : definitely feel
vv v ? no : feel slightly
vv v ? no : cannot decide
vv v ? no : definitely do not feel

carefree	vv	v	?	no	aroused	vv	v	?	no
serious	vv	v	?	no	fearful	vv	v	?	no
peppy	vv	v	?	no	lively	vv	v	?	no
pleased	vv	v	?	no	still	vv	v	?	no
placid	vv	v	?	no	self-centered	vv	v	?	no
leisurely	vv	v	?	no	wide-awake	vv	v	?	no
sleepy	vv	v	?	no	skeptical	vv	v	?	no
jittery	vv	v	?	no	activated	vv	v	?	no
intense	vv	v	?	no	sad	vv	v	?	no
grouchy	vv	v	?	no	full-of-pep	vv	v	?	no

vv v ? no : definitely feel
vv v ? no : feel slightly
vv v ? no : cannot decide
vv v ? no : definitely do not feel

---

energetic	vv	v	?	no	affectionate	vv	v	?	no
egotistic	vv	v	?	no	quiet	vv	v	?	no
calm	vv	v	?	no	concentrating	vv	v	?	no
suspicious	vv	v	?	no	sluggish	vv	v	?	no
tired	vv	v	?	no	overjoyed	vv	v	?	no
regretful	vv	v	?	no	quick	vv	v	?	no
stirred-up	vv	v	?	no	nonchalant	vv	v	?	no
warm-hearted	vv	v	?	no	quiescent	vv	v	?	no
vigorous	vv	v	?	no	clutched-up	vv	v	?	no
engaged-in-thought	vv	v	?	no	wakeful	vv	v	?	no
at rest	vv	v	?	no	rebellious	vv	v	?	no
elated	vv	v	?	no	active	vv	v	?	no
drowsy	vv	v	?	no	blue	vv	v	?	no
witty	vv	v	?	no	defiant	vv	v	?	no
anxious	vv	v	?	no	tense	vv	v	?	no

Appendix C
Tables

TABLE 4

ANOVA SUMMARY TABLE

Recall as a function of age, gender, caffeine consumption, passage length and importance level.

SOURCE	DF	MEAN SQUARE	F VALUES	P
AGE	1	0.228	3.291	NS
SEX	1	0.396	5.701	0.020
CONSUMPTION (CONS)	1	0.001	0.021	NS
AGE X SEX	1	0.077	1.104	NS
AGE X CONS	1	0.000	0.002	NS
SEX X CONS	1	0.016	0.237	NS
AGE X SEX X CONS	1	0.052	0.745	NS
ERROR	90	0.069		
LENGTH (LEN)	1	3.947	300.770	<00.001
AGE X LEN	1	0.039	2.949	NS
SEX X LEN	1	0.023	1.719	NS
CONS X LEN	1	0.022	1.699	NS
AGE X SEX X LEN	1	0.001	0.053	NS
AGE X CONS X LEN	1	0.002	0.144	NS
SEX X CONS X LEN	1	0.037	2.815	NS
AGEx SEXx CONSx LEN	1	0.002	0.179	NS
LEN X ERROR	90	0.013		
IMPORTANCE (IMP)	2	2.158	187.150	<0.001
AGE X IMP	2	0.005	0.468	NS
SEX X IMP	2	0.022	1.865	NS
CONS X IMP	2	0.007	0.581	NS
AGE X SEX X IMP	2	0.010	0.876	NS
AGE X CONS X IMP	2	0.002	0.157	NS
SEX X CONS X IMP	2	0.005	0.425	NS
AGEx SEXx CONSx IMP	2	0.044	3.831	0.024
IMP X ERROR	180	0.012		
LEN X IMP	2	0.593	74.856	<0.001
AGE X LEN X IMP	2	0.005	0.660	NS
SEX X LEN X IMP	2	0.007	0.832	NS
CONS X LEN X IMP	2	0.009	1.193	NS
AGEx SEXx LENx IMP	2	0.022	2.725	NS
AGEx CONSx LENx IMP	2	0.006	0.817	NS
SEXx CONSx LENx IMP	2	0.018	2.315	NS
AGExSEXxCONSxLENxIMP	2	0.005	0.597	NS
LEN X IMP X ERROR	180	0.008		

TABLE 5

ONE WAY ANOVA PERFORMED ON WAHLER PHYSICAL SYMPTOMS

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	0.011	0.046	NS
SEX	1	0.011	0.043	NS
CONS	1	0.268	1.081	NS
AGE X SEX	1	0.666	2.685	NS
AGE X CONS	1	0.050	0.201	NS
SEX X CONS	1	0.011	0.044	NS
AGE X SEX X CONS	1	0.289	1.164	NS
ERROR	90	0.248		

TABLE 6

ONE WAY ANOVA PERFORMED ON AD/ACL - GENERAL DEACTIVATION

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	4.752	0.056	NS
SEX	1	70.983	0.834	NS
CONS	1	0.105	0.001	NS
AGE X SEX	1	77.342	0.909	NS
AGE X CONS	1	285.252	3.353	NS
SEX X CONS	1	114.795	1.349	NS
AGE X SEX X CONS	1	25.597	0.301	NS
ERROR	90	85.076		

TABLE 7

ONE WAY ANOVA PERFORMED ON AD/ACL - HIGH ACTIVATION

DEPENDENT VARIABLE: AD/ACL - High Activation

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	189.050	2.023	NS
SEX	1	20.011	0.214	NS
CONS	1	97.853	1.047	NS
AGE X SEX	1	5.717	0.061	NS
AGE X CONS	1	105.952	1.134	NS
SEX X CONS	1	16.716	0.179	NS
AGE X SEX X CONS	1	73.802	0.790	NS
ERROR	90	93.464		

TABLE 8

ONE WAY ANOVA PERFORMED ON AD/ACL - GENERAL ACTIVATION

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	47.363	0.481	NS
SEX	1	34.321	0.348	NS
CONS	1	91.759	0.931	NS
AGE X SEX	1	3.046	0.031	NS
AGE X CONS	1	0.380	0.004	NS
SEX X CONS	1	161.798	1.641	NS
AGE X SEX X CONS	1	200.482	2.034	NS
ERROR	90	98.570		

TABLE 9

ONE WAY ANOVA PERFORMED ON DRINKER - 1=YES, 2=NO

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	0.250	1.401	NS
SEX	1	0.194	1.083	NS
CONS	1	0.065	0.364	NS
AGE X SEX	1	0.141	0.788	NS
AGE X CONS	1	0.090	0.503	NS
SEX X CONS	1	0.385	2.153	NS
AGE X SEX X CONS	1	0.332	1.855	NS
ERROR	90	0.179		

TABLE 10

ONE WAY ANOVA PERFORMED ON BECK DEPRESSION

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	2.583	0.099	NS
SEX	1	16.561	0.637	NS
CONS	1	43.411	1.670	NS
AGE X SEX	1	105.516	4.056	0.048
AGE X CONS	1	38.443	1.490	NS
SEX X CONS	1	3.409	0.131	NS
AGE X SEX X CONS	1	0.695	0.027	NS
ERROR	90	26.015		

TABLE 11

ONE WAY ANOVA PERFORMED ON AD/ACL - DEACTIVATION/SLEEP

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	1053.389	11.809	0.001
SEX	1	183.185	2.054	NS
CONS	1	34.763	0.390	NS
AGE X SEX	1	225.073	2.523	NS
AGE X CONS	1	88.391	0.991	NS
SEX X CONS	1	13.956	0.156	NS
AGE X SEX X CONS	1	47.400	0.531	NS
ERROR	90	89.206		

TABLE 12

ONE WAY ANOVA PERFORMED ON WAIS RAW VOCABULARY SCORE

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	841.147	12.944	0.001
SEX	1	331.978	5.109	0.027
CONS	1	5.497	0.085	NS
AGE X SEX	1	45.194	0.695	NS
AGE X CONS	1	0.880	0.014	NS
SEX X CONS	1	290.868	4.476	0.038
AGE X SEX X CONS	1	32.678	0.503	NS
ERROR	90	64.983		

TABLE 13

ONE WAY ANOVA PERFORMED ON EYSENCK EXTROVERSION/INTROVERSION

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	557.292	36.976	NS
SEX	1	8.143	0.540	NS
CONS	1	44.757	2.970	NS
AGE X SEX	1	5.615	0.373	NS
AGE X CONS	1	4.594	0.305	NS
SEX X CONS	1	0.107	0.007	NS
AGE X SEX X CONS	1	3.125	0.207	NS
ERROR	90	15.072		

TABLE 14

ONE WAY ANOVA PERFORMED ON EYSENCK LIE SCALE

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	55.313	23.182	<0.001
SEX	1	7.471	3.131	NS
CONS	1	15.760	6.605	0.012
AGE X SEX	1	4.317	1.809	NS
AGE X CONS	1	0.002	very small	NS
SEX X CONS	1	0.167	0.070	NS
AGE X SEX X CONS	1	0.897	0.376	NS
ERROR	90	2.386		

TABLE 15

ONE WAY ANOVA PERFORMED ON EYSENCK SOCIABILITY

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	164.759	18.379	<0.001
SEX	1	10.387	1.159	NS
CONS	1	5.922	0.132	NS
AGE X SEX	1	1.180	0.132	NS
AGE X CONS	1	27.779	3.099	NS
SEX X CONS	1	0.963	0.107	NS
AGE X SEX X CONS	1	0.011	0.000	NS
ERROR	90	8.964		

TABLE 16

ONE WAY ANOVA PERFORMED ON EYSENCK IMPULSIVITY

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	44.889	13.242	<0.001
SEX	1	0.428	0.126	NS
CONS	1	8.924	2.633	NS
AGE X SEX	1	2.168	0.640	NS
AGE X CONS	1	8.935	2.636	NS
SEX X CONS	1	0.592	0.175	NS
AGE X SEX X CONS	1	0.428	0.126	NS
ERROR	90	3.390		

TABLE 17

ONE WAY ANOVA PERFORMED ON SMOKER - 1=YES, 2=NO

SOURCE	DF	MEAN SQUARE	F VALUE	P
AGE	1	0.238	1.833	NS
SEX	1	0.021	0.164	NS
CONS	1	0.494	3.797	0.055
AGE X SEX	1	0.004	0.034	NS
AGE X CONS	1	0.007	0.051	NS
SEX X CONS	1	0.021	0.159	NS
AGE X SEX X CONS	1	0.172	1.321	NS
ERROR	90	0.130		

TABLE 18: ANCOVA SUMMARY TABLE

RECALL AS A FUNCTION OF AGE, GENDER, CAFFEINE CONSUMPTION, PASSAGE LENGTH AND IMPORTANCE LEVEL

Covariate: WAIS Vocabulary

SOURCE	DF	MEAN SQUARE	F VALUES	P
AGE	1	0.652	11.135	0.002
SEX	1	0.141	2.417	NS
CONS	1	0.005	0.082	NS
AGE X SEX	1	0.133	2.272	NS
AGE X CONS	1	0.000	very small	NS
SEX X CONS	1	0.009	0.158	NS
AGE X SEX X CONS	1	0.023	0.389	NS
COVARIATES	1	0.034	17.665	<0.001
ERROR	90	0.059		
LEN	1	3.947	300.770	<0.001
AGE X LEN	1	0.039	2.949	NS
SEX X LEN	1	0.023	1.719	NS
CONS X LEN	1	0.022	1.699	NS
AGE X SEX X LEN	1	0.001	0.053	NS
AGE X CONS X LEN	1	0.002	0.144	NS
SEX X CONS X LEN	1	0.037	2.815	NS
AGEx SEXx CONSx LEN	1	0.002	0.179	NS
COVARIATES	0			
LEN X ERROR	90	0.013		
IMP	2	2.158	187.150	<0.001
AGE X IMP	2	0.005	0.468	NS
SEX X IMP	2	0.022	1.865	NS
CONS X IMP	2	0.007	0.581	NS
AGE X SEX X IMP	2	0.010	0.876	NS
AGE X CONS X IMP	2	0.002	0.157	NS
SEX X CONS X IMP	2	0.005	0.425	NS
AGEx SEXx CONSx IMP	2	0.044	3.831	0.024
COVARIATES	0			
IMP X ERROR	180	0.012		
LEN X IMP	2	0.593	74.856	<0.001
AGE X LEN X IMP	2	0.005	0.660	NS
SEX X LEN X IMP	2	0.007	0.832	NS
CONS X LEN X IMP	2	0.009	1.193	NS
AGEx SEXx LENx IMP	2	0.022	2.725	NS
AGEx CONSx LENx IMP	2	0.006	0.817	NS
SEXx CONSx LENx IMP	2	0.018	2.315	NS

Table 18 continued

Covariate: WAIS Vocabulary

SOURCE	DF	MEAN SQUARE	F VALUES	P
AGExSEXxCONSxLENxIMP	2	0.005	0.597	NS
COVARIATES	0			
LEN X IMP X ERROR	180	0.008		

TABLE 19: ANCOVA SUMMARY TABLE

RECALL AS A FUNCTION OF AGE, GENDER, CAFFEINECONSUMPTION, PASSAGE LENGTH AND IMPORTANCE LEVEL

Covariate: Eysenck Impulsivity

SOURCE	DF	MEAN SQUARE	F VALUES	P
AGE	1	0.229	4.322	0.041
SEX	1	0.382	5.513	0.022
CONS	1	0.000	0.001	NS
AGE X SEX	1	0.090	1.294	NS
AGE X CONS	1	0.004	0.052	NS
SEX X CONS	1	0.020	0.285	NS
AGE X SEX X CONS	1	0.047	0.677	NS
COVARIATES	1	0.080	1.149	NS
ERROR	90	0.059		
LEN	1	3.947	300.770	<0.001
AGE X LEN	1	0.039	2.949	NS
SEX X LEN	1	0.023	1.719	NS
CONS X LEN	1	0.022	1.699	NS
AGE X SEX X LEN	1	0.001	0.053	NS
AGE X CONS X LEN	1	0.002	0.144	NS
SEX X CONS X LEN	1	0.037	2.815	NS
AGEx SEXx CONSx LEN	1	0.002	0.179	NS
COVARIATES	0			
LEN X ERROR	90	0.013		
IMP	2	2.158	187.150	<0.001
AGE X IMP	2	0.005	0.465	NS
SEX X IMP	2	0.022	1.855	NS
CONS X IMP	2	0.007	0.578	NS
AGE X SEX X IMP	2	0.010	0.871	NS
AGE X CONS X IMP	2	0.002	0.156	NS
SEX X CONS X IMP	2	0.005	0.422	NS
AGEx SEXx CONSx IMP	2	0.044	3.810	0.024
COVARIATES	1	very small		
IMP X ERROR	180	0.012		
LEN X IMP	2	0.593	74.856	<0.001
AGE X LEN X IMP	2	0.005	0.660	NS
SEX X LEN X IMP	2	0.007	0.832	NS
CONS X LEN X IMP	2	0.009	1.193	NS
AGEx SEXx LENx IMP	2	0.022	2.725	NS

Table 19 continued

Covariate: Eysenck Impulsivity

SOURCE	DF	MEAN SQUARE	F VALUES	P
AGEx CONSx LENx IMP	2	0.006	0.817	NS
SEXx CONSx LENx IMP	2	0.018	2.315	NS
AGExSEXxCONSxLENxIMP	2	0.005	0.597	NS
COVARIATES	0			
LEN X IMP X ERROR	180	0.008		

REFERENCES

Arnold, M.E., Petros, T.V., Beckwith, B.E., Coons, G., & Gorman, N. (1987). The effects of caffeine, impulsivity and sex on memory for word lists. Physiology and Behavior, 41, 25-30.

Bartus, R.T. (1979). Four stimulants of the central nervous system: Effects on short-term memory in young versus aged monkeys. Journal of the American Geriatrics Society, 27, 289-297.

Beck, A.T. (1967). Depression: Clinical, experimental and theoretical aspects. New York: Harper & Row.

Brown, A. & Smiley, S. (1977). Rating the importance of structural units of prose passages: A problem of metacognition. Child Development, 48, 1-8.

Cohen, G. (1979). Language comprehension in old age. Cognitive Psychology, 11, 412-429.

Craik, F.M. & Simon, E. (1980). Age differences in memory: The roles of attention and depth of processing. In Poon, L.W., Forard, J.L., Cermak, L.S., Arenberg, D. & Thompson, L.W. (Eds). New directions in memory and aging: Proceedings of the George A. Talland Memorial Conference, Hillsdale, N.J. Erebaum, pp. 95-112.

Dale, E. & Chale, J.S. (1948). A formula for predicting readability. Education Research Bulletin, 27, 37-54.

Diagnostic and Statistical Manual of Mental Disorders. (1987). 3rd Ed.-revised. Washington: American Psychiatric Association, 138-9.

Dixon, R.A., Simon, E.W., Nowak, C.A. & Hultsch, D.F. (1982), Text recall in adulthood as a function of level of information, input, modality and delay interval. Journal of Gerontology, 37, 358-364.

Erickson, G., Hager, L., Houseworth, C., Dungan, J., Petros, T., & Beckwith, B. (1985). The effects of caffeine on memory for word lists. Physiology and Behavior, 35, 47-51.

Eysenck, H.J. (1967). The biological basis of personality. Springfield, Illinois: Charles C. Thomas.

File, S.E., Bond, A.J., Lister, R.G. (1982). Interaction between effects of caffeine and lorazepam in performance tests and self-ratings. Journal of Clinical Pharmacology. 2, 102-106.

Gilbert, R. (1976). Caffeine as a drug of abuse. Research Advances in Alcohol and Drug Problems, Gibbons, R. et al, Eds.,3, New York: John Wiley.

Gilliland, K. (1980). The interactive effect of introversion-extroversion with caffeine induced arousal on verbal performance. Journal of Research in Personality, 14, 482-492.

Goldstein, A. (1984). Wakefulness caused by caffeine. Archives of Experimental Pathology Pharmakinetics, 248, 269-278.

Gilliland, K., & Andress, D. (1981). Ad lib caffeine consumption, symptoms of caffeinism and academic performance. Americam Journal of Psychiatry, 138, 512-514.

Greden, J.F., Fontaine, P., Lubetsky, M. & Chamberlin, K. (1978). Anxiety and depression associated with caffeinism among psychiatric inpatients. American Journal of Psychiatry, 135, 963-964.

Greden, J.F. & Cameron, O.G. (1983). Caffeine questionaire. University of Michigan Medical Center, Ann Arbor.

Hager, L.B., Petros, T.V., Beckwith, B.E., Erickson, G.E. & Arnold, M.E. (1986). The effects of caffeine on prose memory. Paper presented at the Midwestern Psychological Association Annual Meeting, Chicago.

Hammer, C. & Padesky, C. (1977). Sex differences in the expression of depressive responses on the Beck Depression Inventory. Journal of Abnormal Psychology, 86, 609-614.

Hirsh, K. (1984). Central nervous system pharmacology of the dietary methylxanthines. In G.A. Spiller, Ed., Progress in Clinical and Biological Research. The methylxanthine beverages and foods: Chemistry, consumption and health effects, 158, 235-302. New York: Alan R. Liss.

Hull, C.L. (1935). The influence of caffeine and other factors on certain phenomena of rote learning. Journal of General Psychology, 13, 249-274.

Hultsch, D.F. (1971). Age differences in free-classification and free-recall. Developmental Psychology, 4, 331-347.

Humphreys, M. & Revelle, W. (1984). Personality, motivation and performance: A theory of the relationship between individual differences and information processing. Psychological Review, 91, 153-184.

Kintsch, W. & van Dijk, T.A. (1978). Toward a model of text comprehansion and production. Psychological Review, 85, 363-394.

Klein, S. (1989). The long-term effects of caffeine consumption on expository passages. Unpublished Honor's Thesis. University of North Dakota.

Lieberman, H.R. & Wurtman, R.J. (1987). The effects of low doses of caffeine on human performance and mood. Psychopharmacology, 92, 308-312.

Loke, W.L. & Meliska, C.J. (1984). Effects of caffeine use and ingestion on a protracted visual vigilance task. Psychopharmacology, 84, 54-57.

Marangos, P.J., Boulenger, J. & Patel, J. (1984). Effects of caffeine on brain adenosine receptors: Regional and ontogenetic studies. Life Sciences, 34, 899-907.

Nolen-Hoeksema, S. (1987). Sex differences in unipolar depression: Evidence and theory. Psychological Bulletin, 101, 259-282.

Petros, T., Tabor, L., Cooney, T. & Chabot, R.J. (1983). Adult age differences in sensitivity to semantic structure of prose. Developmental Psychology, 19, 907-914.

Petros, T., Zehr, D. & Bentz, B. (1989). The effects of passage organization and text structure on individual differences in prose processing. Manuscript submitted for publication.

Pilette, W.L. (1983). Caffeine: Psychiatric grounds for concern. Journal of Psychosocial Nursing and Mental Health Sciences, 21, 19-24.

Rall, T.W. (1980). Central nervous system stimulants: The xanthines. In A.G. Gilman, L.S. Goodman & A. Gilman (Eds.), The Pharmacological Basis of Therapeutics, 6th Ed., 592-607, New York: Macmillan.

Rapoport, J.L., Jensvold, M., Elkins, R., Buchsbaum, M.S., Weingarter, H., Ludlow, C., Zahn, T.P., Berg, C.J. & Neims, A.H. (1981). Behavioral and Cognitive effects of caffeine in boys and adult males. Journal of Nervous and Mental Disease, 169, 726-732.

Revelle, W., Humphreys, M., Simon, L. & Gilliland, K. (1980). The interactive effect of personality, time of day, and caffeine: A test of the arousal model. Journal of Experimental Psychology: General, 109, 1-31.

Rice, E.G. & Meyer, B.J. (1986). Prose recall: Effects of aging, verbal ability and reading behavior. Journal of Gerontology, 41, 469-480.

Robertson, D., Wade, D., Workman, R., Woosley, R., & Oates, J. (1981). Tolerance to the humoral and hemodynamic effects of caffeine in man. Journal of Clinical Investgation, 67, 1111-1117.

Smith, S.W., Rebok, G.W., Smith, W.R., Hall, S.E. & Alvin, M. (1983). Adult age differences in the use of story structure in delayed free recall. Experimental Aging Research, 9, 191-195.

Stangler, R. & Printz, A. (1980). DSM-III: Psychiatric diagnosis in a university population. American Journal of Psychiatry, 137, 937-940.

Sternhagen, S. (1987). The effects of caffeine on the recall of prose passages. Unpublished Master's Thesis, University of North Dakota, Grand Forks.

Swift, C. & Tiplady, B. (1988). The effects of age on the response to caffeine. Psychopharmacology, 94, 29-31.

Taub, H.A. & Kline, G.E. (1978). Recall of prose as a function of age and input modality. Journal of Gerontology, 33, 725-730.

Terry, W.S., & Phifer, B. (1986). Caffeine and memory performance on the AVLT. Journal of Clinical Psychology, 42, 860-863.

Thayer, R.E. (1967). Measurement of activation through self-report. Psychological Reports, 20, 663-678.

Wahler, H.J. (1983). Wahler physical symptoms inventory manual. Los Angeles, Western Psychological Services.

Wechsler, D. (1981). Manual - Wechsler adult intelligence scale-revised. The Psychological Corporation. 70-71, 111-124.

Wells, S.J. (1984). Caffeine: Implications of recent research for clinical practice. American Journal of Orthopsychiatry, 54, 375-389.