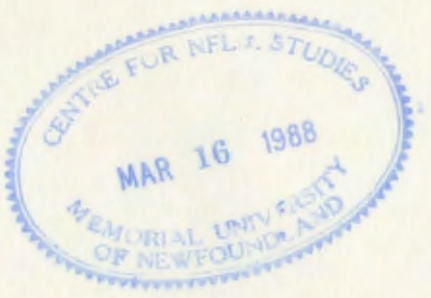
MOOD: MEASUREMENT, DIURNAL VARIATION, AND AGE EFFECTS

JAMES KEVIN McNEIL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MOOD: MEASUREMENT, DIURNAL VARIATION, AND AGE EFFECTS

BY

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ABSTRACT

Nothing is known about mood in later life and measurements of mood in the young have both methodological and conceptual problems. This research developed a mood adjective checklist scale (called the Memorial University Mood Scale, or MUMS) suitable for all adult ages. The MUMS was experimentally validated on old subjects and used to compare diurnal mood in both the young and old.

In total, 1,972 subjects between the ages of 17 and 97 years participated in this research. Over 1600 of these subjects were involved in the development of the MUMS, and the remainder in its validation.

An age invariant, two component structure of mood was found. These two components, labelled vigor and affect, were developed into highly reliable subscales of the MUMS. Both vigor and affect were found to be significant predictors of global mood.

Vigor was found to change both diurnally and under experimental conditions in ways indicative of a measure of appraised somatic state. Specifically, vigor was observed among both the young and the old to follow an inverted U-shaped curve throughout the day, similar to several diurnal physiological measures. Vigor was also found to increase as a consequence of participation in exercise and to decrease after muscular relaxation. In addition, vigor

was found to be higher at wakeup for morning people than for day or night people. Vigor was also found to be invariant under conditions where somatic changes were not expected, such as on negative days compared to ordinary days, or as a consequence of recall of positive and negative experiences.

Affect was found to have characteristics indicative of a measure of appraised positive and negative environmental conditions. Diurnal affect was found to follow a primarily linear pattern, reflecting the measurement of averaged reactions to a variety of positive and negative events. Affect was found to become less positive after recall of negative experiences and to be lower on negative days compared to ordinary days. In addition, affect was also found to become more positive as a consequence of participation in pleasant activities such as exercise and muscular relaxation.

The diurnal pattern of both vigor and affect were found to be age invariant; however, mean levels of both components of mood were found to be higher in the old compared to the young.

Key words: mood - structure - scale development - experimental validation - age comparison - diurnal variation

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I wish to dedicate this research to
Wendy. Only she really knows how much
it means to me, and only she really
knows what I went through in doing it.
For that closeness, and all the
comfort, thankyou.

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INTRODUCTION

Later life (i.e., 60 years and over) is accompanied by many physical and environmental changes. Some of these changes may be gradual, such as deteriorating health. Others, like the death of a spouse, may be sudden. Attempts to measure the short-term psychological impact of these changes have resulted in the development of several measures of subjective well-being (e.g., happiness scales, life satisfaction scales, morale scales); however, these scales have been found to measure properties of a long-term disposition, or trait (as evidenced by stable test-retest reliabilities with durations of up to months and years [Kozma & Stones, 1980; McNeil, Stones, & Kozma, 1986b; Stones & Kozma, 1986]) rather than moods (that endure for briefer periods of minutes or hours). In addition, some of the subjective well-being measures have other weaknesses such as the low internal consistency obtained for Bradburn's (1969) Affect Balance Scale (Himmelfarb & Murrell, 1983; Kozma & Stones, 1980). Consequently, a good measure of mood in old age is lacking. As a result of this lack, reactions such as the anxiety experienced by the elder who is forced to enter hospital, or the excitement of a grandmother following a visit from grandchildren, cannot be measured easily. In addition, the lack of a measure of mood has made on-going assessment of the psychological impact of

intervention programs, including pharmacological treatments, difficult.

One purpose of this research is to develop a measure of mood for use with people of all ages, including the old. Another purpose is to assess the structural stability of mood across the life span. To these ends, previous research on the measurement and structure of mood will be critically discussed, and research hypotheses investigated.

Critical review

Mood has been measured mainly by three methods; the questionnaire, the continuous rating scale, and the adjective checklist. The questionnaire (or multiple choice) approach has been used almost exclusively by Cattell and his associates (Cattell, 1973). One problem with multiple choice response formats is that response alternatives are determined a priori by the researcher, thereby imposing constraints upon the respondent´s reported experience of mood.

The continuous rating scale method (or visual analogue scale) involves the subject marking a point on a line (usually 100 mm in length) which represents how they feel at that moment on an array of bipolar adjective dimensions (e.g., happy - sad, alert - sleepy) (Bond & Ladder, 1974, Herbert, Jones & Dore, 1976). A major difficulty with this

approach is that polar opposites of adjectives are determined by the researcher rather than the subject and, as a consequence, so is the bipolarity of mood; therefore, any unipolar components of mood would not be measured by this approach.

The adjective checklist (ACL) consists of a list of adjectives which describe mood states. The subject indicates the relevance of each mood adjective as a descriptor of their current mood. The adjective checklist is by far the most widely used and most extensively researched method of measuring mood. One reason for its popularity is because the adjective checklist does not rigidly impose bipolarity as does the continuous rating scale. Another reason is that it easily allows for an extensive sampling of the domain of all mood descriptors. Other advantages include its obvious face validity and its ease and speed of administration.

Because of the advantages of the adjective checklist as a measure of mood, and because of its widespread use in past research, this research will focus exclusively on this method.

Since the introduction of the adjective checklist by Nowlis and his contemporaries in the 1960´s, much research has investigated the factor structure of self-reported mood. Unfortunately, little consensus has resulted from this research.

The remainder of this review discusses the reasons for this lack of consensus in two parts. Part One describes the dimensions on which disagreements have been reported. Part Two discusses the reasons why such divergent findings have been obtained.

Part one

The lack of consensus about the structure of mood involves four interrelated aspects of factor structure: the number of factors, the polarity of the factors, the type of factors, and the combinations of factors. These four aspects are discussed in the following section.

1. Number of factors

The number of factors that have been reported to constitute the structure of mood have ranged from 2 to 12. Investigations in the 1960´s, using a variety of ACLs, found between 4 and 12 factors (e.g., Borgatta, 1961; Lorr, McNair, Weinstein, Michaux, & Raskin, 1961; Nowlis, 1965; Thayer, 1967). Since the 1970´s, two independent factors have been repeatedly found that account for the majority of the variance (i.e., Mackay et al., 1978; Russell, 1979, 1980, 1983; Tiller & Campbell, 1984; Watson & Tellegen, 1985; Watson, et al., 1984; Zevon & Tellegen, 1982);

however, larger numbers of factors have also been obtained recently. Cruickshank (1984) and Russell (1980), for example, both have found five factors.

One reason for the difference in the number of factors across studies is the polarity of the obtained factors. When a large number of factors are obtained, they are usually unipolar. When bipolar factors are found, the number of factors is smaller. Bipolar factors are usually combinations of unipolar factors.

2. Polarity

Both unipolar and bipolar factors have been obtained in past mood research. Meddis (1972), Svensson (1977), and Russell (1979) found that the polarity of factors in ACLs is related to response format. Two types of response formats have been used in ACLs; asymmetrical, which have more positive than negative choices (e.g., definitely do not feel, cannot decide, feel slightly, definitely feel), and symmetrical, which have an equal number of positive and negative responses (e.g., definitely do not feel, do not feel, slightly feel, and definitely feel). When asymmetrical response formats have been used, the resulting factors are usually unipolar (i.e., Cruickshank, 1984; Nowlis, 1965; McNair & Lorr 1964; Thayer, 1967; Watson, Clark, & Tellegen, 1984; Zevon & Tellegen, 1982). When a symmetrical response

format has been used bipolar factors have been obtained (Meddis, 1972; Russell, 1979; Sjoberg, Svensson, & Persson, 1979; Svensson, 1977).

3. Type of factors

Factor type is determined by adjective content. Many different types of mood factors and combinations of these types, have been reported in the mood literature. This lack of consistency has resulted in much confusion over the structure of mood. Five of the most frequently obtained types of factors are described in this section.

A. Vigor/sleepy: A factor measuring vigor, arousal, activation, or alertness, and its half-range (i.e., sleepy, tired, drowsy), has been obtained repeatedly in the literature (e.g., Mackay et al., 1978; Russell, 1980; Russell & Mehrabian, 1977; Russell and Ridgeway, 1983; Watson, & Tellegen, 1985). This factor has been validated extensively by analyses of its diurnal fluctuation (Clements, Hafer, & Vermillion, 1976; Thayer, 1967; Watts, Cox, & Robson, 1983), by a variety of experimental manipulations (Bird, 1981; Burrows, Cox, & Simpson, 1977; Cox, Thirlaway, & Cox, 1983; Ray and Fitzgibbon, 1981), and by correlations with physiological indices of vigor such as heart rate, urinary secretion of adrenalin, and skin

resistance (Clements, Hafer, and Vermillion, 1976; Forberg, 1977; Thayer, 1967; Walton, Tinklenberg, Doyle, Horvath, & Kopell, 1976).

Vigor and sleepy have also been reported as two unipolar factors by Nowlis (1965), Thayer (1967), and Cruickshank (1984).

B. Stress/calm: A factor measuring stress, tension, nervousness, and its half-range (e.g., calm, relaxed, peaceful) has been reported in several studies (Mackay, et al., 1978; Russell, 1980; Watson and Tellegen, 1985). This factor has been validated in several experimental studies (i.e., Burrows, Cox, & Simpson, 1977; Cox, Mackay, & Page, 1982; Cruickshank, 1982; Ray & Fitzgibbon, 1981).

Stress and calm have also been reported as two separate (i.e., unipolar) factors by Cruickshank (1984).

C. Pleasant/unpleasant: A factor measuring a combination of stress and affect adjectives (e.g., happy, relaxed, at one pole and sad, tense, and angry at the other) has been reported in several investigations (i.e., Russell, 1979, 1980; Russell and Ridgeway, 1983). The convergent validity of this factor has been established by Russell (1978) through intercorrelations with a variety of other measures of mood (e.g., self-report and semantic-differential measures).

D. Positive affect: A factor measuring a combination of positive half ranges of several factor types such as vigor (e.g., alert, energetic), positive affect (e.g., happy, delighted) and calm (e.g., calm, leisurely) has been reported by Zevon and Tellegen (1982) and Stone (1981). This factor has been labelled positive affect or positive mood.

E. Negative affect: A factor measuring a combination of negative half ranges such as negative affect (e.g., sad, blue), stress (nervous, clutched up), self concept (disgusted with oneself, dissatisfied with oneself) and anger was obtained by Zevon and Tellegen (1982) and Stone (1981). This factor has been labelled negative affect or negative mood.

4. Factor type combinations

Past research has obtained a variety of combinations of factor types (usually two in number, as discussed above). One combination of factors is vigor/sleepy and stress/calm (e.g., Mackay, et al., 1978); another is vigor/sleepy and pleasant/unpleasant (e.g., Russell, & Ridgeway, 1983). Yet another combination is positive affect and negative affect (Zevon & Tellegen, 1982). There are also numerous examples of combinations of more than two factor types (e.g.,

Cruickshank, 1984; Nowlis, 1965; Thayer, 1967; Russell, 1980) which add to the overall lack of consensus and consequent confusion.

part two

A major reason for the lack of consensus in past research on the structure of mood has been attributed to methodological weaknesses (Russell, 1979; Watson & Tellegen, 1985). Two such weaknesses are inappropriate response formats and inappropriate adjective content. These weaknesses are described in the following two sections.

1. Response format

The response formats used in ACLs have been found to greatly influence the outcome of analyses of mood structure. One influence, already discussed, is the effect of symmetry on polarity; an asymmetrical response format usually results in unipolar factors, and a symmetrical response format in bipolar factors. Common experience tells us that the bipolar alternative is more acceptable because at any one moment in time, one cannot experience both positive and negative feelings; consequently, the symmetric format yields factor solutions more in accord with the subjective experience of mood (i.e., solutions of higher face validity).

Another advantage of symmetrical response formats is that they are less affected by acquiescence (a response style of responding positively regardless of content) than asymmetrical response formats. Russell (1979) showed that controlling for acquiescence had no effect on intercorrelations between polar opposites when a symmetrical response format was used, but that controlling for acquiescence significantly reduced bipolarity in asymmetrical response formats.

While there are several advantages to the use of symmetrical response formats, there are several disadvantages in the kind of symmetrical response formats that have been used in the literature. All symmetrical response formats have provided more than one rejection category (e.g., "definately do not feel", and "do not feel", or negative half-ranges of multi-item bipolar rating scales) (e.g., Meddis, 1972; Russell, 1979; Russell, 1980; Svensson, 1977; Sjoberg & Svensson, 1976; Sjoberg, Svensson, & Persson, 1979). Bohlin and Kjellberg (1975) and Tiller and Campbell (1984) argue that it is not possible to measure the intensity of the absence of a feeling. It may be that such response categories impose artificial variability on responses to mood adjectives, and this may influence factor structure.

Another problem with past symmetrical formats is that they have not included a "cannot decide" category (e.g.,

Meddis, 1972, Russell, 1979). Subjects are thereby forced to describe their mood using adjectives that may not be relevant to their perception of mood at that moment in time. Such a forced choice format may result in factor content which reflects the investigators' conceptions of mood more than the subjects' perceptions.

One type of ACL response format that overcomes the above criticisms, but has not been used previously, is a three-point symmetrical scale: "no, I do not feel", "cannot decide", and "yes, I do feel". This response format measures the simple occurrence/nonoccurrence of a mood-adjective, and not its intensity. All mood ACLs in the past have used measures of intensity, although no rationale has ever been provided for this procedure. In other areas of personality research, measuring the occurrence/ nonoccurrence of variables such as trait and state expressions of subjective well-being, is the rule (e.g., Bradburn, 1969; Kozma & Stones, 1980; McNeil, Stones & Kozma, 1986a); measures of intensity are the exception (e.g., Diener, Larsen, Levine, & Emmons, 1985).

Another strength of this three-point scale is the provision of a "cannot decide", or "?" midpoint response. This response provides individuals with the option of expressing ambivalence concerning the mood-adjective, or their inability to understand.

2. Adjective content

Analyses of structure using ACLs depend directly on the adjectives used to measure mood. A selection of mood adjectives biased toward a specific content area (e.g., one that contains primarily high vigor adjectives) will determine the outcome of the factor structure. Several investigators have suggested that poor sampling of mood adjectives in past research is responsible for the lack of consensus on the structure of mood (i.e., Russell, 1979; Watson & Tellegen, 1985). Selection of ACL adjectives should reflect a variety of content areas.

Another adjective content bias is verbal ability. Cruickshank (¢984) showed that some of the adjectives in MacKay et al.'s (1978) mood ACL (with an asymmetrical response format) were unfamiliar to many people. Significant correlations were obtained between the number of question mark responses for certain adjectives (e.g., quiescent, somnolent) and their word-use frequency listings in the English language (as listed in Thorndike & Lorge; 1944). Reanalysis of MacKay et al.'s ACL by Cruickshank (1984) with unfamiliar adjectives removed resulted in a very different factor structure (i.e., five unipolar factors instead of the two bipolar factors obtained by MacKay et al., 1978).

Summary of critical review

A review of the past research on the structure of mood shows little consensus about the number of factors, the polarity of the factors, or the type of factors that make up mood. Methodological weaknesses help to explain these inconsistencies and suggest problems in previous research. Future analyses on the structure of mood should correct these methodological weaknesses rather than repeat them.

Purpose of the present research

The purpose of the present research was twofold. One purpose was to develop a measure of mood which overcame many of the methodological problems discussed in the previous section. Another purpose was to extend mood measurement beyond young populations to people of all adult ages.

Nothing is known from past research about mood in old age. For example, no one has yet compared the factor structure of mood between the old and the young. If mood is structurally the same, then investigations can be made into the mood of the old relative to the young (e.g., mean level differences, differences in variability). If mood is structurally different, then the nature of this difference can be investigated.

Another reason for the need for mood measurement in all

ages is that the suitability of current mood scales that have been developed on the young has yet to be demonstrated for the old. It may be that current mood scales are not suitable for all ages. Gilmore (1972), for example, found that old people have difficulty understanding items of the Maudsley Personality Inventory because of the irrelevancy and inappropriateness of these items to the elderly person's situation. It may be that adjectives that describe the young person's mood either do not describe an old person's mood at all, or have a different meaning.

There has also been no attempt to validate available mood scales on old populations. It is therefore unknown whether the environmental effects on mood that have been demonstrated with the young have similar implications for the old.

The present research was divided into four studies. The purpose of Study One was to construct a mood adjective checklist (MACL) that would be suitable for future structural analyses. The purpose of Study Two was to analyze the structure of mood across the adult age span using the MACL developed in Study One, and, it was hoped, develop a mood scale that would be useful with people of all ages. The purpose of Study Three was to experimentally validate the mood scale obtained in Study Two. Study Four was designed both as a further validation of the mood scale and as a study of the differences in diurnal mood across the life span.

STUDY ONE: DEVELOPMENT OF A MACL

Purpose

The purpose of Study One was to select adjectives for a MACL suitable for the structural analyses of mood. (This MACL will be refined further in Study Two.) A suitable MACL would be one which contains a broad selection of mood adjectives, is free of a verbal ability bias, has a conceptually sound response format, and can be administered easily and quickly.

No research is available which demonstrates what combination of adjectives provide the most comprehensive, yet brief measure of mood. In this study, a broad selection of mood adjectives was obtained by combining seven MACLs from past mood research.

A MACL free of verbal ability bias is one which minimizes the number of adjectives for which comprehension is related to verbal ability. The measurement of such a relationship was accomplished by evaluating the relationship of verbal ability with the frequency with which subjects indicated an inability to decide the relevance of a mood adjective to their mood state. The inability to decide was represented by a question mark (?) response on the MACL.

At least two factors contribute to the use of the question mark response. One factor is verbal ability (i.e.,

the noncomprehension of the adjective). The second factor is true indecision about the applicability of the adjective to his/her mood state. Ideally, one does not want to eliminate adjectives for which the subject is undecided, but only those that are not comprehended. This is because the applicability of an adjective may vary over time with different mood states, whereas noncomprehension is more likely to be invariant of mood.

The approach used in this study of relating verbal ability with frequency of question mark responding is similar to that of Cruickshank (1984). Cruickshank (1984) investigated the frequency with which 189 out-patients of a hospital clinic responded to MacKay, et al.'s (1978) MACL with the question mark response. Six of the fifteen vigor scale adjectives and two of the nineteen stress scale adjectives were given the "?" response by patients in over 15% of the responses. Cruickshank argued that the high rate of question mark responses was related to patient's unfamiliarity with the adjectives (i.e., restricted vocabulary). This argument was indirectly supported by correlations between the question mark response and word-use frequency listings of the English language (as listed in Thorndike and Lorge, 1944). Correlations were found to be highly significant (e.g., $p<.001$).

The present study was intended to be an improvement over Cruickshank's (1984) study for two reasons. First,

Cruickshank's measure of word familiarity by frequency listings of the English language may not be a valid measure of adjective comprehension. This is because the frequency listings used by Cruickshank were based upon written as opposed to verbal usage of the English language. Therefore, Cruickshank's results may not accurately measure verbal comprehension in infrequent readers. Such a deficiency may be major when assessing mood among the old, who (at least in Newfoundland) have little formal education and therefore are expected to be infrequent readers. The measure of adjective comprehension in this study (i.e., by correlation with verbal ability) is a valid measure for any age group.

A second problem with Cruickshank's study is that his results contain a serious experimenter bias effect. His subjects were instructed by the experimenter to respond to queried items (adjectives for which the subject asked the experimenter to explain its meaning) with a question mark (i.e., cannot decide response). It may be that subjects would have responded differently on their own. In this study, subjects were asked to respond to all adjectives without help from others.

In Study One, the intent was to derive a representative array of adjectives that were relatively free of verbal ability bias. Adjectives that showed a verbal ability bias were deleted from the MACL. It was expected that in addition to a verbal ability bias, there would be an age bias for

undecidedness, resulting in older subjects indicating more question marks than younger subjects (i.e., because of greater caution). To prevent confounding of verbal ability with undecidedness, age was statistically controlled.

Method

Subjects

A sample of 190 subjects from St. John's, Newfoundland were selected so that a wide range of verbal skills were represented. The subjects consisted of 52 students of a first-year Memorial University psychology night course, 35 residents of a seniors' housing facility, 91 registrants at a St. John's conference on the elderly, 10 employees of a large automobile retail outlet, and 2 residents of private dwellings. An additional four subjects' data were discarded due to incomplete responding to test items.

The mean age of this sample of 54 male and 136 female subjects was 42.84 years (range 17 to 90, standard deviation = 21.52 years).

Subjects were given pins and bumper-stickers imprinted with "Age Successfully" as payment for their participation in this research.

Materials

Two pencil-and-paper scales were administered to each subject; an 81-item mood adjective checklist (MACL) and the 40-item vocabulary subtest of the Shipley Institute of Living Scale. The following describes the selection of items for the initial MACL and describes the vocabulary test.

1. Selection of adjectives for MACL

The selection of adjectives for the initial MACL proceeded in three stages. Stage 1 was the selection of a set of mood adjectives drawn from previous research. The adjectives included all those from seven major ACLs which have been used in the literature (Cruickshank, 1984; Mackay, et al. 1978; Meddis, 1972; Nowlis, 1965; Russell, 1979; Thayer, 1967; and Zevon & Tellegen, 1982). This version consisted of 214 different adjectives. Such a large MACL is impractical to administer to subjects due to excessive time requirements. Stage 2 was directed at reducing this number to prevent respondent fatigue, while at the same time retaining enough items to allow an accurate analysis of the structure of mood.

Stage 2 consisted of three steps:

1. Adjectives that were present on only one of the seven ACLs of the past research were excluded. One hundred

and twenty-five adjectives were deleted by this method.

2. Six items that were more than a single word were deleted.

3. Two words that were bipolar opposites by virtue of a prefix only (i.e., in<u>active</u>, dis<u>satisfied</u>) were deleted. (The items active and satisfied were retained).

These three steps of Stage 2 reduced the aggregate MACL from 214 to 81 adjectives.

Written instructions on each 81-item MACL requested subjects to describe how they were feeling right now by circling for each adjective one response from three choices: "no, I do not feel, or NO"; "cannot decide, or ?"; and "yes, I do feel, or YES". Appendix A presents this 81-item MACL in one of its four randomized forms.

2. The verbal ability measure

The Shipley-Institute of Living Scale (1967) was standardized on over 1000 American college students in the early 1940's. Since its development, the Shipley has been used with all age groups (e.g., Paulson & Lin, 1970), including the old (Belmore, 1981; Gilberstadt, 1968). The Shipley consists of two subscales, abstraction and vocabulary, the scores of which are summed to obtain the total score. The total and subscale scores have been repeatedly validated as a measure of intellectual ability by

correlations with the Weschsler Adult Intelligence Scale of between .73 and .90 (Mack, 1970; Paulson & Lin, 1970; Sines & Simmons, 1959; Wiens & Banaka, 1960). Test-retest reliability coefficients in the mid 70's have been obtained for the total score as well as the vocabulary subscale (Ruiz & Kraus 1967; Stone, 1965).

For this research, only the vocabulary subscale was required. This subscale consists of 40 words of increasing difficulty accompanied by four synonym alternatives. Written instructions requested subjects to draw a line under the one word which meant the same thing or nearly the same thing as the first word. (A scoring key is provided in the Shipley manual).

Procedure

Subjects were tested by the experimenter both individually and in groups. Adjectives of the MACL were arranged in four randomized orders which were evenly distributed among the sample. Immediately following administration of the MACL, subjects completed the vocabulary subtest of the Shipley's Institute of Living Scale, which was attached to the end of the MACL.

The MACL was scored by giving NO responses a value of 0 (zero), question mark responses a value of 1, and YES a

value of 2.

Results

The possible range of scores on the Shipley vocabulary subtest is 0 to 40. The range of subjects' scores in this study was 8 to 39 (WAIS IQ equivalent = 70 to 137 [extrapolated from Paulson & Lin, 1970, and the Shipley-Institute of Living Scale manual]). This range shows that the subjects in this study represented a wide range of verbal ability. The mean Shipley vocabulary score was 28.39 (standard deviation, 6.45).

Analysis of variance revealed no significant gender or item order effects for mean mood adjective scores. Table 1 presents the means and standard deviations of mean mood adjective scores by gender and item order. Table 2 presents the analyses of variance summary statistics (averaged across all adjectives and all subjects) for gender and item order. As a result of this analysis, data by gender and item order were combined on all subsequent analyses.

The Pearson product-moment correlation between the number of question mark responses and verbal ability was $r(190) = -.18$, $p < .05$. The Pearson product-moment correlation between the number of question mark responses and age was $r(187) = .202$, $p < .01$. The partial correlation between the number of question mark responses and verbal ability with

Table 1

Means and standard deviations of mean mood adjective scores by gender and item order

Variable	n	M	SD
Gender			
Male	54	0.880	0.243
Female	136	0.853	0.220
Item Order			
A	46	0.873	0.225
B	45	0.892	0.259
C	52	0.832	0.201
D	47	0.846	0.228

Note: Scoring of MACL: 0 for NO, 1 for "?", and 2 for YES.

Table 2

Summary table for the analyses of variance of mean mood adjective scores (averaged across adjectives and subjects) by item order and gender

Variable	SS_A	SS_E	MS_B	MS_W	F	p
Order[a]	140.034	6250.374	0.576	.580	0.990	.618
Gender[b]	40.779	6349.630	0.503	.581	0.867	.797

[a] df = 243, 10,773. [b] df = 81, 10,935.

age controlled was -.28, $p<.001$ ($df= 187$).

These data indicate that the question mark response is significantly related to both verbal ability and age at the zero order level. Also, these data show that when age is controlled, the question mark/verbal ability relationship increases. These results suggest that lower verbal ability contributes to the overall frequency with which question mark responses are made, even when age is controlled.

The next analysis was intended to indicate specific adjectives that showed a relationship between question mark responses and verbal ability with age controlled. Such adjectives should be deleted from a MACL because of confounding of response with verbal ability.

Table 3 presents the partial correlations for each of the 81 adjectives between the presence or absence of a question mark response and verbal ability. Age was controlled for each of these correlations. A total of 13 adjectives had a significant ($p< .005$) and negative correlation between the question mark response and verbal ability (in Table 3 these adjectives are indicated by one and two asterisks).

Discussion

The results of this investigation show that a significant negative relationship exists between the

Table 3
Partial correlations for each adjective of the MACL between the presence/absence of a question mark response and verbal ability with age controlled

Adjective	Partial Corr.	Adjective	Partial Corr
cheerful	-.037	alert	-.156**
boastful	-.138	nonchalant	-.266*
blue	.128	jittery	-.187
inspired	-.091	sorry	-.141**
restful	.125	defiant	-.361*
comfortable	-.046	tense	-.095
playful	.120	peppy	-.160
ashamed	-.103	tired	.070
dull	-.116	joyful	.032
aroused	-.179	attentive	-.184
activated	-.103	bothered	-.039
lonely	-.038	downhearted	-.108**
quiet	.109	rebellious	-.259*
witty	-.115**	irritated	.002
dejected	-.291*	still	-.132
egotistic	-.017**	excited	.060
elated	-.341*	refreshed	-.030
contented	-.033	vigorous	.010
energetic	.083	nervous	-.061
uneasy	-.116	quiescent	-.167
relaxed	-.006	satisfied	-.033**
interested	-.061	apprehensive	-.415**
active	-.079	dubious	-.300*
peaceful	.051	leisurely	-.132
affectionate	.015	sleepy	-.005*
contemplative	-.088	slow	-.213*
sad	-.096	confident	-.091
lively	.007**	distressed	-.172
annoyed	-.269*	strong	-.026
carefree	.003	pleasant	.108
fearful	-.107	enthusiastic	-.065
grouchy	-.111	talkitive	-.125
calm	-.076**	intense	-.163
regretful	-.230*	worried	-.067
delighted	.071	drowsy	-.134
sociable	.085	angry	-.171
pleased	.032**	happy	-.020
aloof	-.288*	overjoyed	-.010
forgiving	.131**	warmhearted	-.052*
placid	-.330*	sluggish	-.290*
proud	.073		

N = 190.

* p<.005. ** p<.001.

frequency of responding to adjectives on MACLs with the question mark response and verbal ability. This result is in agreement with the general conclusions of Cruickshank (1984) and the expectations of this study.

Thirteen adjectives had a partial correlation between the presence or absence of a question mark response and verbal ability (controlled for age) with a probability of less than .005 (a probability level of less than .01 was selected as the cut-off for eliminating adjectives due to the large number of correlations; however, only probabilities of less than .005 were obtained). Removal of these adjectives resulted in a 68-item MACL unbiased by verbal ability.

STUDY TWO:
STRUCTURAL ANALYSES OF MOOD FROM YOUTH TO LATER LIFE AND MOOD SCALE DEVELOPMENT

Purpose

The purpose of Study Two was threefold. One purpose was to analyze the structure of mood using the MACL developed in Study One with a three-point response format: question mark ("?"), "NO", and "YES". Given the lack of consensus in past research, prediction of the precise nature of the structure of mood was difficult; however, content areas (or component structure) rather than factor structure, were predicted to consist of two major components, a vigor component and a stress or affect component. This prediction was made because the vigor component has been reported in almost all studies of mood structure (e.g., Mackay et al., 1978; Nowlis, 1965; Russell, 1978; Russell & Mehrabian, 1977; Russell & Ridgeway, 1983; Watson & Tellegen, 1985). The nature of the second component of mood has been less reliably reported in the literature. Based upon the more methodologically rigorous studies, either a stress component (e.g., MacKay, et al., 1978; Russell, 1980), or an affect component (Zevon & Tellegen, 1982) has been reported.

A second purpose of Study Two was to examine the life span structure of mood. No research exists which compares

the structure of mood at different ages of the adult life span, and no measure of mood exists that has been developed on an old population. The development of a mood scale that is equally applicable to all age levels is important because it enables one to compare the relative impact of the environment across age levels. Therefore, the focus of this study was on developing an age invariant scale, if findings permitted, rather than different scales at different age levels.

A third purpose of Study Two was the preliminary validation of the mood scale. Validity was determined by the mood scale's predictive ability of a measure of global mood.

Method

Subjects

A sample of 1502 subjects participated in this study. Thirteen hundred and ninety-two of these subjects were selected on a random basis at a large urban shopping mall in St. John's, Newfoundland. This setting was chosen because of the availability of a wide range of subjects by age, as well as other demographic characteristics. Data collection took place on three weekdays as well as one weekend day to ensure that a heterogeneous sample of shoppers was obtained.

A further fifty-five subjects were obtained from an institution for seniors in St. John's, and an additional 55

were members of a retired senior´s club in St. John´s. These subjects were obtained to increase the number of old subjects so that a reasonable variable to subject ratio would be available for the purposes of factor analysis. The inclusion of the institutionalized old also provided representation of the less active old (compared to the more active old shoppers).

Fifty-three subject´s data were discarded, nine due to incomplete responding (e.g., a whole page of missing data), or age not recorded, and 44 for age under 17 years. The remaining 1449 subjects were divided into three age groups; young, middle, and old age.

Table 4 presents the age ranges, mean ages, and standard deviations (all in years) and percentages of males and females for these three age groups as well as for the total sample. Compared to national statistics, females are under represented in this sample for the young and middle age groups (percentage females/males of national sample for young [20 to 34 years]= 50/50; middle age [45 to 54 years]= 50/50; old age [65 years and over]=57.5/42.5 [calaulated from 1983 Canada Postcensal Estimates; Statistics Canada, 1983]).

Table 4

Age ranges, mean ages, standard deviations, and percentages of females and males by age group

Age Group	Range	*n*	*M*	*SD*	Female	Male
Young	17-34	776	23.3	4.62	43.2	56.8
Middle	35-59	383	44.0	6.85	42.3	57.7
Elderly	60-97	290	71.8	8.39	61.2	38.8
Total	17-97	1449	38.5	19.79	46.7	53.3

Materials

All subjects were administered a three-page questionnaire consisting of one of four randomly ordered 68-item MACLs (developed in Study One), and one question assessing global mood (presented in Appendix B). On the first page of each questionnaire subjects were asked their age, gender, time of day, marital status, education, and whether or not they had consumed sedatives, tranquilizers, or alcohol on that day. Following this information, written instructions asked subjects to describe how they felt, "right now", by circling, for each adjective listed on the questionnaire, one of three responses: "no, I do not feel, or NO"; "cannot decide, or ?" (question mark); or, "yes, I do feel, or YES". At the end of the MACL, a written question asked: "How would you assess your mood right now"? A seven-point response format was provided ranging from extremely good mood (1), to extremely bad mood, (7). A pencil with an eraser and a clipboard were provided to subjects for use in filling out the questionnaire. Subjects were given a pin or bumper-sticker imprinted with "Age Successfully" for their participation.

Procedure

Subjects in the shopping mall were approached and tested either individually, or in groups of up to four, by one of eight employed research assistants. Subjects were told that the purpose of the study was to assess the effects of age on mood. The research assistant requested and recorded each subject's demographic information and drug taking behavior. Also, the time of day was recorded. The research assistant then read the instructions (while pointing) aloud to each subject, and asked the subject to complete the questionnaire by himself or herself. Ninety-five subjects refused to complete the questionnaire by reading it themselves. For these subjects, the research assistant read aloud the entire questionnaire (this post hoc variable will be referred to as "method of administration"). Subjects in the institution and the retired senior's club were approached in a similar manner.

Results

Preliminary analysis

Table 5 presents the means and standard deviations for mean mood adjective scores (scores averaged across all adjectives and all subjects) by order, gender, drug use, and method of administration that were calculated to test for differences in responding due to these variables (scoring: 0 for NO, 1 for "?", and 2 for YES). Analysis of item order effect was of major interest, since position of the

Table 5

Means and standard deviations of mean mood adjective scores by order, gender, drug use, and method of administration

Variable	n	M	SD
Item Order			
A	365	0.985	0.211
B	364	0.936	0.222
C	356	0.928	0.239
D	364	0.962	0.230
Gender			
Male	772	0.953[a]	0.222
Female	677	0.953[b]	0.231
Drug Use			
No	1287	0.955	0.228
Yes	125	0.949	0.213
Administration			
Self	1354	0.948	0.228
Researcher	95	1.034	0.183

Note. Range of scores = 0 to 2 (No =0, "?" = 1, and Yes = 2).

[a] The actual value for this mean score is 0.95342.

[b] The actual value for this mean value is 0.95267, therefore, the mean values for male and female were not equal, as this table suggests.

adjectives on the MACL may influence responding. No specific predictions were made concerning differences in responding by gender, drug use, or method of administration. However, analyses of all variables are presented here for completeness.

The results of an analyses of variance on these data (averaged across all adjectives and all subjects) are presented in Table 6. Highly significant effects were obtained for each variable; however, relatively minor differences across groups can be obtained where the sample size is large. Measures of association provide a more meaningful estimate of the magnitude of effect with regard to explained variance. Also included in Table 6 is the percentage of variance accounted for by each variable. These variances were calculated using Omega squared for gender, drug use, and method of administration effects (i.e., a fixed-effects model was chosen; variances apply only to the levels measured). For the item order variable, a random-effects model (outlined by Hays, 1963) was used to calculate the percentage of variance, and is generalizable to all possible orders of items.

The estimated proportion of variance accounted for by each variable is one percent or smaller, indicating that no one effect is highly "meaningful" (Linton, Gallo, & Logan, 1975), especially in consideration of the large sample used for these data. Comparison of means in Table 5 indicate that

Table 6

Summary table for the analyses of variance of mean mood adjective scores (averaged across adjectives and subjects) by order, gender, drug use, and method of administration

Variable	SS_A	SS_E	MS_B	MS_W	F	p	Var[a]
Order[b]	571.891	46036.883	2.803	.574	4.886	.000	1.03[c]
Gender[d]	116.713	46492.061	1.716	.578	2.967	.000	0.17[e]
Drug[f]	131.970	45405.704	1.941	.576	3.369	.000	0.20[e]
Admin.[g]	164.440	46444.335	2.418	.578	4.185	.000	0.27[e]

[a] Var = Variance in percent

[b] *df* = 204, 80,240

[c] estimated proportion of variance accounted for by the variable (random-effects model)

[d] *df* = 68, 80,376

[e] Omega, or the estimated proportion of the variance accounted for by the variable (fixed-effects model).

[f] *df* = 68, 78,812

[g] *df* = 68, 80,376

intergroup mean differences are also small. Also, in Study One, when fewer comparisons were made among similar variables (i.e., gender and item order), no significant effects were obtained. Since the purpose of this study concerned structural analyses rather than hypothesis testing about specific variable effects, and since these variable effects are small, data were fully collapsed for further analyses.

Main analyses

The main analyses were concerned with factor structure. For each age group, responses to the 68-item MACL were submitted to separate principal-components analysis. Two rules were used to extract and interpret factors. Firstly, following Kaiser's rule (Kaiser, 1958), only factors with eigenvalues of 1.00 or more were extracted. These factors were orthogonally rotated using the Varimax procedure. Factor loadings of .4 or greater were considered meaningful for purposes of factor definition.

Secondly, following the criteria of Substantive Importance, as outlined by Kim and Mueller (1978), only factors which explained 4% or more of the total variance were interpreted. This 4% cut-off corresponded to the point at which the interpretability of additional factors was reduced. The 4% cut-off also provided a factor structure

which corresponded most closely with the factor structure found by other investigators. In addition, the 4% cut-off provided a factor structure that was similar in content across age groups.

Interpretation of structure

The structure of mood was interpreted for each age group as well as for the total sample (i.e., all ages combined).

1. Factor analysis by age group

The structure of mood was interpreted at two levels: (a) the factor structure of mood, which was determined both by the number of factors and the content of the individual factors, and (b) the component structure of mood which was determined by the overall content of individual factors, but is independent of the number of factors.

(a) Factor structure

A two-factor solution was interpreted for both the young and middle age groups, and a three-factor solution was interpreted for the old. Tables 7 and 8 present the factor matrices (loadings $\geq$ .4) for the two factor solutions for the young and middle age groups. Table 9 presents the factor

Table 7

High factor loadings (≥.4) for the first two rotated factors of the young age group

Adjective	Factor 1	Factor 2
angry	.709	
sad	.686	
downhearted	.686	
blue	.686	
distressed	.662	
irritated	.661	
grouchy	.656	
bothered	.619	
happy	-.607	
worried	.579	
pleasant	-.571	
uneasy	.570	
lonely	.526	
tense	.512	
contented	-.511	
cheerful	-.505	.421
pleased	-.499	
satisfied	-.493	
dull	.470	
comfortable	-.436	
confident	-.433	
fearful	.412	
energetic		.731
lively		.701
active		.643
peppy		.591
activated		.570
strong		.568
vigorous		.547
alert		.545
enthusiastic		.539
refreshed		.502
playful		.468
inspired		.465
witty		.437
joyful		.416
Eigenvalue	15.292	5.822
Variance	22.5	8.6

Table 8

High factor loadings (≥.4) for the first two rotated factors of the middle age group

Adjective	Factor 1	Factor 2
energetic	.753	
peppy	.744	
vigorous	.683	
active	.669	
enthusiastic	.620	
activated	.582	
refreshed	.525	
strong	.519	
joyful	.435	
inspired	.401	
contented		.700
downhearted		-.696
happy		.639
satisfied		.632
blue		-.619
lonely		-.589
pleased		.484
worried		-.454
distressed		-.441
peaceful		.416
sorry		-.407
Eigenvalue	15.275	6.126
Variance	22.5	9.0

Table 9
High factor loadings (≥.4) for the first three rotated factors of the old age group

Adjective	Factor 1	Factor 2	Factor 3
energetic	.755		
peppy	.695		
lively	.676		
vigorous	.645		
active	.636		
refreshed	.584		
playful	.519		
enthusiastic	.483		
strong	.451		
cheerful	.410		
activated	.401		
downhearted		.785	
lonely		.725	
sad		.654	
blue		.627	
contented		-.502	.506
worried		-.419	
happy			.716
pleased			.626
pleasant			.540
interested			.424
Eigenvalue	10.748	5.157	2.720
Variance	15.8	8.1	4.0

matrix for the three factor solution of the old age group.

Factor names were determined by item content. The similar bipolar factor of the young and middle age groups were both labelled positive/negative affect. The similar unipolar factor of these two age groups were labelled vigor. For the old group, a unipolar factor similar in content to the vigor factor of the young and middle age groups was also labelled vigor. The second factor of the old group, a unipolar factor, was labelled negative affect, and the third factor, also unipolar, was labelled positive affect.

(b) Component structure

The overall content of mood, independent of the number of factors, consists of two components: vigor and affect. This component structure is age invariant.

2. Factor analysis for all age groups combined

For all age groups combined, (i.e., the total sample) the 68-item MACL was submitted to principal-components analysis and Varimax rotation, using the same procedures outlined for the age groups' factor analyses. Two major factors resulted, a unipolar vigor factor and a unipolar tension factor (in this case the "factor structure" and the "component structure" are the same). Table 10 presents the factor loadings equal to or greater than .4 for the first

Table 10
High factor loadings (≥.4) for the first two rotated factors of the total sample

Adjective	Factor 1	Factor 2
tense	.721	
nervous	.705	
uneasy	.664	
worried	.615	
distressed	.614	
jittery	.586	
irritated	.560	
bothered	.525	
angry	.490	
downhearted	.496	
blue	.496	
relaxed	-.481	
sad	.431	
fearful	.431	
calm	-.422	
energetic		.755
lively		.697
peppy		.690
active		.654
vigorous		.627
refreshed		.569
strong		.549
activated		.546
enthusiastic		.538
alert		.474
playful		.405
inspired		.403
cheerful		.401
Eigenvalue	14.59	5.69
Variance	21.5	8.4

two rotated factors of the total sample. The reason for the presence of a unipolar tension factor in the total sample rather than a bipolar affect factor is unknown.

The factor structure of the total sample was not used in subsequent mood scale development for two reasons; (a) because the primary purpose of this study was age comparison rather than integration, and, (b) due to the reliable finding of both vigor and affect components in the young, middle, and old age groups.

Mood scale development and analyses

One objective of Study Two was to develop a mood scale that was suitable for all ages. This mood scale was developed based upon factor analysis for each age group. This mood scale, named the Memorial University Mood Scale (MUMS), consists of two subscales; a vigor subscale and an affect subscale. The vigor subscale consists of only those adjectives with loadings equal to or greater than .4 on the vigor factor for every age group (e.g., "energetic" loads above 0.4 for the vigor factors of the young group, the middle age group, and the old group). This criteria resulted in a nine item vigor scale, presented in Table 11.

The bipolar affect subscale, like the vigor subscale, consists of only those adjectives with loadings equal to or greater than +/- 0.4 on the affect factor for all three age

Table 11

Item content of the vigor and affect subscales of the Memorial University Mood Scale (MUMS)

Subscale	Items
Vigor	energetic
	lively
	active
	peppy
	activated
	vigorous
	strong
	enthusiastic
	refreshed
Affect	worried
	lonely
	downhearted
	blue
	happy
	pleased
	contented
	pleasant

groups (the bipolar positive/negative affect factor for the young and middle age groups, and the unipolar negative affect and unipolar positive affect factors of the old age group). This procedure resulted in four adjectives measuring negative affect and three adjectives measuring positive affect. An additional positive affect adjective, pleasant, was added to the bipolar affect subscale. Pleasant was the only adjective that loaded above 0.4 on affect factors of two age groups (i.e., young and old). The reason for including pleasant in the affect subscale was to equalize the number of positive and negative items. The final eight-item bipolar affect subscale is presented in Table 11.

Alpha coefficients for the vigor and affect subscales of the mood scale were calculated for each age group and are presented in Table 12. This table shows that both subscales have acceptably high internal consistencies for all three age groups.

The combination of the two unipolar affect factors of the old group into the bipolar affect scale can be recommended on three grounds:

1. The affect scales for both the young and middle aged groups are bipolar.

2. The unipolar negative affect scale and the unipolar positive affect scale of the old group are highly intercorrelated (Pearson $r[266]=-.508$, $p<.001$), indicating that the two scales represent opposite poles of a common

Table 12

Alpha coefficients for the vigor and affect subscales by age group

	Mood Subscale	
Age Group	Vigor	Affect
Young	.869	.832
Middle	.88	.869
Old	.83	.8

dimension.

3. The alpha coefficient for the combined positive and negative scales of the old group is high (alpha=.8).

(The combination of unipolar affect factors will be discussed further in the Discussion section of this study.)

The Pearson product-moment correlation coefficients between the vigor and affect subscales of the mood scale are $r(724) = .44$, $p<.001$ for the young age group, $r(337) = .356$, $p<.001$ for the middle age group, and $r(248) = .334$, $p<.001$ for the old age group. These data indicate that the vigor and affect subscales have between 13 and 19% of variance in common. Despite these moderate correlations, the vigor and affect subscales were not combined into one scale because the internal consistency of the two subscales combined for each age group was lower than for the separate subscales (coefficient alpha for vigor and affect combined for the young age group = .79; for the middle age group = .806; and for the old age group = .73).

Scoring of the MUMS

For all of the following research, the MUMS was scored as follows: Each of the seventeen items was scored 0 for the "NO" and "?" responses, and 1 for the "YES" responses (i.e., only adjectives reported as descriptive of the subject's mood state were used in the calculation of mood; adjectives

that were not descriptive were not used in the calculation of the mood score). The vigor score is the sum of the nine adjectives making up that subscale. The range of possible vigor scores is 0 (low vigor) to 9 (high vigor). The affect score is equal to the sum of the scores of the positive affect adjectives (happy, pleased, contented, and pleasant) minus the the sum of the scores of the negative affect adjectives (worried, lonely, downhearted, and blue). The range of possible affect scores is +4 (indicating extreme positive affect) to -4 (indicating extreme negative affect).

Preliminary validation

Preliminary validation of the mood scale was assessed by its ability to predict global mood, and by comparison of variance among mood indices

Prediction of global mood

The purpose of these analyses was to provide a preliminary measure of the validity of the vigor and affect subscales. If both vigor and affect measure mood, both subscales should significantly predict global mood. For each age group, the vigor and affect subscales of the mood scale were submitted to a stepwise multiple regression analysis with the seven-point global mood scale as the dependent

variable. Table 13 presents the summarized results from these regression analyses.

Table 13 shows that vigor and affect significantly predict global mood for all age groups, thereby confirming the predictive validity of these two subscales. The mood scale (vigor and affect together) predict 38.9% of the variance in global mood in the young, 34.7% in the middle age group, and 9.8% in the old. Table 13 also shows that the affect subscale predicts global mood more than the vigor subscale in the young and middle age groups but that vigor is more predictive of global mood than affect among the old. Comparison of the Beta weights of both vigor and affect for all three age groups reveal that this reversal in the predictive power of vigor and affect in the old is due more to the decreased predictive power of affect in the old group than the increased prediction of vigor.

Post hoc analyses

Post hoc analyses are reported in this section. No specific predictions were made concerning these data.

The means and standard deviations of global mood, the vigor subscale, and the affect subscale are presented in Table 14. Appendix C presents the analysis of variance for global mood, vigor and affect. For each measure, increases in means are highly significant (affect and global mood more positive, vigor increased). More specific comparisons

Table 13

Summary statistics for the stepwise multiple regression of global mood against the vigor and affect subscales by age group

		Regression Statistics				
Age Group	Predictors	r	R	Beta	F[a]	p[b]
Young	Affect	-.534	.534	-.376	144.4	<.0001
	Vigor	-.524	.624	-.359	131.2	<.0001
Middle	Affect	-.536	.536	-.442	99.3	<.0001
	Vigor	-.42	.589	-.262	34.9	<.0001
Old	Vigor	-.274	.274	-.212	13.8	<.0005
	Affect	-.233	.313	-.16	7.2	<.01

[a] F-ratio for Beta

[b] p values for Beta

Table 14

Means and standard deviations of global mood, vigor, and affect by age group

	Global Mood[a]		Vigor		Affect	
Age Group	M	SD	M	SD	M	SD
Young	2.679	1.129	4.06	2.944	2.544	1.899
Middle	2.546	1.082	4.792	3.161	2.962	1.802
Old	2.247	0.87	5.845	2.712	3.235	1.467

[a]Low scores imply better mood

using the Newman Keuls' test revealed that for both global mood and vigor, (for global mood, MS_{Error}= 1.145, df= 1379, N= 1382, for vigor, MS_{Error}= 8.763, df= 1361, N= 1364) all age comparisons were significantly different ($p<.05$). For affect, the young-middle age comparison, and the young-old comparison were significantly different at $p< .05$, but the old-middle comparison was not significantly different (MS_{Error}= 12.930, df= 1398, N= 1401).

The standard deviations of Table 14 were used to calculate the homogeneity of variance between age groups. Results of these analyses for global mood, vigor, and affect subscales are presented in Table 15.

These analyses show that:

1. The global mood scale has less variance in the old group than either the young or middle age groups.

2. The vigor subscale has less variance in the old age group than in the middle age group, but no significant differences are found between the young-old or the young-middle age comparisons.

3. The affect subscale has less variance in the old group than either the young or middle age groups.

These data indicate that mood is less variable among the old than younger age groups when measured either globally or with the vigor or affect subscales.

Table 15

F-ratios for homogeneity of variance comparisons of global mood, vigor, and affect subscales between young, middle, and old age groups

	Mood Scale		
Age Comparison	Global	Vigor	Affect
Middle-Old[a]	1.547*	1.359*	1.509*
Young-Old[b]	1.684*	1.178	1.677*
Young-Middle[c]	1.089	1.153	1.111

Note Group differences in homogeneity of variance were tested using the formula outlined by Ferguson, 1971; $F=s^2/s^2$, where F = *F* ratio, s(numerator) = larger standard deviation and s(denominator) = smaller standard deviation.

[a] *df*=382, 289. [b] *df*=775, 289. [c] *df*=775, 382

* $p<.02$

Discussion

The purposes of Study Two were to analyze the structure of mood in the young, middle, and old age groups, to develop a mood scale suitable for use with all age groups based upon the outcome of the structural analyses, and to provide preliminary validation data for the mood scale.

The structure of mood

An age invariant two component model of mood is supported by this research. A two component model of mood has been reported by many researchers (MacKay et al., 1978; Russell, 1979, 1980, 1983; Tiller & Campbell, 1984; Watson & Tellegen, 1985; Watson et al., 1984; Zevon & Tellegen, 1982). As predicted, one of these components is vigor, and the other is positive/negative affect; the stress/calm factor found by other researchers did not emerge as a component of mood in any single age group.

The vigor component of mood is represented by a single unipolar factor in all three age groups, which, when converted into a subscale of mood, significantly predicts global mood in all three age groups.

A second component of mood in all age groups is affect. A bipolar affect factor has never been found in past research as one of the two major components of mood. This

component, when converted into a subscale of mood, significantly predicts global mood.

The more commonly reported second component of mood in past research has been stress/calm (e.g., MacKay et al., 1978; Russell, 1980; Watson & Tellegen, 1985). Not only did this component not emerge as a major component of mood, but stress/calm adjectives are poorly represented on the positive/negative affect factor of the young age group, and not at all represented on the affect factors of the middle or old age groups.

A unipolar stress dimension does occur when the total sample is submitted to a factor analysis (referred in the Results section as "tension"). The appearance of this tension factor cannot easily be explained; however, the procedure of developing a scale applicable to each individual age group is felt to be more advantageous than developing one (such as vigor and tension) that is not applicable to any age group.

The novelty of a unipolar vigor and a bipolar affect component structure of mood may be at least partly explained by the changes in methodology that are presented as improvements employed in this research. In particular, this research has improved the response format as well as the selection of adjectives that compose the mood adjective checklist. Past research has shown that changes in these two aspects of MACLs result in changes in the structural outcome

of mood (e.g., Cruickshank, 1984; Meddis, 1972).

Differences in findings across age groups

Three differences in findings were obtained across the three age groups studied. The first difference is the split of the bipolar affect factors of the young and middle age groups into two unipolar affect factors of the old group.

A second difference is the decreased predictability of global mood by the vigor and affect subscales from the young age group (i.e., 38.9%) through to the old age group (9.8%).

A third difference is that the old age group is characterized by lower variance estimates and more favorable mean scores compared to younger age groups for all measures of mood.

It may be that these three changes are related. The lower variance in the old age group may at least partly explain the observed lower correlations among global mood, vigor, and affect scales (i.e., lower predictability) for that age group. Lower variance in the affect subscale of the old compared to younger age groups may in a similar way help to explain the split in affect from one bipolar factor in younger age groups to two unipolar factors in the old. Lower variance may result in overall lower correlations among affect adjectives, thus splitting the affect factor into its two polar dimensions.

Despite the split in affect into two unipolar dimensions in the old group, the evidence supports the combination of these two factors into one bipolar affect subscale for the purpose of developing a mood scale (i.e., high intercorrelation of scales and high alpha coefficient). Also, on conceptual grounds, it is unlikely that positive affect and negative affect, regardless of age, occur independently of each other (i.e., one cannot feel happy and sad at the same time).

STUDY THREE:
CONSTRUCT VALIDATION OF MOOD SCALE

The purpose of Study Three was to validate the vigor and affect subscale of the MUMS experimentally. The following section presents a review of the relevant literature and statement of specific predictions.

Critical Review

Support for the validity of earlier ACL vigor measures comes from the experimental manipulation of mood. Cox, Thirlaway, & Cox (1983) found vigor to decline during a monotonous, repetitive task (button-sorting), to increase during a non button-sorting interval (lunch, presumably less monotonous than button-sorting) and to decline again upon resumption of button-sorting.

Bird (1981), using the general activation or vigor scale of Thayer's (1967) Activation-Deactivation Adjective Checklist, provided further evidence for the validity of the vigor dimension. Four studies were reported which were designed to experimentally manipulate vigor (no measure of affect is included in Thayer's ACL) . In study one, vigor decreased from before to after engagement in a monotonous industrial task (assembling nuts, washers, and bolts). In study two, reported vigor was low while subjects were seated

in a lab, significantly increased prior to participation in recreational athletics, and significantly declined to the lowest level (significantly lower than while in the lab) following a period of passive relaxation. All three conditions occurred within one hour. The results of study two were replicated in study three with different subjects. In study four, vigor scores of veteran athletes significantly declined from immediately before to immediately after participation in a championship competition. All three monotonous activities (relaxation, industrial task, and sitting in the laboratory) were given lower vigor scores by subjects compared to other subjects who participated in the two stimulating activities (recreational and competitive athletics).

Several studies have demonstrated physiological changes as a consequence of the experimental manipulation of vigor. Thayer (1967) reported significant relationships between heart rate, skin conductance and ACL measures of vigor when subjects were engaged in cognitively monotonous (i.e, forward counting) and cognitively stimulating tasks (i.e., backward counting under stressful conditions). Clements, Hafer, and Vermillion (1976) reported significant relationships between pulse rate, respiration rate, skin resistance level, and ACL measures of vigor under conditions of passivity (sitting quietly) and cognitive stimulation (mental arithmetic).

No research has attempted to measure a bipolar affect component of mood under experimental conditions using ACLs. McNair, Lorr, and Droppleman (1971) reported on the experimental validation of the unipolar depression-dejection subscale (similar to the negative half-range of the MUMS affect subscale) of the Profile of Mood States (POMS). These validation studies measured the effectiveness of psychotherapy and controlled clinical drug trials.

The purpose of the present study was to experimentally validate the MUMS vigor and affect subscales on samples of old subjects. No previous research has manipulated mood in an experimental design using older subjects. On the basis of past research using young adults, it was predicted that (a) the MUMS vigor subscale scores would significantly increase from before to after participation in a group administered exercise program in subjects low in vigor and, (b) vigor would significantly decrease in subjects high on vigor from before to after participation in a group administered progressive muscular relaxation. Ceiling and floor effects, respectively, were expected to curtail changes to more extreme states among subjects already close to scale extremes. Because of this, no changes were anticipated in subjects already close to the extreme (i.e., ceiling extreme for exercise condition, floor extreme for relaxation condition).

It was predicted that the MUMS affect subscale scores would significantly increase (indicating positive affect) from before to after participation in group administered exercise and muscular relaxation.

The predicted increases in affect due to exercise and relaxation were restricted to individuals with low initial affect due to ceiling effects. It was anticipated that most initial affect scores would be high in this sample because of the pleasant social environmental interactions prior to participation in the actual activity (exercise, or muscular relaxation).

Experiment one;

Measurement of mood manipulation by group administered exercise

Method

Subjects

A sample of 30 subjects (28.2% male, 71.8% female) were approached at random in a 3F exercise program class (Fitness with Fun and Fellowship) in St. John's, Newfoundland. This

program has been the object of previous research (Stacey, Kozma, & Stones, 1985; Stones, Kozma & Stones, 1985). The mean age of the subjects was 61.7 years (standard deviation, 6.5 years). Forty-eight point seven percent of these subjects were married, 38.5% widowed, and 12.9% were either single or divorced.

Socioeconomic status was determined by a 3-point scale, where category 1 denotes manual labour (e.g., homemaker, tradesman), 2 denotes clerical worker (e.g., secretary, small business owner), and category 3 denotes managerial or professional employment. Only the highest classification of self or spouse was used for each subject. Thirteen point three percent of the subjects were classified within category 1, 36.7% within category 2, and 60.0% within category 3. These data suggest that the socioeconomic status of this sample lay predominantly toward the managerial or professional end of the distribution.

The 3F program consisted of two weekly sessions, each of 45 minutes duration (from 1930 hours to 2015 hours). The first 15 minutes were devoted to flexibility exercises and the last 30 minutes to endurance activities. Participants had been trained to monitor their heart rate during the endurance portion to ensure that endurance training levels were maintained.

Subjects received no payment for their participation in this experiment.

Materials

All subjects were administered two identical one-page questionnaires consisting of the 17-item Memorial University Mood Scale (MUMS) developed in Study Three (presented in Appendix D). The instructions on each MUMS form requested subjects to describe how they felt "right now" by circling, for each adjective listed on the MUMS, one of three responses: "no, I do not feel, or NO"; "cannot decide, or ?" (question mark); or "yes, I do feel, or YES". On an attached information sheet, subjects were asked to record their name, age, sex, marital status, and occupation. The information sheet and the MUMS were magnified to accomodate exercisers without reading glasses.

A pencil with an eraser was provided to each subject for use in filling out the personal information and the MUMS.

Procedure

Subjects were approached by two researchers approximately five minutes prior to the onset of the exercise program and immediately after the exercises ended. On both occasions, subjects were asked to complete the personal information sheet (in the post exercise assessment, only the subjects name was requested) and the MUMS. Subjects were told that the purpose of the study was to assess the

effects of exercise on mood.

For both the vigor and affect subscales of the MUMS, subjects were divided, post hoc, into low and high initial vigor (scores 0 to 4 = low vigor, 5 to 9 = high vigor) and low and high initial affect (scores 1 to 3 = low affect, 4 = high affect). The unequal split in affect scores was necessitated by the low percentage (20%) of subjects with scores less than 4.

Statistical analyses proceeded, for both vigor and affect separately, in two steps. The first step involved an overall analysis of variance (on both low and high initial scores combined) to test for the significance of the groups by time interaction and to obtain an estimate of the overall error variance. The second step involved analysis of variance of low and high initial scores separately, using the overall variance from the analysis in step one.

Results

Vigor

The results of this experiment showed that vigor increased significantly as a consequence of participation in group administered exercise among old adults with low initial levels of vigor. Subjects with high initial vigor did not change significantly during this experiment.

Table 16 presents the means and standard deviations of

Table 16

Means and standard deviations of vigor and affect for the low and high initial vigor and low and high initial affect groups

Groups	n	M		SD	
		Pre	Post	Pre	Post
Vigor					
Low	14	2.143	5.214	1.512	2.848
High	16	7.688	6.625	1.302	2.604
Affect					
Low	6	2.500	3.833	0.837	0.408
High	24	4.000	3.917	0.000	0.058

vigor and affect for the low and high initial vigor and low and high initial affect groups.

Table 17 presents the analysis of variance statistics of vigor. This table shows a significant groups main effect, and a significant groups by time interaction, but no significant time main effect. (Figure 1 presents the groups by time interaction graphically.)

Table 18 presents the analysis of variance of vigor by time for the low initial vigor group. This table reveals a significant difference in vigor from before to after exercise participation. From the means of Table 16, it is evident that this difference represents an increase in vigor.

Table 19 presents the analysis of variance of vigor by time for the high initial vigor group. This table shows that no significant difference in vigor occurred in this group from before to after exercise participation.

Affect

The results of this experiment showed significant increases in affect for the 20% of subjects with low initial affect. Subjects with high initial affect did not change as a consequence of participation in exercise.

Table 20 presents the analysis of variance of affect for the time and groups main effects and the groups by time

Table 17

Summary table for the analysis of variance of vigor for the time and groups main effects and the groups by time interaction

Design	Source	df	SS	MS	F	p
Between	Groups	1	431.072	431.072	40.737	.000
	Error	28	296.295	10.582		
Within	Time	1	13.934	13.934	1.708	.202
	GroupsXTime	1	91.000	91.000	11.158	.002
	Error	28	228.366	8.156		

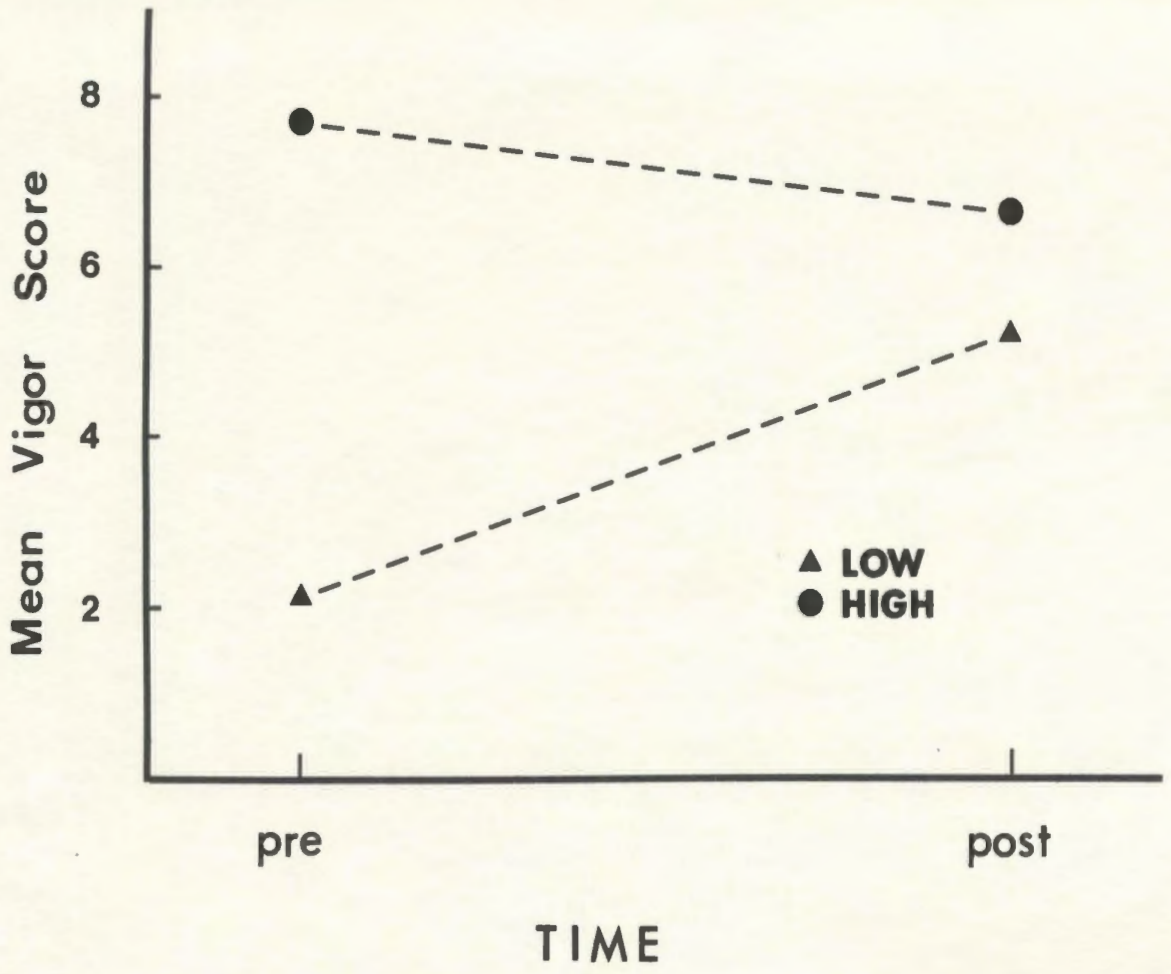


Figure 1. Mean vigor scores pre and post exercise for high and low initial vigor groups.

Table 18

Summary table for the analysis of variance of vigor by time for the low initial vigor group

Design	Source	df	SS	MS	F
Within	Time	1	41.286	41.286	5.062*
	Error[a]	28	228.366	8.156	

[a] Within subjects error from Table 17.

* $p<.05$

Table 19

Summary table for the analysis of variance of vigor by time for the high initial vigor group

Design	Source	df	SS	MS	F
Within	Time	1	9.031	9.031	1.107
	Error[a]	28	228.366	8.156	

[a] Within subjects error from Table 17.

Table 20

Summary table for the analysis of variance of affect for the time and groups main effects and the groups by time interaction

Design	Source	df	SS	MS	F	p
Between	Groups	1	12.033	12.033	65.213	.000
	Error	28	5.168	0.185		
Within	Time	1	7.500	7.500	29.303	.000
	GroupsXTime	1	9.633	9.633	37.637	.000
	Error	28	7.167	0.256		

interaction. This table shows significant main effects of groups and time and a significant groups by time interaction. (Figure 2 presents the groups by time interaction graphically).

Table 21 presents the analysis of variance of affect by time for the low initial affect group. This table reveals a significant difference in affect from before to after exercise participation. From the means of Table 16, it is evident that this difference represents an increase in affect.

Table 22 presents the analysis of variance of affect by time for the high initial affect group. This table shows that no significant difference in affect occurred in this group from before to after exercise participation.

Discussion

The results of this experiment attest to the validity of the vigor subscale of the MUMS. As predicted, vigor increased significantly as a consequence of participation in group exercise among old adults with low initial levels of vigor, while subjects with initial high levels of vigor did not change. These results are in agreement with the previous research of Bird (1981) who also found low initial vigor to significantly increase after participation in exercise.

As predicted, many of the subjects' initial levels of

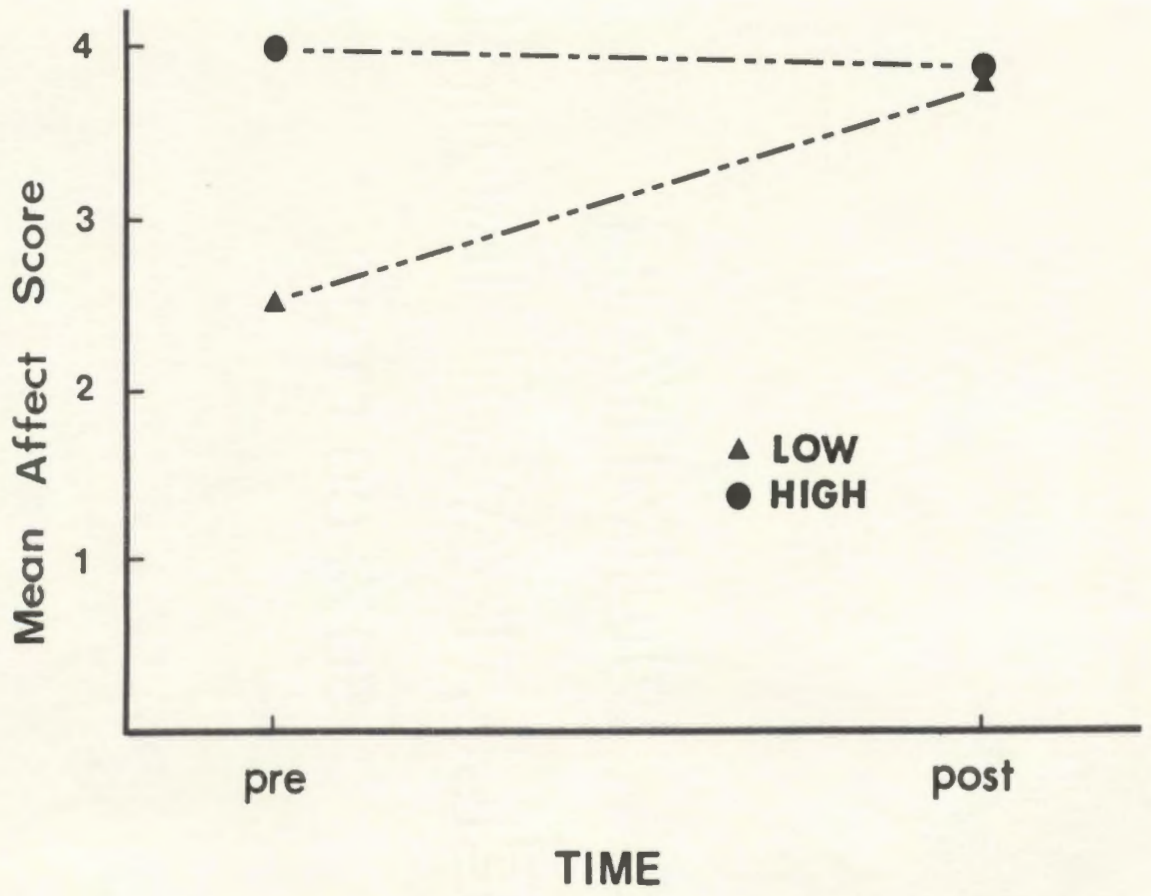


Figure 2. Mean affect scores pre and post exercise for high and low initial affect groups.

Table 21

Summary table for the analysis of variance of affect by time for the low initial affect group

Design	Source	df	SS	MS	F
Within	Time	1	5.333	5.333	20.083*
	Error[a]	28	7.167	0.256	

[a] Within subjects error from Table 20.

* $p<.01$

Table 22

Summary table for the analysis of variance of affect by time for the high initial affect group

Design	Source	df	SS	MS	F
Within	Time	1	0.083	0.083	0.324
	Error[a]	28	7.167	0.256	

[a] Within subjects error from Table 20.

affect were at a maximum (80.0% of the subjects' initial affect score = 4). For the remaining six subjects with low initial affect, increases in affect were significant from before to after participation in exercise.

An alternative interpretation of the findings might cite tendencies of regression to the mean over time; however, the absence of significant changes in both the high affect and low vigor groups provide no evidence of bidirectional changes across groups. This suggests that regression toward the mean had little effect on the results of this experiment.

Experiment two:
Measurement of mood manipulation
by group-administered muscular relaxation

Method

Subjects

A new sample of 26 subjects obtained from membership in a 3F exercise program in St. John's, Newfoundland (15.4% male, 84.6% female) volunteered to participate in this study. The 3F exercise program was similar to that described in Experiment One, but with a different geographic location in the city and under a different administration. Subjects were not paid for participation in this research.

The mean age of these subjects was 63.1 years (standard deviation, 5.2 years). Fifty-three point nine percent of these subjects were married, 42.3% widowed, and 3.9% were single.

Socioeconomic status was determined, as in Experiment One, by a 3-point scale. Nineteen point two percent of the subjects were classified within category 1, 30.8% within category 2, and 50.0% within category 3. These data suggest that the socioeconomic status of this sample lay predominantly toward the managerial or professional end of the distribution.

Materials

All subjects were administered materials similar to those used in Experiment One (with the exception that the word "exercise" was replaced by "relaxation" on the questionnaires).

Procedure

One week prior to this experiment, participants in the 3F exercise program were approached by an administrator and informed that a researcher from the university was going to teach them a relaxation technique. On the specified day, the author approached 3F exercisers immediately after their participation in a regular 45-minute exercise program. 3F members were given an explanation of the principles underlying the relaxation technique (muscular tension and relaxation) and were told that the purpose of the research was to assess the effects of relaxation on mood. 3F members who agreed to participate in the research were asked to complete the personal information form and the MUMS immediately before and after the relaxation procedure.

The relaxation procedure followed the techniques outlined by Bernstein and Borkovec (1973), and was presented live by the author (an experienced clinical psychologist familiar with the technique). (The outline of the muscle

groups used during the relaxation procedure is presented in Appendix E. This outline was given to each participant for private use after the experiment).

For both the vigor and affect subscales of the MUMS, subjects were divided, post hoc, into low and high initial vigor (scores 0 to 4 = low vigor and scores 5 to 9 = high vigor) and low and high initial affect (scores 1 to 3 = low affect, and a score of 4 = high affect).

Statistical analyses proceded in the same manner as in Experiment One.

Results

Vigor

The results of this experiment showed that vigor significantly decreased as a result of participation in a group-administered muscular relaxation program when initial levels were high, but did not change when initial levels were low.

Table 23 presents the means and standard deviations of vigor and affect for the low and high initial vigor and low and high initial affect groups.

Table 24 presents the analysis of variance statistics of vigor. This table shows a significant groups main effect and a significant groups by time interaction, but no significant time main effect. (Figure 3 presents the groups

Table 23

Means and standard deviations of vigor and affect for the low and high initial vigor and low and high initial affect groups

		M		SD	
Groups	n	Pre	Post	Pre	Post
Vigor					
Low	7	2.143	3.571	0.690	2.878
High	19	7.316	5.842	1.455	3.078
Affect					
Low	8	1.750	3.250	1.581	0.707
High	18	4.000	3.833	0.000	0.383

Table 24

Summary table for the analysis of variance of vigor for the time and groups main effect and the groups by time interaction

Design	Source	df	SS	MS	F	p
Between						
	Groups	1	141.715	141.715	21.260	.000
	Error	25	159.977	6.398		
Within						
	Time	1	0.005	0.005	0.001	.972
	GroupsXTime	1	21.544	21.544	5.108	.033
	Error	24	101.226	4.218		

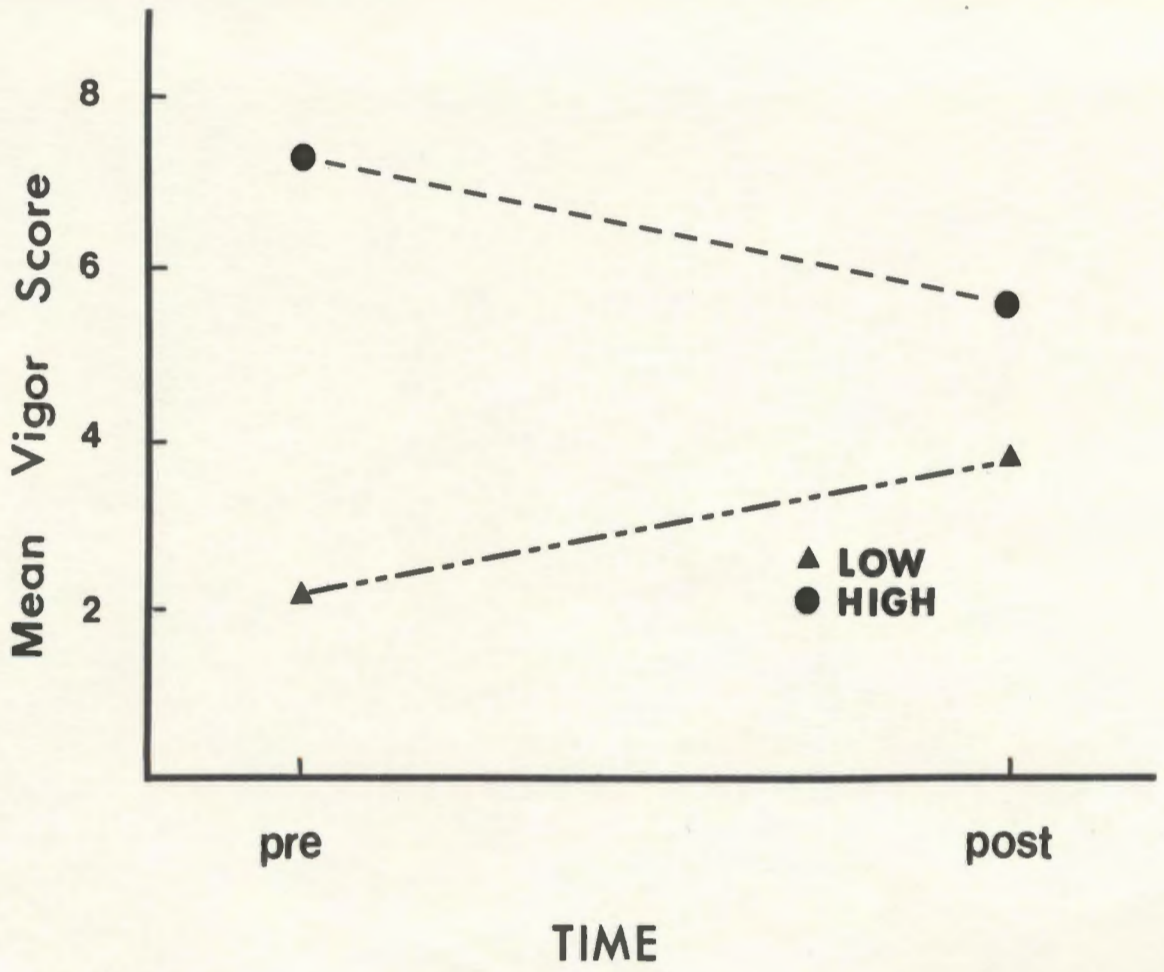


Figure 3. Mean vigor score pre and post relaxation for high and low initial vigor groups.

by time interaction graphically.)

Table 25 presents the analysis of variance of vigor by time for the high initial vigor group. This table shows a significant difference in vigor from before to after participation in muscular relaxation. From the means in Table 23, it is evident that this difference represents a decrease in vigor.

Table 26 presents the analysis of variance of vigor by time for the low initial vigor group. This table reveals no significant difference in vigor from before to after participation in muscular relaxation.

In order to provide a check on the nonsignificant change of low initial vigor with more subjects, the classification of low vigor was changed from 0 - 4 to 0 - 5. The analyses of this data (including the corresponding means) are presented in Appendix F. These results show no difference from that reported here, thereby confirming that the effect of relaxation is to reduce states of high vigor.

Affect

The results of this experiment showed that affect increased as a result of participation in group-administered muscular relaxation when initial levels were low, but not when initial levels were high.

Table 27 presents the analysis of variance statistics

Table 25

Summary table for the analysis of variance of vigor by time for the high initial vigor group

Design	Source	df	SS	MS	F
Within	Time	1	20.632	20.632	4.891*
	Error[a]	24	101.226	4.218	

[a] Within subjects error from Table 24.

* $p<.05$

Table 26

Summary table for the analysis of variance of vigor by time for the low initial vigor group

Design	Source	df	SS	MS	F
Within	Time	1	7.143	7.143	1.693
	Error[a]	24	101.226	4.218	

[a] Within subjects error from Table 24.

Table 27

Summary statistics for the analysis of variance of affect for the time and groups main effect and the groups by time interaction

Design	Source	df	SS	MS	F	p
Between						
	Groups	1	22.231	22.231	37.441	.000
	Error	25	14.250	0.570		
Within						
	Time	1	4.923	4.923	12.773	.002
	GroupsXTime	1	7.692	7.692	19.958	.000
	Error	24	9.250	0.385		

of affect (means presented in Table 23). Table 27 shows that the time and groups main effects, and the groups by time interaction, are all significant. (Figure 4 presents the groups by time interaction graphically.)

Table 28 presents the analysis of variance of affect by time for the low initial affect group. This table reveals a significant difference in affect from before to after exercise participation. From the means of Table 23, it is evident that this difference represents an increase in affect.

Table 29 presents the analysis of variance of affect by time for the high initial affect group. This table shows that no significant difference ocuurred in affect from before to after exercise participation. (Any alternative data splitting into low and high initial affect would only serve to decrease the number of subjects in the low initial affect group further; consequently, no further analysis was completed.)

Discussion

The results of this experiment attest to the validity of the vigor subscale of the MUMS. Vigor decreased significantly as a result of participation in group muscular relaxation among old adults with high initial levels of vigor, while those with low initial levels of vigor did not

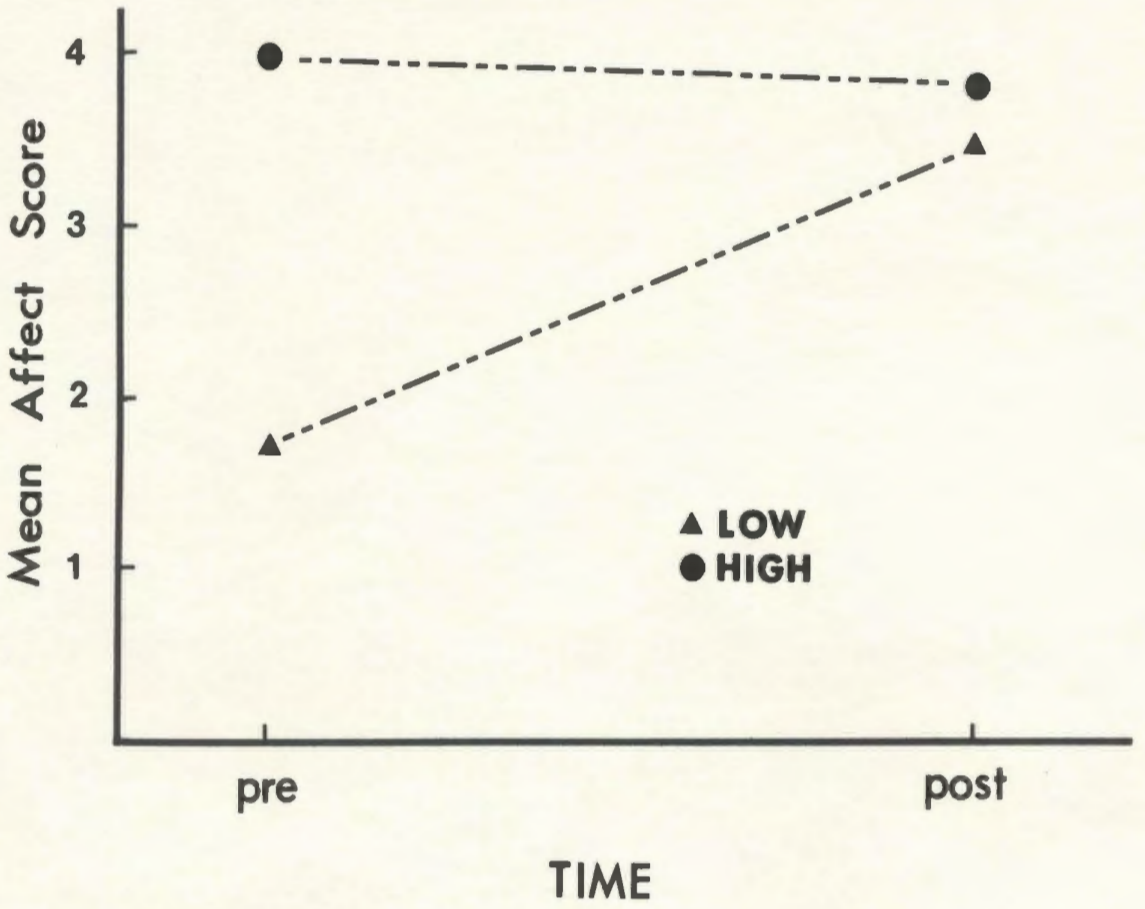


Figure 4. Mean affect scores pre and post relaxation for the high and low initial affect groups.

Table 28

Summary table for the analysis of variance of affect by time for the low initial affect group

Design	Source	df	SS	MS	F
Within	Time	1	9.000	9.000	23.377*
	Error[a]	24	9.250	0.385	

[a] Within subjects error from Table 27.

* $p<.01$

Table 29

Summary table for the analysis of variance of affect by time for the high initial affect group

Design	Source	df	SS	MS	F
Within	Time	1	0.250	0.250	0.649
	Error[a]	24	9.250	0.385	

[a] Within subjects error from Table 27.

change significantly. As predicted, many of the subject's initial levels of affect were at a maximum (69.2% of the subjects' initial affect scores = 4). For the remaining eight subjects with low initial affect, increases in affect were significant from before to after participation in group muscular relaxation.

The results of this experiment correspond to other research that has shown muscular relaxation to be effective in reducing physiological indices of arousal (such as heart rate, skin conductance) as well producing more positive feelings, such as the reduction of anxiety (Bellack, Hersen, & Kazdin, 1982).

The absence of significant changes in both the high initial vigor group and the high initial affect group indicate that regression toward the mean had little effect on the data of this experiment.

Experiment three:
Measurement of mood manipulation
by recall of positive and negative experiences

No research has attempted to experimentally manipulate a bipolar affect component of mood in the old. Several studies (using between subject designs) have experimentally manipulated mood-related states such as depression, hostility, and anxiety among the young (Coleman, 1975; Frost

& Green, 1982; Hale & Strickland, 1976; Strickland, Hale & Anderson, 1975). These mood-related states were manipulated by a procedure developed by Velton (1968). This procedure involved having subjects read silently, then aloud, 60 statements which were either positive or negative. These studies showed that subjects who read the negative statements reported more negative feelings (either depression, hostility, or anxiety) than subjects who read the positive statements. (Depression, hostility and anxiety were measured in these studies by scales such as the Beck Depression Inventory [Beck, Ward, Mendelson, Mock, & Erbaugh, 1961] and the anxiety, hostility, and depression subscales of the Multiple Affective Adjective Checklist [Zuckerman & Lubin, 1965]).

Rogers and Craighead (1977) found that one problem with the Velton procedure was that changes in some of the mood-related measures depended upon the extent to which subjects believed the statements they read. On the basis of this finding, Hollon and Beck (1979) cautioned that repeating positive or negative statements alone may be an ineffective means for producing changes in mood-related states. In order to produce change, these authors suggest that subjects must believe the statements, and that the statements must have meaning for them.

An additional finding by Rogers and Craighead (1977) was that, within subjects, positive statements resulted in

less change in mood than negative statements.

On the basis of this research, it was predicted that the affect component of mood could be manipulated in the old by having subjects recall, aloud, positive and negative personal experiences that occurred to them over the past year. Specifically, it was predicted that, within subjects, positive recall would increase affect (indicating more positive affect), and negative recall would decrease affect (indicating less positive, or negative affect); however, based upon the finding of Rogers and Craighead (1977), it was predicted that recall of negative experiences would result in a greater change in affect than recall of positive experiences. No effect on vigor was expected as a result of this experiment.

Method

Subjects

A sample of 37 new subjects, 43.2% male and 56.8% female, were selected by convenience from the community in St. John´s, Newfoundland. The mean age of these subjects was 70.4 years (standard deviation, 10.46 years). Fifty-four point one percent of these subjects were married, 43.2% widowed, and 2.7% were single.

Socioeconomic status was determined by the same method as in Experiments One and Two. Twenty-nine point seven percent of the subjects were classified within category 1,

35.1% within category 2, and 35.1% within category 3. These data suggest that this sample represents all three categories of socioeconomic strata approximately equally.

Subjects were not paid for their participation in this research.

Materials

All subjects were administered a six-page questionnaire package. The first page consisted of a personal information sheet which requested the subject's name, age, sex, marital status, and occupation.

Pages two, four, and six were identical one-page questionnaires consisting of the 17-item MUMS developed in Study Two.

Pages three and five requested subjects to recall as many affect-related experiences as possible that had occurred during the past year. One of these pages requested recall of positive experiences or "good things", and the other page requested recall of negative experiences, or "bad things". The order of presentation of positive and negative recall was counterbalanced.

Appendix G presents the six-page questionnaire used in this experiment.

A pencil with an eraser was provided for use in filling out the sheets.

Procedure

Every subject was approached individually by a researcher in their own home. The order of presentation of positive and negative recall was random across subjects. Subjects were asked to complete the personal information form and the first MUMS (pages 1 and 2 of the questionnaire package).

Subjects were instructed to follow the instructions in their own questionnaire package. The researcher then requested subjects to recall from one affect category, followed by the completion of the second MUMS, then recall from the other affect category followed by the completion of the third MUMS. Recall lasted five minutes per category.

Statistical analyses followed the same procedures as Experiments One and Two.

Results

Affect

The prediction was made that recall of positive experiences would increase affect, recall of negative experiences would decrease affect, and that recall of negative experiences would result in greater change in affect than recall of positive experiences. The results showed an order by time of measurement interaction, whereby

affect changed negatively after recall of negative experiences; however affect did not change as a result of recall of positive experiences. Another finding was that the initial affect of subjects in the two order conditions was significantly different.

Table 30 presents the means and standard deviations of affect and vigor by order and time of measurement.

Table 31 presents the analysis of variance statistics of affect. This table shows a significant main effect for order, no significant time main effect and a significant order by time interaction. Figure 5 presents the order by time interaction graphically.

The significant order main effect was not anticipated nor was of primary interest. Figure 5 shows that affect at Time 1 (initial affect) for order 1 and order 2 are different. The results of a t-test (two-tailed) of order 1 initial affect (M= 2.556) compared to order 2 initial affect (M= 3.684) was significant $t(35)= -2.09$, $p= .044$.

The significant order by time interaction was investigated further by separate analyses of variance of affect for order 1 and order 2, presented in Tables 32 and 33, respectively. These results show that the within subjects main effect of time in the order 1 condition is significant (positive followed by negative), but not for the order 2 condition (negative followed by positive).

Table 34 presents the results of the comparison of

Table 30

Means and standard deviations of vigor and affect by order 1 and order 2 and time of measurement

Time	Vigor		Affect	
	Order 1[a]	Order 2[b]	Order 1[a]	Order 2[b]
Mean				
Time 1	5.111	6.263	2.556	3.684
Time 2	4.778	6.263	2.556	3.474
Time 3	4.556	6.737	1.722	3.737
Standard Deviation				
Time 1	3.411	2.766	2.255	0.671
Time 2	3.388	3.070	2.406	0.905
Time 3	3.166	2.806	2.608	0.562

[a] Order 1 = Positive recall followed by negative recall: n= 18.

[b] Order 2 = Negative recall followed by positive recall: n= 19.

Table 31

Summary table for the analysis of variance of affect for the order and time main effects and the time by order interaction

Design	Source	df	SS	MS	F	p
Between						
	Order	1	50.822	50.822	6.132	.018
	Error	35	290.095	8.288		
Within						
	Time	2	3.016	1.508	2.712	.073
	OrderXTime	2	6.259	3.130	5.628	.005
	Error	70	38.930	0.556		

Figure 5. Mean affect scores by time of measurement for order 1 (positive recall followed by negative recall) and order 2 (negative recall followed by positive recall) conditions.

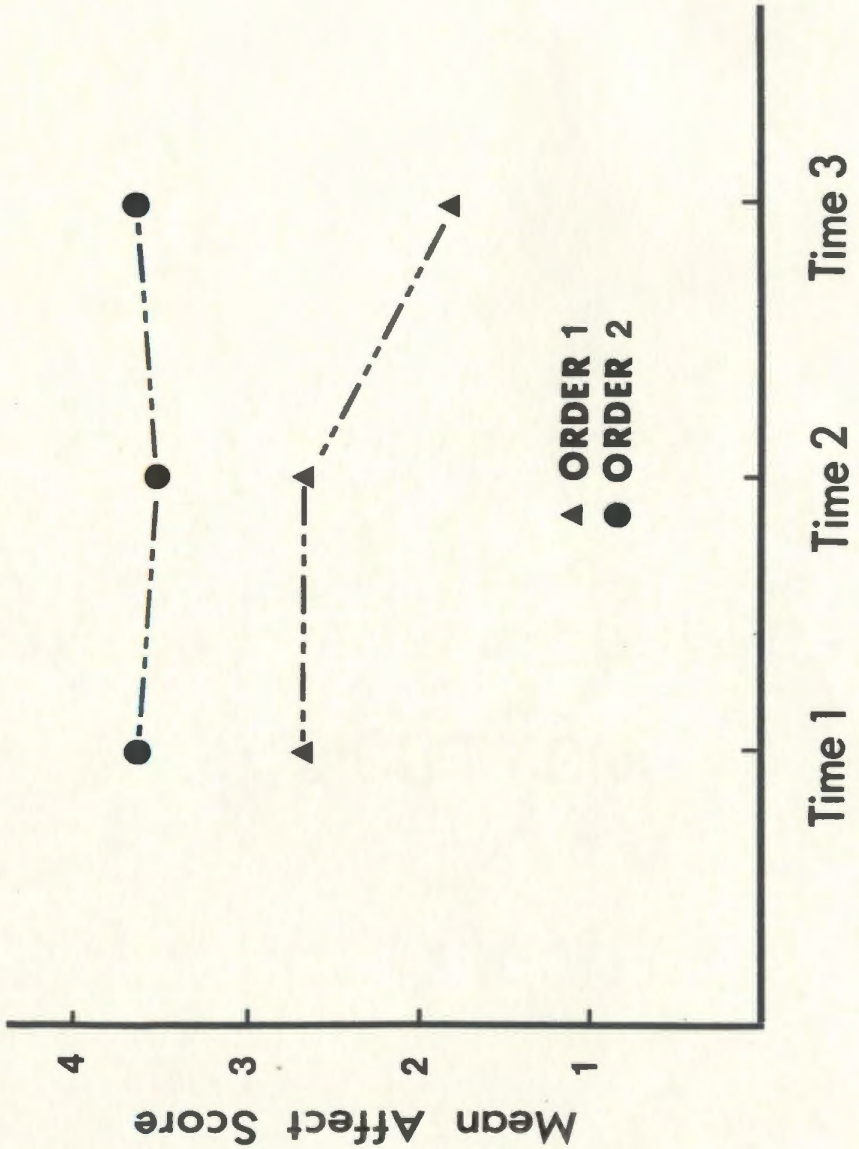

Mean Affect Score
4
3
2
1
Time 1
Time 2
Time 3
▲ ORDER 1
● ORDER 2

Table 32

Summary table for the analysis of variance statistics of affect for order 1[a]

Design	Source	df	SS	MS	F
Within					
	Time	2	8.333	4.167	7.495*
	Error[b]	70	38.930	0.556	

[a] Order 1 = Positive recall followed by negative recall.

[b] Within subjects error from Table 31

* $p < .01$

Table 33

Summary table for the analysis of variance statistics of affect for order 2[a]

Design	Source	df	SS	MS	F
Within					
	Time	2	0.737	0.368	0.662
	Error[b]	70	38.930	0.556	

[a] Order 2 = Negative recall followed by positive recall.

[b] Within subjects error from Table 31

Table 34

Summary table for the analysis of variance statistics of affect at time 2 and time 3 for order 1

Design	Source	df	SS	MS	F
Within					
	Time	1	6.250	6.250	11.241*
	Error[a]	70	38.930	0.556	

[a] Within subjects error from Table 31

* $p < .01$

affect at time 2 compared to 3 for the order 1 condition (time 1 and time 2 have equal means, and therefore were not statistically analyzed). Table 30 shows that the significant change from before to after recall of negative experiences represents a decrease in affect.

Vigor

The results of experiment three showed that vigor did not change as a result of recall of positive or negative experiences. Table 35 presents the analysis of variance statistics of vigor (means presented in Table 30). Table 35 shows that neither of the main effects, nor the interaction are significant.

Discussion

The results of this experiment provide partial support for the validity of the MUMS as a measure of vigor and affect. Affect was found to decrease significantly from before to after five minutes of recall of negative experiences, but only when recall of negative experiences was preceeded by recall of positive experiences. No changes in affect resulted due to recall of positive experiences.

Another anticipated finding that was confirmed by this experiment was the absence of statistically significant

Table 35

Summary table for the analysis of variance of vigor for the order and time main effects and the time by order interaction

Design	Source	df	SS	MS	F	p
Between						
	Order	1	71.543	71.543	2.647	.113
	Error	35	946.049	27.030		
Within						
	Time	2	0.558	0.279	0.294	.746
	OrderXTime	2	5.098	2.549	2.700	.075
	Error	70	66.343	0.948		

changes in vigor as a result of recall of negative or positive experiences, regardless of order of recall.

An unexpected finding was the significant difference in initial affect between the two order conditions. The reason for this difference is unknown, but assumed to be a chance effect, since subjects were randomly assigned to order conditions.

The results of this study are only partially supported by previous studies that showed changes in the expected directions for mood-related measures both after negative as well as positive statements.

Another interpretation of the findings is that experimenter effects influenced the subjects responding on the MUMS (i.e., the subjects perceived the intent of the study and tried to comply with their perceptions by responding accordingly). This interpretation is rejected for two reasons. Firstly, significant changes in affect would be predicted from Time 1 to Time 2 for order 1 as well as from Time 2 to Time 3: no changes were obtained from Time 1 to Time 2. Secondly, changes would be predicted in vigor that parallel those in affect, since vigor was found in Study Two to be related to global mood: no changes in vigor were obtained. For these reasons, an interpretation of the findings in terms of experimenter effects does not appear very plausible.

General summary and discussion of Study Three

There has been no attempt in past research to experimentally manipulate mood in older subjects for purposes of validating a mood scale. The experiments conducted in Study Three overcome this lack, and also demonstrate that the MUMS is a valid measure of mood for use with older subjects. As predicted, the vigor component of mood was observed to increase after participation in exercise, to decrease after relaxation and not to change, as expected, after recall of positive and negative experiences.

As predicted, the affect component of mood was observed to increase after participation in exercise and muscular relaxation as well as to decrease after recall of negative experiences when preceeded by recall of positive experiences. Affect did not change as a consequence of recalling positive experiences nor did it change from initial levels as a consequence of recalling negative experiences.

A simple theoretical model that encompasses the vigor and affect components of the MUMS might suggest that global mood is made up of subjective appraisals of current somatic and environmental conditions, respectively.

The findings presented in Study Three support a conceptualization of the vigor component as an appraisal of the somatic state of the organism. Increases in

physiological activity that occur as a result of exercise (Shephard, 1978) are found to increase vigor. Decreases in physiological activity associated with relaxation (Bellack et al., 1982) are found to decrease vigor. Activity involving no direct manipulation of physiological state, as in the recall of positive and negative experiences, were observed to have no effect on vigor.

The findings of study three are consistent with a conceptualization of affect as an appraisal of environmental conditions. Affect increased after environmental manipulations that are usually considered to be positive in direction (group exercise and muscular relaxation). The decrease in affect as a consequence of recall of negative experiences suggests that current affect may also be effected by appraisal of memories of one´s past environmental encounters. Aspects of this model will be further appraised in Study Four.

STUDY FOUR: DIURNAL VARIATION OF MOOD

Part one: Validation

The vigor dimension

One would expect that a valid measure of an appraisal of one's somatic state, such as the vigor component of mood, would vary at different times of the day - to be high at midday and low at bedtime, for example. This diurnal variation in vigor (typically following an inverted U-shaped pattern from morning to bedtime) has been found repeatedly using ACL measures of vigor (Clements, Hafer, & Vermillion, 1976; Thayer, 1967; Watts, Cox, & Robson 1983).

The diurnal, inverted, U-shaped pattern of ACL vigor has been found to correspond closely with diurnal measures of physiological arousal. A significant relationship between diurnally measured heart rate and ACL vigor has been reported by Walton, Tinklenberg, Doyle, Horvath, & Kopell (1976). Forberg (1977) found significant relationships between a diurnal, self-reported measure of alertness, and diurnal urinary secretion of adrenaline, and body temperature.

But not all people experience an inverted U-shaped pattern of vigor. Between 8 and 16% of subjects in three separate experiments have been identified as "morning people" (higher levels of vigor in the morning than others) and similar percentages have been identified as "evening people" (higher levels of vigor in the evening than others)

(Froberg, 1977; Patkai, 1971; Watts, Cox, & Robson, 1983). Watts, Cox, & Robson (1983) found self-reported vigor as measured by the Mackay et al. (1978) ACL to follow expected patterns for morning and evening people, providing further evidence for the validity of the ACL measurement of the vigor dimension of mood.

On the basis of this research, it was predicted that: (a) vigor would follow a diurnal inverted U-shaped pattern, (b) subjects identified as morning people would have higher levels of vigor at the wakeup recording than day or night people, and (c) subjects identified as night people would have higher levels of vigor in the evening than morning or day people.

The affect dimension

Unlike vigor, there has been no diurnal studies of a bipolar affect component of mood. One study which investigated the diurnal variation of a mood measure similiar to the negative half-range of bipolar affect was conducted by Hedges, Jandorf, and Stone (1985). These reasearchers measured "negative mood" which contained adjectives measuring negatve affect, anger, and tension. (Also measured was "positive mood", similar to the vigor measure of this research). These researchers found both negative and positive diurnal mood to be primarily linear

(only one of eight diurnal measurements differed significantly).

There is no a priori reason why a bipolar affect dimension should vary diurnally if it reflects appraisal of environmental conditions. Common knowledge suggests that people's levels of affect change little throughout the day (with the exception of those with manic-depressive psychosis). When affect is affected by the environment, this effect, when averaged across persons and environments, should result in diurnal linearity. Therefore, it is predicted that affect will follow primarily a diurnal linear pattern. The only departure from linearity predicted for affect was at the wakeup recording. At this time, the antecedent environment was similar for all subjects (i.e., sleep).

Common experience suggests that not all days are the same, but that some days are more unusual than others. This unusualness may be attributable, at least in part, to the greater number, and/or greater intensity, of either positive or negative environmental influences than usual. One might expect, therefore, that a valid measure of mean affect on unusual days would be different (higher on positive days, lower on negative days) than affect on ordinary days.

Part two; Age-related changes in diurnal mood

The vigor dimension

1. Daily mean level

No previous research has studied mean level changes in the diurnal vigor dimension of mood by age.

Research on changes in physiological arousal with age do not clearly support either a prediction of higher or lower mean levels of vigor in old age. Woodruff (1985), in a review of this literature, identified several conflicting areas of research on the effect of age on physiological arousal, and indicated that new models would need to be developed before further major advances could occur.

The only source of information on mean level changes in vigor with age is the data reported in Study Two of this research. Table 14 shows mean levels of vigor on the MUMS to be significantly higher at each successively older group (young, middle, and old). On the basis of these findings, it was predicted that the mean daily levels of vigor would be higher in the old group compared to the young group.

2. Age by time of day interaction

Another way to study age-related changes in self-reported vigor is by analysis of diurnal peak changes. Two studies by Templer and his colleagues present data which

suggest such changes. In one study, Templer, Ruff, Ayers, & Beshai, (1981-82) found that those under 35 years of age reported "better mood" toward the evening than those 35 years and over, who reported better mood in the morning. Furthermore, a highly significant ($p < .001$) negative relationship was found between age and better mood toward the evening.

In Templer et al.'s study, mood was measured as a global construct. Subjects were asked to check one of three responses: "Mood usually higher in the morning", "Mood usually higher in the evening", or "Mood pretty much the same in the morning as toward the evening" (p. 190). This method of assessment is deficient in two ways. Firstly, global ratings of mood imply a single dimension; however, most of the past research reviewed in this paper, as well as the findings of this research, indicate that mood is at least bidimensional; therefore, it is not clear exactly what aspect of mood was assessed by Templer and his colleagues (the present research, for example, indicates that vigor as well as affect contribute to global mood). Secondly, mood was assessed retrospectively; however, no data are available on the validity of this procedure. It is likely that retrospective judgements of mood are less accurate than current judgements.

In a second study, Brooner, Templer, & Corgait (1983) replicated Templer et al.'s (1981-82) findings and extended

them to find that the highly significant relationship between age and diurnal mood fluctuation was maintained when the influence of self-reported health, energy level, and time of preferred recreation were separately removed. Mood was assessed in Brooner et al.'s study in the same way as in Templer et al.'s study and therefore has the same limitations.

Despite the limitations, Templer et al.'s (1981-82) and Brooner et al.'s (1983) findings do provide some indication that age may be related to changes in the diurnal peak levels of the vigor dimension of mood, and also provide some insight into the nature of those changes. On the basis of this research, it was predicted that peak levels of vigor would occur earlier in the day among old adults than young adults.

The affect dimension

1. Daily mean level

No previous research has investigated age-related changes in diurnal mean levels of the affect dimension of mood.

Research on dispositional aspects of subjective well-being (i.e., happiness, life satisfaction, and morale) shows little consensus on mean level changes with age. Some studies report decreases (e.g. Bradburn & Caplovitz, 1965;

Gurin, Veroff, & Feld, 1960), while others report no change (Andrews & Withey, 1976; McNeil, Stones, & Kozma, 1986a; Sauer, 1977). Several correlational studies using cross sectional data have found positive relationships between age and subjective well-being (Cantril, 1965; Medley, 1980), while other studies have found virtually no correlation (Stock, Okun, Haring, & Witter, 1983). Other correlational studies using longitudinal data have found subjective well-being measures to be stable for periods of up to five years and over (George & Maddox, 1977; Kozma & Stones, 1983; Paulmore & Kivett, 1977; Recker & Wong, 1984). Major reviews have indicated that there is little or no overall effect of age on subjective well-being (Diener, 1984; Larson, 1978; McNeil, Stones, & Kozma, 1986b).

Based upon the subjective well-being research, a prediction could be made that the affect component of mood also shows little or no change in mean levels with age; however, this prediction is counter to the findings of Study Two which show that mean levels of affect are significantly higher for the old compared to the young. On the basis of the finding of the large sample of Study Two, it was predicted that diurnal mean levels of affect will be higher in the old age group compared to the young. In addition, it was also predicted that affect would be higher at all five times of the day for the old compared to the young.

2. Age by time of day interaction

Affect has been predicted to follow a primarily linear pattern throughout the day. There is no a priori reason why this pattern should change with age. Therefore, no age by time of day interaction was expected for affect.

Purpose of study four

The purpose of Study Four was two-fold. The objective of Part One was to further demonstrate the validity of the vigor and affect subscales of the MUMS.

It was predicted that vigor would vary diurnally in an inverted U-shaped pattern. It was also predicted that morning people would experience, on average, higher levels of vigor in the morning than either day or night people, and that night people would experience higher levels of vigor in the evening than day or morning people.

It was predicted that affect would follow a primarily linear pattern throughout the day. It was expected that there would be no effect of morning/night type on affect. Another prediction was that affect scores would be lower on days described as unusual because of negative experiences compared to days described as ordinary or days described as unusual due to positive experiences.

The purpose of Part Two of this study was to evaluate the prediction that daily mean levels of vigor and affect are higher for old adults than for young adults. In addition, it was predicted that vigor and affect would be higher at each time of day recording for the old compared to the young. An additional aim of this study was to test the expectation that peak vigor for old adults occurs earlier in the day compared to young adults.

Method

Subjects

A sample of 187 subjects volunteered to participate in this study. This sample was selected so that approximately half were active young people, and the other half were active old people. All 95 young adult subjects were full-time undergraduate students at Memorial University of Newfoundland. All 92 old adult subjects were members of one of two 3F exercise programs in St. John's, Newfoundland (some of these old subjects participated in Study Three which occurred after Study Four was completed).

Sixteen subjects' data were discarded due to incomplete responding (e.g., a whole day of missing data). The remaining 171 subjects (net sample) were divided into two age groups; young adults and old adults.

Table 36 presents the age characteristics , marital status, and gender for these two age groups for the net sample as well as for the discarded sample. This table shows that all of the discarded subjects were in the old age

Table 36

Age characteristics, marital status, and gender of young and old adult subjects for the net and discarded samples

		Age Characteristics[a]			Marital Status[bc]			Gender[bd]	
Group	n	M	SD	Range	M	W	S	M	F
Net Sample									
Young	95	20.1	2.323	17-30	10.5	0.0	89.5	35.8	64.2
Old	76	63.2	6.501	49-83	62.8	26.9	10.3	25.6	74.4
Discarded Sample									
Young	0	0.0	0.0	0-0	0.0	0.0	0.0	0.0	0.0
Old	16	64.5	8.371	54-76	53.8	46.2	0.0	0.0	100.0

[a] units = years. [b] units = percentages. [c] M = married, W = widowed, S = single (includes divorced and separated). [d] M= male, F= female.

group. This probably reflects university students' greater familiarity with filling out questionnaires. Compared to national statistics, the number of males in both age groups were under represented by this sample (percentage of male to female for young [20 to 34 years of age] = 50/50, for old [65 years and over] = 46.5/57.5 [from 1983 Canada Postcensal Estimates - National; Statistics Canada, 1983]).

Socioeconomic status of the old adults was determined by the same method reported earlier in this research. Ten percent of the subjects were classified within category 1, 31.4% within category 2, and 58.6% within category 3. These data suggest that the socioeconomic status lay predominantly toward the managerial or professional end of the distribution.

Each young adult was paid $7.50 for his/her participation in this research. At the request of the 3F organizers, the old adults were not paid; instead, each was given a pin imprinted with "Age Successfully".

Materials

Each subject completed a package of forms consisting of (1). One sheet requesting name, age, gender, marital status, and occupation of self and spouse. Also on this sheet was a question assessing the individual differences variable of morning/night type.

(2) Three identical booklets (each booklet representing one day of mood recording). The first page of each booklet had an identification number for each subject, the date, and instructions. The instructions asked subjects to describe how they felt, "right now" by circling, for each adjective listed on the following five pages, one of three responses: "no, I do not feel, or NO"; "cannot decide or ?" (question mark); or, "yes, I do feel, or YES". An example using the adjective "peppy" was provided. Subjects were then instructed to complete the MUMS at the following times of the day:

a. Whenever you get up in the morning.

b. At noon (between 11 a.m. and 1 p.m.).

c. In the afternoon (between 3 p.m. and 5 p.m.).

d. In the evening (between 7 p.m. and 9 p.m.).

e. At bedtime.

Each recording sheet requested the subject to record the exact time of day that the MUMS was completed.

The individual differences variable of morning/night type was scored from 1 to 5, where 1 was the response "Definitely a morning type", 5 was the response "Definitely a night type", and scores 2, 3, and 4 were intermediate responses.

The last sheet of each booklet contained a question assessing whether the day had been an ordinary day or an unusual day. An example of a complete package is presented in Appendix H.

Procedure

Young adults: Young adults were obtained by responding to posters displayed in several buildings at Memorial University and also the author solicited students from three introductory psychology courses. Both the posters and the author in the classrooom described a "psychology experiment" that could be done at home for which there was a payment of $7.50. Interested persons were interviewed individually or in small groups. During this interview, subjects were told that the purpose of the research was to measure people's mood for three consecutive days. (Three days of mood recording was requested to provide sampling of a wide range of typical mood states.) The questionnaire package was explained to them in detail, and questions were answered. Each subject completed the first page of the questionnaire package which requested their name and demographic information, and then completed the morning/night question. This page was then detached from the questionnaire package, and the subject took the remaining 3-booklet package away with him/her. Each subject was requested to visit the author

at his office at least once during the three days of the research. The reason for this request was to ensure that the data was being recorded accurately, and also to provide a reminder to students to complete their mood recordings regularly. At the end of the recording period, (the recording period was on Tuesday, Wednesday, and Thursday of the same week) the students returned their completed booklets and were paid.

Old adults: Old adult participation was solicited by the author and three assistants who approached 3F members, in groups of 10 to 20, immediately after they had completed a session of organized group exercise. The intent of the research and the instructions were explained to the old adults in a similar way as with the young adult group. However, instead of the old adult subjects being required to visit the author once during the course of the study, the telephone numbers of the old adults were obtained, and the author telephoned each of the old adult participants once during the three days of mood recordings (the recording period was on Wednesday, Thursday, and Friday of the same week). The old subjects returned the completed forms the following week at their sports facility.

Weekday recordings of mood were requested of subjects rather than weekend day recordings because weekend moods have been found to be more positive and less negative

compared to weekday moods (Stone, Hedges, Neale, & Satin, 1985). These researchers also found that weekday moods did not differ from one another. On the basis of the latter finding, the procedure of young subjects recording mood in the early half of the week and old subjects recording in the later half of the week was not expected to influence the results.

Identification of morning/night type: Subjects who scored 1 on the morning/night question were classified as a morning type, subjects who scored 5 were classified as night type, and scores 2, 3, and 4 were classified as day type (i.e., neither a morning nor a night type).

Results

The Results section of Study Four is divided into two subsections. Section A presents the results of the analyses of diurnal vigor and affect from all three days of recordings combined. Section B presents the results of the comparison of negative unusual day 3 with ordinary day 3.

Section A: Combined analyses

Times of Recording

Table 37 presents the means, standard deviations, and

Table 37

Means, standard deviations, and ranges of time of day recordings of the MUMS

Time of Day	M	SD	Range
Wakeup	8:01	1:07	5:27 - 12:30
Noon	12:07	0:42	10:45 - 14:45
Afternoon	16:10	0:47	13:30 - 19:00
Evening	19:58	1:00	17:10 - 23:03
Bedtime	23:41	1:42	22:13 - 03:30

Note. Times are recorded in hours and minutes of a 24-hour day. N = 171.

ranges of the the five times of the day that subjects completed the MUMS.

The vigor subscale

Table 38 presents the means and standard deviations of the vigor subscale of the MUMS for the young and old adult groups and the total sample at the five recorded times of the day. The data of this table are for all three days of mood measurement combined.

Table 39 presents the mean vigor scores for the individual differences variable of morning/night type by time of day.

The results of the analyses of vigor showed that:

1. Vigor was significantly higher at all times of the day except bedtime for old adults compared to young adults.

2. Vigor varied diurnally for both age groups in an inverted U-shaped pattern.

3. For both age groups, morning people had significantly higher vigor only at the morning recording, compared to both day and night people.

Figure 6 presents the mean values for vigor by time of day for both the young and old adult age groups graphically (mean values presented in Table 38). It is evident from Figure 6, as well as from the mean values in Table 38, that old adults had higher mean levels of vigor for all time of day recordings than the young adult group. It is also

Table 38

Means and standard deviations of mean vigor subscale scores for young and old groups and the total sample at five times of the day for days 1, 2, and 3 combined.

Time	Young[a]		Old[b]		Total[c]	
	M	SD	M	SD	M	SD
Wakeup	2.300	2.195	4.533	2.830	3.292	2.727
Noon	3.867	2.423	6.250	2.509	4.926	2.727
Afternoon	3.040	2.280	5.009	2.631	3.915	2.625
Evening	3.051	2.267	4.353	2.678	3.629	2.535
Bedtime	1.186	1.581	2.136	2.315	1.608	1.993
Daily	2.821	1.382	4.602	2.215	3.511	1.985

[a] n = 95. [b] n = 76. [c] N=171.

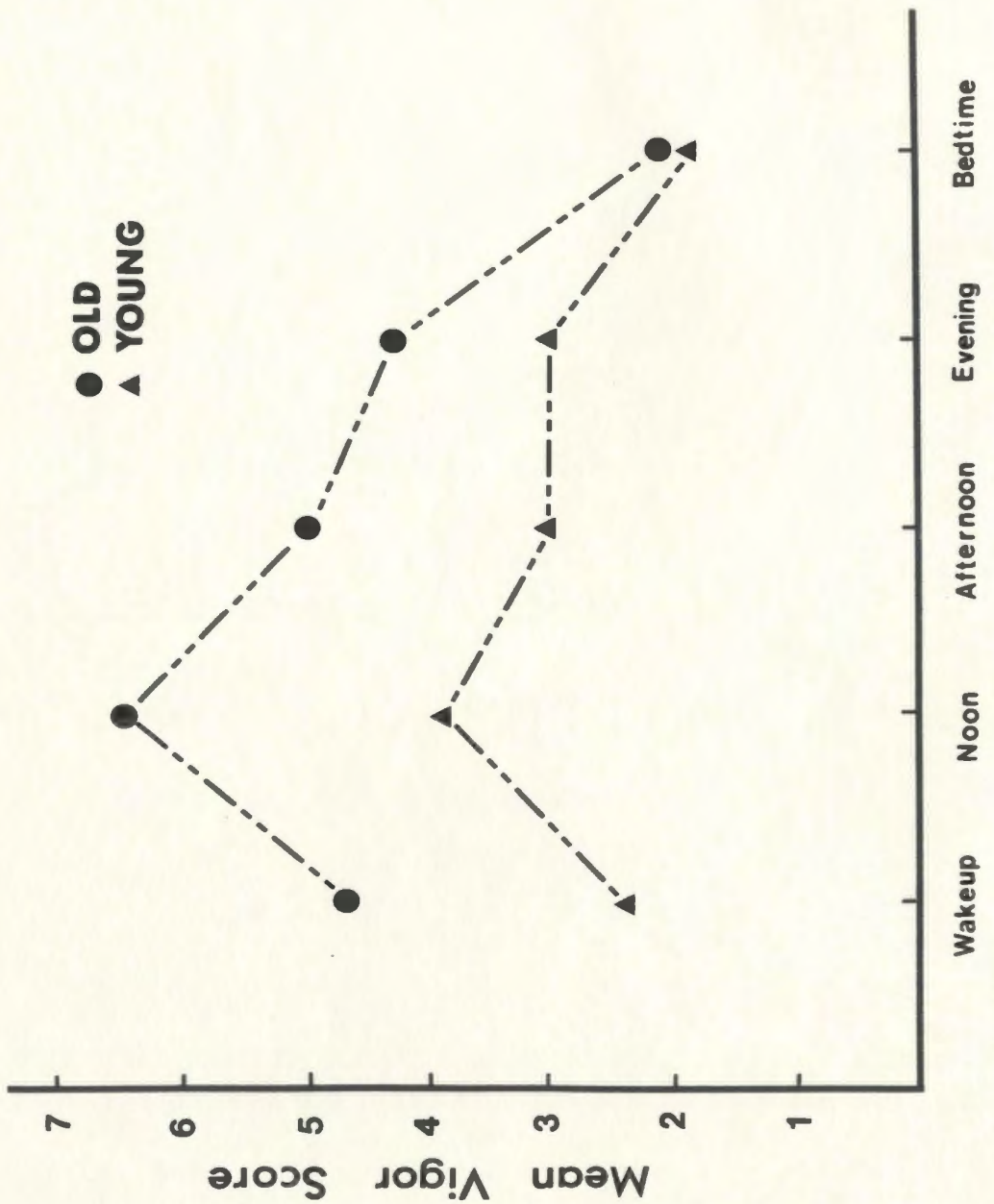
Table 39

Means and standard deviations of vigor subscale scores for morning, daytime, and night people at five times of the day

Time	Morning[a]	Day[b]	Night[c]
Wakeup			
M	4.930	3.115	2.154
SD	2.721	2.674	2.144
Noon			
M	5.608	4.861	4.414
SD	2.765	2.671	2.862
Afternoon			
M	4.489	3.730	4.031
SD	2.813	2.590	2.544
Evening			
M	3.495	3.481	4.407
SD	2.980	2.479	2.136
Bedtime			
M	1.441	1.606	1.809
SD	1.844	2.045	1.987

[a] $n = 31$. [b] $n = 113$. c $n = 27$.

Figure 6. Mean vigor scores by time of day for young and old age groups.


● OLD
▲ YOUNG
Mean Vigor Score
7
6
5
4
3
2
1
Wakeup
Noon
Afternoon
Evening
Bedtime
TIME OF DAY

evident from Figure 6 and Table 38 that for both young and old groups, vigor varied according to time of day, increasing from the wakeup recording to its daily peak at noon, and then gradually declining throughout the afternoon and evening to the lowest values at bedtime.

General analysis: Table 40 presents the analysis of variance of diurnal vigor by age group and morning/night type. This table shows that there were significant age group and time of day main effects, and two significant interactions; age group by time of day and morning/night type by time of day. The morning/night type main effect, and all other interactions were not significant.

Specific analyses

Age group main effect: Comparison of average daily mean scores of vigor from Table 38 show that old adults had higher daily mean levels of vigor than young adults.

Time of day main effect: Newman-Keuls' comparisons (MS_{Error}=3.1, df=660, n=171, $p<.05$), showed that:

1. Wakeup vigor was significantly lower than noon and afternoon vigor, and significantly higher than bedtime vigor. There was no difference between wakeup vigor and evening vigor.

Table 40

Summary table for the analysis of variance of diurnal vigor by age and morning/night type.

Design	Source	df	SS	MS	F	p
Between						
	Age	1	269.819	269.819	17.472	.000
	MN[a]	2	2.667	1.333	0.086	.917
	Age X MN	2	16.874	8.437	0.546	.580
	Error	165	2548.027	15.443		
Within						
	Time	4	575.436	143.859	46.410	.000
	Age X Time	4	52.730	13.182	4.253	.002
	MN X Time	8	74.268	9.283	2.995	.003
	Age X MN X Time	8	24.433	3.054	0.985	.446
	Error	660	2045.832	3.100		

[a] MN = morning/night type factor.

2. Noon vigor was significantly higher than all other time of day measures of vigor.

3. Afternoon vigor was significantly higher than wakeup and bedtime vigor, and significantly lower than noon vigor. There was no significant difference between afternoon vigor and evening vigor.

4. Evening vigor was significantly higher than at bedtime, and significantly lower than at noon. Evening vigor was not significantly different than wakeup or afternoon vigor.

5. Bedtime vigor was significantly lower than all other time of day measures of vigor.

Age group by time of day interaction: Inspection of Figure 6 indicates that peak vigor for both old and young occured at noon. The significant age group by time of day interaction was therefore not due to peak vigor differences by age group (as predicted). Appendix I presents the analyses of variance of vigor by age group for all five times of the day. This appendix shows that the significant interaction was due to the significant differences between age groups of all time of day vigor scores with the exception of bedtime.

Morning/night type by time of day interaction: Table 39 presented the time of day scores of mean vigor by

morning/night type. Figure 7 presents the means of Table 39 graphically. Appendix J presents the analyses of variance of vigor by morning/night type at each time of day. Appendix J shows that the only significant difference in morning/night type was at the wakeup recording. More specific comparisons using the Newman-Keuls test (MS_{Error}= 15.443, df= 165, N = 171) showed that morning peoples' mean vigor scores were significantly higher ($p<.05$) than those of both day and night people, but that day and night peoples' mean vigor scores were not significantly different from one another.

The Affect subscale

Table 41 presents the means and standard deviations of the affect subscale of the MUMS for the young and old adult groups and the total sample at the five recorded times of the day. The data of this table are for all three days of mood measurement combined.

The results of the analyses of affect showed that:

1. Affect was significantly higher at all times of the day for old adults compared to young adults.

2. While affect varied diurnally, variation was low so that the diurnal pattern of affect was primarily linear.

3. Affect was not effected by morning/night type.

Figure 7. Mean vigor scores by time of day for morning, day, and night types.

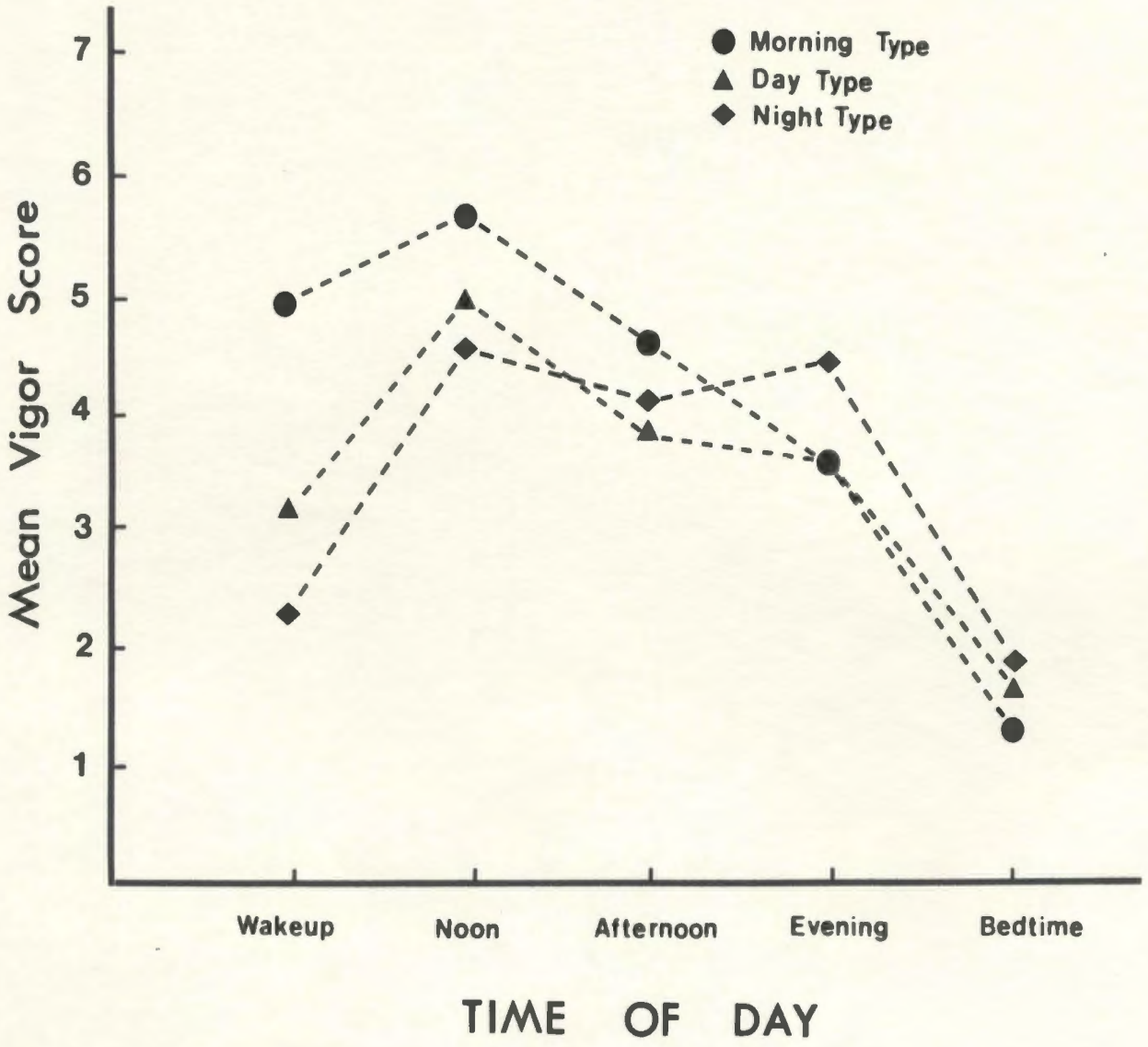

Morning Type
Day Type
Night Type
Mean Vigor Score
7
6
5
4
3
2
1
Wakeup
Noon
Afternoon
Evening
Bedtime
TIME OF DAY

Table 41

Means and standard deviations of mean affect subscale scores for young and old groups and total sample at five times of the day for days 1, 2, and 3 combined.

Time	Young[a]		Old[b]		Total[c]	
	M	SD	M	SD	M	SD
Wakeup	2.004	1.463	3.242	1.203	2.550	1.485
Noon	2.479	1.370	3.549	0.919	2.951	1.303
Afternoon	2.142	1.613	3.556	0.904	2.766	1.517
Evening	2.368	1.476	3.664	0.737	2.940	1.366
Bedtime	2.267	1.460	3.500	0.946	2.811	1.398
Daily	2.405	1.112	3.572	0.737	2.815	1.185

[a] n = 95. [b] n = 76. [c] N=171.

Figure 8 presents the mean values for affect (presented in Table 41) by time of day for both the young and old adult age groups. As is apparent from Figure 8, old adults had higher mean levels of affect for all time of day recordings than the young adult group.

General analysis: Table 42 presents the analysis of variance of diurnal affect by age group and morning/night type. This table shows a significant age group and time of day main effect but no morning/night type main effect and no significant interactions.

Specific analyses

Age group main effect: Comparison of average daily mean scores of affect from Table 41 show that old adults had higher daily mean levels of affect (i.e., affect was more positive) than young adults. This finding also applies to each time of day recording.

Time of day main effect: Newman-Keuls' comparisons revealed that wakeup affect was significantly lower than all other times of the day (MS_{Error}=0.749, df 656. N=171, $p<.05$). No other time of day comparisons differed significantly

Figure 8. Mean affect scores by time of day for young and old age groups.

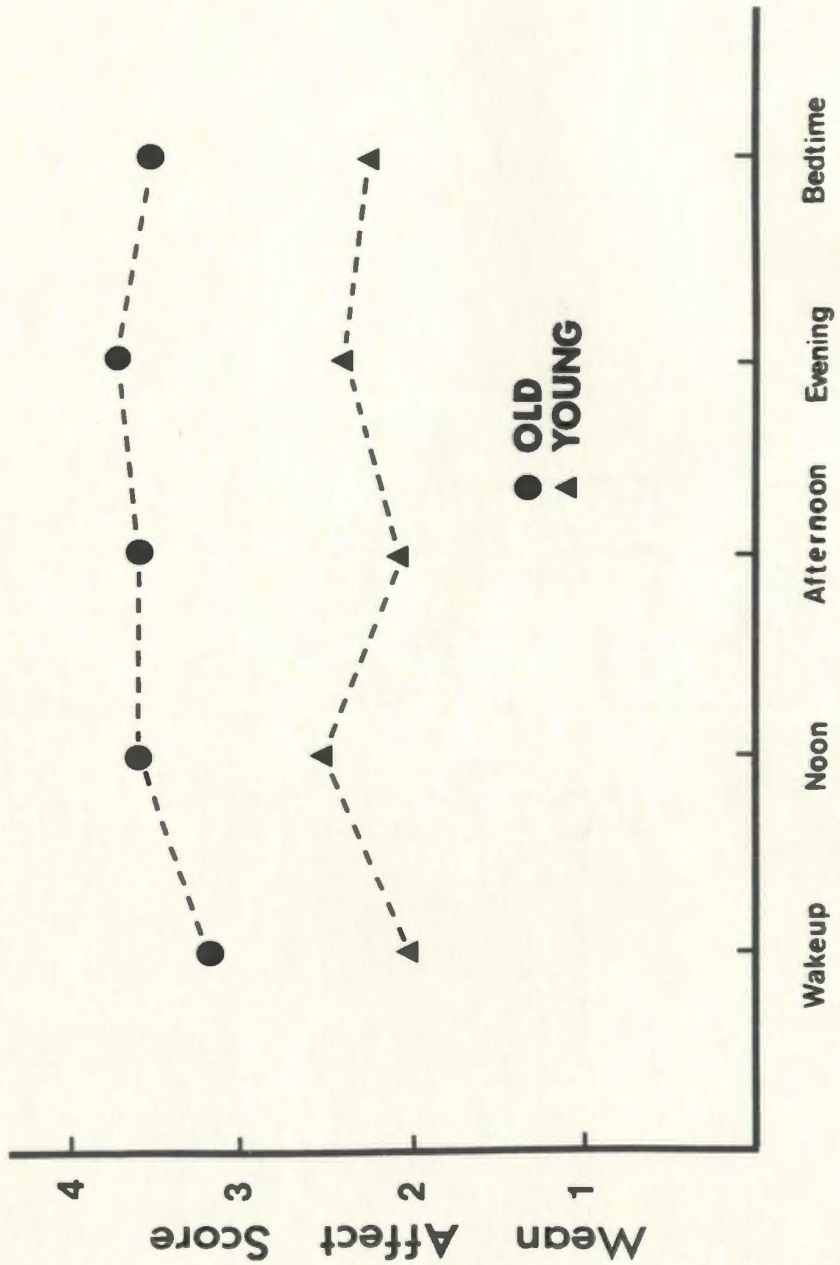

Mean Affect Score
4
3
2
1
Wakeup
Noon
Afternoon
Evening
Bedtime
TIME OF DAY
OLD
YOUNG

Table 42

Summary for the analysis of variance of diurnal affect by age and morning/night type

Design	Source	df	SS	MS	F	p
Between						
	Age	1	258.480	258.480	50.038	.000
	MN[a]	2	9.307	4.654	0.901	.409
	Age X MN	2	10.851	5.426	1.050	.352
	Error	165	847.175	5.166		
Within						
	Time	4	8.788	2.197	2.932	.020
	Age X Time	4	1.925	0.481	0.642	.633
	MN X Time	8	2.811	0.351	0.469	.878
	Age X MN X Time	8	3.095	0.387	0.516	.845
	Error	656	491.593	0.749		

[a]MN = morning/night type factor.

Although the age group by time of day interaction for affect was not sigificant, for the sake of completeness, Appendix K presents the analysis of variance of affect by age group for all five times of the day. This appendix shows that all time of day affect scores differed significantly between old and young adults.

Post hoc analyses

A two-way Chi square analyses revealed an overall association between age group and morning/night type ($\chi^2[2, N=173] = 14.378$, $p<.01$). Table 43 presents the frequency table for morning/night type by age group. Specific comparisons using Ryan's procedure (Linton, Gallo, & Logan, 1975) revealed that morning and night people differed significantly, with morning people more likely to be young and night people more likely to be old, ($\chi^2[a=3, d-1=2] = 10.519$, $p=.05$). In addition, a significant difference was found between morning and day people, with day people more likely to be old than young ($\chi^2[a=3, d-1=2]=9.328$, $p=.05$).

These results suggest a possible confounding of mood by age and morning/night type; however, the absence of significant interactions (i.e., age by morning/night type and age by morning/night type by time), in addition to the absence of morning/night main effects for either vigor or

Table 43

Frequency table for morning/night type by age group

Type	Age group	
	Young	Old
Morning	23	8
Day	47	67
Night	8	28

affect, indicate that the influence of such a confound is small and that influences on mood are due primarily to the age factor.

Results: Section B. Negative days versus ordinary days

It was predicted that negative days would produce lower mean affect scores than ordinary days. It was also anticipated that there would be no difference in vigor scores between negative and ordinary days.

All 171 subjects monitored their mood for a total of 513 days (three days each). Each day was described by every subject as ordinary ("about average, an ordinary day") or "an unusual day, quite different from the ordinary" by completing the last page of the questionnaire package (Appendix H).

There were a total of 443 ordinary days (86.4%) and 70 unusual days (13.6%). One hundred and seventeen subjects reported at least one ordinary day, 41 subjects reported one unusual day, 10 subjects reported two unusual days, and three subjects reported all unusual days.

Each subject was requested to write a brief description of every unusual day after the bedtime recording of that unusual day. The 67 descriptions (3 unusual days were not described) were judged as positive, negative, neutral, or

unable to decide by five blind, independent, judges (3 graduate students in psychology, 1 undergraduate student in engineering, and one professional engineer). Appendix L presents the 67 descriptions and the instructions given to judges. Of the 67 unusual days, 46 (68.6%) were reported by young adults and 21 (31.3%) were reported by old adults.

The mean percentage of interrater agreement for all of the 67 unusual day descriptions was 90.8% (percentage interrater agreement = [number of agreements/ number of agreements + number of disagreements] X 100). Table 44 presents the numbers of unusual day descriptions judged as negative, positive, neutral, or cannot decide by percentage of interrater agreement for day 1, day 2, and day 3. This table shows that for all three days, the majority of unusual days were judged to be negative rather than positive or neutral.

The following results are the between subjects analyses of mean affect scores for negative unusual day 3 (hereafter called negative day 3) compared to ordinary day 3. Day 3 was selected for these analyses because it contained the largest number of unusual days that were judged as negative with an agreement of at least 80%. Comparisons with positive unusual days were not possible due to small numbers.

Table 45 presents the means and standard deviations of vigor and affect by time of day for negative day 3 and ordinary day 3.

Table 44

Number of unusual day descriptions judged as negative, positive, neutral, or cannot decide by percentage of interrater agreement for day 1 to day 3

Interrater	Day 1				Day2				Day 3			
Agreement[a]	Neg	Pos	Neut	?	Neg	Pos	Neut	?	Neg	Pos	Neut	?
100	10	7	0	0	10	6	0	0	15	1	0	0
80	2	0	1	0	1	0	0	0	5	0	0	0
60	2	0	0	0	2	0	0	0	1	0	1	0
40	0	0	0	0	1	0	0	0	0	0	2	0

Note."Neg" = negative "Pos" = positive, "Neut" = neutral, "?" = cannot decide.

[a] Percentage interrater agreement = (number of agreements/ number of agreements + number of disagreements) X 100.

Table 45

Means and standard deviations of vigor and affect scores for negative and ordinary day 3 at five times of the day

	Vigor		Affect	
Time	Negative[a]	Ordinary[b]	Negative[c]	Ordinary[d]
Wakeup				
M	2.333	3.412	1.579	2.813
SD	3.361	3.465	2.036	1.621
Noon				
M	3.500	4.924	2.263	3.195
SD	3.434	3.566	1.881	1.568
Afternoon				
M	2.778	3.866	1.474	2.758
SD	3.300	3.283	2.632	1.947
Evening				
M	2.667	3.600	1.421	3.070
SD	3.581	3.224	2.244	1.740
Bedtime				
M	1.556	1.765	1.578	3.313
SD	2.770	2.550	2.433	1.303
Daily				
M	2.576	3.513	1.579	3.030
SD	3.289	3.218	2.245	1.636

[a] n = 18. [b] n = 119. [c] n = 19. [d] n = 128.

Note. The difference in *n*s between vigor and affect and the total sample are due to listwise deletion of missing data.

The results showed that negative day 3 had significantly lower mean levels of affect than ordinary day 3. There was no difference in mean vigor between negative day 3 and ordinary day 3.

Table 46 presents the analysis of variance statistics of affect for negative day 3 compared to ordinary day 3. This table shows a significant main effect of day type (negative versus ordinary day factor) for affect. (The mean values for affect presented in Table 45 show that negative days have lower affect means than ordinary days.) Table 46 also shows that there is no time of day main effect or time of day by day type interaction for affect.

Table 47 presents the analysis of variance statistics of vigor for negative day 3 compared to ordinary day 3. This table shows that there was no significant main effect of day type for vigor. A significant time of day main effect was obtained, which reflects the inverted U-shaped pattern typical of vigor. The time by day type interaction was not significant.

Post hoc analyses

The standard deviations of Table 45 were used to compare the variance between negative and ordinary days for affect and vigor.

Table 48 presents the *F*-ratios for homogeneity of variance comparisons of vigor and affect between negative

Table 46

Summary table for the analysis of variance of day 3 affect for the day type and time of day main effects and their interaction

Design	Source	df	SS	MS	F	p
Between						
	Day Type	1	174.099	174.099	21.079	.000
	Error	145	1197.594	8.259		
Within						
	Time	4	15.626	3.907	2.290	.059
	Day TypeXTime	4	14.537	3.634	2.130	.076
	Error	580	989.593	1.706		

Table 47

Sumary table for the analysis of variance of day 3 vigor for day type and time of day main effects and their interaction

Design	Source	df	SS	MS	F	p
Between						
	Day Type	1	69.951	69.951	2.598	.109
	Error	135	3635.156	16.927		
Within						
	Time	4	212.251	53.063	8.248	.000
	Day TypeXTime	4	12.659	3.165	0.492	.742
	Error	540	3473.942	6.433		

Table 48

F-ratios for homogeneity of variance comparisons of vigor and affect between negative day 3 and ordinary day 3 at five times of the day

Time	Vigor[a]	Affect[b]
Wakeup	1.063	1.6
Noon	1.079	1.439
Afternoon	1.014	2.554*
Evening	1.234	1.663
Bedtime	1.18	3.486*

* $p<.02$

day 3 and ordinary day 3 at five times of the day (the calculation of homogeneity of variance followed the same procedure outlined in Study Two, Table 15). Table 48, along with the standard deviations of Table 45 show that for the afternoon and bedtime recordings, affect on ordinary day 3 has significantly less variance than affect on negative day 3. In addition, this table shows that for the same two time of day recordings, there is no difference in the variance for vigor between ordinary and negative day 3. This finding shows that (a) the affect subscale is sensitive to changes in the environment by reflecting greater variability of affect on a negative day compared to an ordinary day, and (b) by vigor remaining stable despite changes in the affect subscale, the discriminant validity of the vigor and affect subscales is supported.

Discussion

Part one: Validity evidence

The results of Study Four attest to the validity of the MUMS as a measure of mood. As predicted, the vigor subscale of the MUMS varied diurnally in an inverted U-shaped pattern for both young and old adults, whereas affect was characterized by a flatter diurnal pattern.

As anticipated, no difference was obtained in mean level of vigor between subjects who experienced a negative

day compared to subjects who experienced an ordinary day. In contrast, affect was found to be significantly lower among those who experienced a negative day compared to an ordinary day. Affect was also observed to have greater variability on a negative day compared to an ordinary day, whereas no concomitant change in vigor occurred.

The results of this study showed that vigor, as predicted, was higher for morning people compared to day or night people only for the wakeup recording; however, vigor was not higher at the evening recording for night people compared to morning or day people. These findings might reflect the influence of the environment on the morning/night mediator of vigor. The wakeup recording is the only recording which is preceeded by similar antecedent conditions for all subjects - sleep. All other time of day recordings are influenced by variable, random, environmental antecedents. It may be, therefore, that morning/night type differences in vigor reflect an interaction of the environment and the morning/night disposition.

As expected, affect was not influenced by morning/night type in this study.

Part two: Age group comparisons of vigor and affect

Differences: As predicted, daily mean levels of both vigor and affect were found to be significantly higher for

old adults compared to young adults. These findings are supported by similar results obtained in Study Two. In that study, vigor was significantly higher for all comparisons of young, middle, and old age groups, and affect was found to be significantly higher for the young-middle and young-old age comparisons. In addition, both vigor and affect were found to be significantly higher for the old compared to the young at all times of the day, with the exception of bedtime vigor, which was age invariant.

The higher mean levels of vigor obtained in this study are supported by only some of the research on physiological arousal. As noted earlier, the research on physiological arousal appears to be inconsistent with regard to age effects. In an attempt to reconcile this apparent inconsistency Lacey (1967) suggested that physiological arousal should be reconceptualized as multidimensional rather than unidimensional, whereby electrocortical, autonomic, and behavioral arousal are viewed within a more complex framework. It may be that subjective arousal (i.e., vigor) is an additional dimension of overall arousal that by itself has its own complexities. One example of this complexity is the different effect of age group membership on diurnal patterns compared to mean levels of vigor. Diurnal patterns of vigor were found to be age invariant, whereas daily mean levels of vigor were significantly different between age groups. This difference suggests that

vigor may be influenced in different ways by different physiological systems, only some of which vary with age.

Sample characteristics may be cited as a possible explanation for the age group differences in mean levels of vigor. For example, the old adults, as regular exercisers, may be a highly vigorous and happy subsample of the old, and undergraduate university students may be an overly stressed, and overworked subsample of young adults. However, the similarity of the current findings to those of Study Two, that consisted of a largely heterogeneous and randomly collected sample of all ages (N= 1449), suggests that this explanation is unlikely.

The lower affect component of mood among the young compared to the old may be explained by environmental differences between age groups. In this study, young adults had twice as many unusual days as old adults. A review of the descriptions of unusual days presented in Appendix L (ID numbers less than 200 are young subjects) suggest that young adults are more financially insecure, occupationally unsettled, and have greater social and sexual demands placed upon them than older adults.

Similarities: Contrary to prediction, peak time of day vigor did not vary between old and young adults. Instead, the noontime recording was the peak level of vigor for both age groups. Furthermore, the inverted U-shaped pattern of

diurnal vigor is very similar between the young and old adult age groups (Figure 5). This similarity suggests that diurnal patterns of vigor and affect are age invariant. These results differ from those of Templer et al. (1981-82) and Brooner et al. (1983) who found that global mood was better in the morning for older people, and better in the evening for younger people.

Bedtime vigor was found to be the only time of day vigor score that was not significantly different between young and old age groups (bedtime vigor was also found to be the lowest vigor score of the day). The absence of an age difference in vigor at bedtime probably reflects an age-invariant prerequisite of low vigor for sleep onset. Bedtime vigor was also found to be the lowest vigor score of the day and invariant among morning, day and night types.

The data presented in Study Four support the conceptualization of the vigor component of mood as an individual's appraisal of his/her somatic state. Vigor for both young and old adult groups was observed to vary diurnally in patterns similar to physiological variables such as heart rate, urinary secretion of adrenaline, and body temperature (Forberg, 1977; Walton, Tinklenberg, Doyle, Horvath, & Kopell, 1976).

The data of Study Four also support the conceptualization of affect as an appraisal of environmental conditions in two ways: Firstly, the diurnal, primarily

linear pattern of affect is what would be expected if mean affect scores were appraisals (averaged across persons) of a variety of essentially random occurring environmental conditions. The only departure from linearity is due to low wakeup scores, which is the only daily recording with a similar environment across subjects - arising from sleep. Secondly, affect on a day which was described as negative due to environmental experiences were found to be significantly lower at all times of the day than affect on ordinary days.

GENERAL SUMMARY AND DISCUSSION

This research has developed the first mood scale (the MUMS) for use with all adult age levels and the first to be validated with older adults. The MUMS is an improvement on mood scales developed on young populations both for empirical and conceptual reasons. It is free from verbal ability bias, has an improved response format, and is brief while maintaining high internal consistency. Administrative advantages are that it can either be self-administered, or read to the subject, and it can be administered easily in groups as well as individually.

One may argue that the MUMS is influenced by a response style of presenting oneself in a socially desirable way (i.e., a good mood); however, Kozma and Stones (1985, in press) have shown that a variety of psychological well-being measures (i.e., happiness, life satisfaction, and morale), are not influenced by socially desirable responses, but that scales that measure social desirability contain much well-being content. The MUMS similarity among the domain of psychological well-being measures makes it equally as unlikely to be effected by socially desirable responding.

Component analysis revealed two major age-invariant components of mood; vigor and positive - negative affect. While each component has been obtained in previous research, the combination of vigor and affect as components of mood is

unique, a feature attributable, at least in part, to the research methodology used here.

This research has repeatedly demonstrated the validity of both the vigor and affect subscales of the MUMS with mature adults under experimental conditions as well as by diurnal measurements. In addition, both the vigor and affect subscales have been found to be significant predictors of a measure of global mood.

A simple theoretical model that encompasses the two components suggests that global mood varies along two main dimensions: a somatic appraisal and evaluation of current environmental conditions.

Vigor was found to change significantly in ways expected of a scale that reflects the appraisal of the somatic states of the individual, and not to change under conditions involving primarily environmental events. Specifically, vigor was found to increase after exercise, to decrease after muscular relaxation, and to follow an inverted U-shaped diurnal pattern, similar to many physiological indices of arousal. In addition, vigor was found to be significantly higher at wakeup for morning people, than for day or night people. Also, bedtime vigor was found to be the only time of day measure that was age invariant, indicating that low vigor for both age groups is a prerequisite to sleep onset. The mean and variance of vigor were also found to be invariant during measurements

where somatic changes were not expected, such as on a negative day compared to an ordinary day. Mean vigor was also found not to change as a consequence of recall of positive and negative experiences.

Affect was found to change in ways expected of a scale that reflects the appraisal of positive and negative environmental influences on the individual. Daily mean affect was found to decrease as a consequence of recall of negative experiences and to be lower on days described as negative compared to days described as ordinary. The findings suggest that affect also increases following participation in positive activities such as exercise and muscular relaxation. In addition, mean affect scores were found to follow a primarily linear pattern throughout the day, reflecting the measurement of averaged reactions to a variety of positive and negative events.

The diurnal pattern of both vigor and affect were found to be age invariant; however, age group differences in mean levels of both vigor and affect have been found. In two separate studies of this research, old adults were found to have significantly higher mean levels of both vigor and affect at all times of the day than young adults. Age differences in the appraisal of vigor suggest that it may be one of several dimensions of overall arousal, some of which increase with age (such as vigor and some physiological measures outlined by Woodruff, 1985), while others decrease (other physiological measures such as electrocortical and

autonomic indicies of arousal, as reviewed by Woodruff, 1985). Age differences in the appraisal of affect may be due to age-related changes in the environment such as improved financial, occupational and social status in later life.

The regression analysis of Study Two showed that among the old, vigor rather than affect was a better predictor of a single-item measure of overall mood (called global mood). For younger age groups, however, affect was a better predictor of overall mood. These data suggest that overall mood is most accurately measured using unequal weights for vigor and affect, and that these weights change with age group membership. Future research should investigate this area more fully using multi-item measures of overall mood.

Another area of future mood research is the measurement and analyses of age effects of abnormal mood states such as depression. It may be that different types of abnormal mood states influence vigor and affect differently. For example, one might expect endogenous or "biological" depression to have a greater effect on vigor (because of vigor's somatic influence) than affect (which is influenced primarily by the environment), whereas reactive or "environmental" depression is likely to influence affect rather than vigor.

References

Andrews, F. M., & Withey, S. B. (1976). Social indicators of well-being: Americans' perceptions of life quality. New York: Plenum.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J. E., & Erbaugh, J. K. (1961). An inventory for measuring depression. Archives of General Psychology, 4, 561-571.

Bellack, A. S., Herson, M., & Kazdin, A. E. (1982). International handbook of behavior modification and therapy. New York: Plenum Press.

Belmore, S. M. (1981). Age-related changes in processing explicit and implicit language. Journal of Gerontology, 36, 316-322.

Bernstein, D. A., & Borkovec, T. D. (1973). Progressive relaxation training: A manual for the helping professions. Champaign, Ill.: Research Press.

Bird, E. I. (1981). Sensitivity of the activation-deactivation checklist to activation during physical activities. Psychological Reports, 49, 375-380.

Bohlin, G., & Kjellberg, A. (1975). Self-reported arousal. Factorial complexity as a function of the subject's arousal level. Scandinavian Journal of Psychology, 16, 203-208.

Bond, A., & Ladder, M. (1974). The use of analogue scales in rating subjective feelings. British Journal of Medical Psychology, 47, 211-218.

Borgatta, E. F. (1961). Mood, personality and interaction. Journal of General Psychology, 64, 105-137.

Bradburn, N. M. (1969). The structure of psychological well-being. Chicago: Aldine.

Bradburn, N. M., & Caplovitz, D. (1965). Reports on happiness. Chicago: Aldine.

Brooner, R. K., Templer, D. I., & Corgiat, M. (1983). Age and diurnal mood fluctuation: A basic biological phenomenon ? Clinical Gerontologist, 2, 55-57.

Burrows, G. C., Cox, T., & Simpson, G. C. (1977). The measurement of stress in a sales training situation. Journal of Occupational Psychology, 50, 45-51.

Cantril, H. (1965). The pattern of human concerns. New Brunswick, N.J.:Rutgers

Cattell, R. B. (1973). Personality and mood by questionnaire. San Francisco, Jossey-Bass Publishers.

Clements, P. R., Hafer, M. D., & Vermillion, M. E. (1976). Psychometric, diurnal, and electrophysiological correlates of activation. Journal of Personality and Social Psychology, 33, 387-394.

Coleman, R. E. (1975). Manipulation of self-esteem as a determinant of mood of elated and depressed women. Journal of Abnormal Psychology, 84, 693-700.

Cox, T., Mackay, C., & Page, H. (1982). Simulated repetitive work and self-reported mood. Journal of Occupational Behavior, 3, 247-252.

Cox, T., Thirlaway, M., & Cox, S. (1983). Repetitive work, wellbeing and arousal. In H. Ursin & R. Murison (Eds.), Biological and psychological basis of psychosomatic disease (pp. 115-136). Oxford: Pergamon.

Cruickshank, P. J. (1982). Patient stress and the computer in the consulting room. Social Science and Medicine, 16, 1371-1376.

Cruickshank, P. J. (1984). A stress and arousal mood scale for low vocabulary subjects: A reworking of Mackay et al. (1978). British Journal of Psychology, 75, 89-94.

Diener, E. (1984). Subjective well-being. Psychological Bulletin, 95, 542-575.

Diener, E., Larsen, R. J., Levine, S., & Emmons, R. A. (1985). Intensity and frequency: Dimensions underlying positive and negative affect. Journal of Personality and Social Psychology, 48, 1253-1265.

Ferguson, G. A. (1976). Statistical analysis in psychology and education. New York: McGraw-Hill.

Froberg, J. E. (1977). Twenty-four-hour patterns in human performance, subjective and physiological variables and differences between morning and evening active subjects. Biological Psychology, 5, 119-134.

Frost, R. O., & Green, M. L. (1982). Velton mood induction procedure effects: Duration and post experimental removal. Personality and Social Psychology Bulletin, 8, 341-347.

George, L. K. & Maddox, G. L. (1977). Subjective adaptation to the work role: A longitudinal study. Journal of Gerontology, 32, 456-462.

Gilberstadt, H. (1968). Relationships among scores of tests suitable for the assessment of adjustment and intellectual functioning. Journal of Gerontology, 23, 483-487.

Gilmore, A. J. J.(1972). Personality in the elderly: Problems in methodology. Age and Ageing, 1, 227-232.

Gurin, G., Veroff, J., & Feld, S. (1960). Americans view their mental health. New York: Basic Books.

Hale, W. O., & Strickland, B. R. (1976). Induction of mood states and their effects on cignitive and social behaviors. Journal of Consulting and Clinical Psychology, 44, 155.

Hays, W. L. (1963). Statistics for psychologists. New York: Holt, Rienhart and Winston.

Hedges, S. M., Jandorf, L., & Stone, A. A. (1985). Meaning of daily mood assessments. Journal of Personality and Social Psychology, 48, 428-434.

Herbert, M. Johns, M. W., & Dore, C. (1976). Factor analysis of analogue scales measuring subjective feelings before and after sleep. British Journal of Medical Psychology, 49, 373-379.

Himmelfarb, S., & Murrell, S. A. (1983). Reliability and validity of five mental health scales in older persons. Journal of Gerontology, 38, 333-339.

Hollon, S., & Beck, A. T. (1979). Cognitive therapy of depression. In P. C. Kendall & S. D. Hollon (Eds.), Cognitive - behavioral interventions: Theory, research, and procedures (pp. 153-204). New York: Academic Press

Kaiser, H. F. (1958). The varimax criterion for analytic rotation in factor analysis. Psychometrika, 23 187-200.

Kim. J-O., & Mueller, C. W. (1978). Factor analysis: Statistical methods and practical issues. Beverly Hills: Sage.

Kozma, A. & Stones, M. J. (1980). The measurement of happiness: Development of the Memorial University of Newfoundland Scale of Happiness (MUNSH). Journal of Gerontology, 35, 906-912.

Kozma, A. & Stones, M. J. (1983). Predictors of happiness. Journal of Gerontology, 38, 626-628.

Kozma, A., & Stones, M. J. (1985). Letter to the editor. Journal of Gerontology, 40, 125 - 126.

Kozma, A., & Stones, M. J. (in press). Social desirability in measures of subjective well-being: A systematic evaluation. Journal of Gerontology.

Lacey, J. I. (1967). Somatic response patterning and stress: Some revisions of activation theory. In M. H. Appley & R. Trumbull (Eds.), Physiological stress: Issues in research. New York: Appleton-Century-Crofts.

Langer, E. J., & Rodin, J. (1976). The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. Journal of Personality and Social Psychology, 34, 191-198.

Larson, R. (1978). Thirty years of research on the subjective well-being of older Americans. Journal of Gerontology, 33, 109-125.

Linton, M., Gallo, P. S., & Logan, C. A. (1975). The practical statistician: Simplified handbook of statistics. California: Brooks/Cole Publishing Co.

Lorr, M., McNair, D. M., Weinstein, G. J., Michaux, W. W., & Raskin, A. (1961). Meprobamate and chlorpromazine in psychotherapy. Archives of General Psychiatry, 4, 381-389.

Mack, J. L. (1970). A comparitive study of group test estimates of WAIS verbal, performance, and full scale IQs. Journal of Clinical Psychology, 26, 177-179.

Mackay, C., Cox, T., Burrows, G., & Lazzerini, T. (1978). An inventory for the measurement of self-reported stress and arousal. British Journal of Social and Clinical Psychology, 17, 283-284.

McNair, D. M., & Lorr, M. (1964). An analysis of mood in neurotics. Journal of Abnormal and Social Psychology, 69, 620-627.

McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). EITS manual for the Profile of Mood States San Diego, CA: Educational and Industrial Testing Service.

McNeil, J. K., Stones, M. J., & Kozma, A. (1986a). Longitudinal variation in domain indicators of happiness. Social Indicators Research 18. 119-124.

McNeil, J. K., Stones, M. J., & Kozma, A. (1986b). Subjective well-being in later life: Issues concerning measurement and prediction. Social Indicators Research, 18, 35-70.

Meddis, R. (1972). Bipolar factors in mood adjective checklists. British Journal of Social and Clinical Psychology, 11, 178-184.

Medley, M. C. (1980). Life satisfaction across four stages of adult life. International Journal of Aging and Human Development 11, 193-209.

Nowlis, V. (1965). Research with the mood adjective check list. In S. S. Tomkins & C. E. Izard (Eds.), Affect, cognition and personality (pp. 352-389). New York: Springer.

Nowlis, V. (1970). Moods: Behavior and experience. In M. B. Arnold (Ed.), Feelings and emotion: The Loyola Symposium (pp. 261-278). New York: Academic Press.

Patkai, P. (1971). The diurnal rhythm of adrenaline secretion in subjects with different working habits. Acta Physiologica Scandinavica, 81, 30-34.

Paulmore, E. & Kivett, V. (1977). Change in life satisfaction: A longitudinal study of persons aged 46-70. Journal of Gerontology, 32, 311-316.

Paulson, M. J., & Lin, T-T. (1970). Predicting WAIS IQ from Shipley-Hartford Scores. Journal of Clinical Psychology. 26, 453-461

Ray C., & Fitzgibbon, G. (1981). Stress arousal and coping with surgery. Psychological Medicine, 11, 741-746.

Recker, G. T., & Wong, P. T. P. (1984). Psychological and physical well-being in the elderly: The Perceived Well-Being Scale (PWB). Canadian Journal on Aging 3, 23-33.

Rogers, T., & Craighead, W. E. (1977). Physiological responses to self-statements: The effects of statement valence and discrepancy. Cognitive Therapy and Research, 1, 99-120.

Ruiz, R. A., & Krauss, H. H. (1967). Test-retest reliability and practice effect with the Shipley-Institute of Living Scale. Psychological Reports, 20, 1085-86.

Russell, J. A. (1978). Evidence of convergent validity on the dimensions of affect. Journal of Personality and Social Psychology, 36, 1152-1168.

Russell, J. A. (1979). Affective space is bipolar. Journal of Personality and Social Psychology, 37, 345-356.

Russell, J. A. (1980). A circumplex model of affect. Journal of Personality and Social Psychology, 39, 1161-1178.

Russell, J. A. (1983). Pancultural aspects of the human conceptual organization of emotions. Journal of Personality and Social Psychology, 45, 1281-1288.

Russell, J. A., & Mehrabian, A. (1977). Evidence for a three-factor theory of emotions. Journal of Research in Personality, 11, 273-294.

Russell, J. A., & Ridgeway, D. (1983). Dimensions underlying children's emotions. Developmental Psychology, 19, 795-804.

Shephard, R. J. (1978). Physical Activity and Aging, Chicago: Year Book Medical Publishers, Inc.

Shipley-Institute of Living Scale for measuring intellectual impairment. (1967). Los Angles, CA.: Western Psychological Services.

Sines, L. K., & Simmons, H. (1959). The Shipley-Hartford Scale and the Dropplet Short Form as estimators of WAIS IQ in a state hospital population. Journal of Clinical Psychology, 15, 452-453.

Sjoberg, L., & Svensson, E. (1976). The polarity and dimensionality of mood. Goteborg Psychological Reports, 6, No. 12.

Sjoberg, L., Svensson, E., & Persson, L-O. (1979). The measurement of mood. Scandinavian Journal of Psychology, 20, 1-18.

Stacey, C., Kozma, A., & Stones, M.J. (1985). Simple cognitive and behavioral changes resulting from improved physical fitness in persons over 50 years of age. Canadian Journal on Aging 4, 67-76.

Statistics Canada (1983). Postcensal estimates of population by sex, age and marital status, Canada and provinces, June 1, 1983. Ottawa: Minister of Supply and Services Canada.

Stock, W., Okun, M. A., Haring, M. J., & Witter, R. A. (1983). Age and subjective well-being: A meta-analysis. In R. J. Light (Ed.), Evaluation studies: Review annual, (Vol. 8, pp.279-302). Beverly Hills: Sage.

Stone, A. A. (1981). The association between perceptions of daily experiences and self- and spouse- rated mood. Journal of Research in Personality, 15, 510-522.

Stone, A. A., Hedges, S. M., Neale, J.M., & Satin, M. S. (1985). Prospective and cross-sectional mood reports offer no evidence of a "Blue Monday" phenomenon. Journal of Personality and Social Psychology, 49, 129-134.

Stone, L. A. (1965). Test-retest stability of the Shipley Institute of Living Scale. Journal of Clinical Psychology, 21, 432.

Stones, M. J. & Kozma. A. (1986). "Happy are those who are happy..." A test between two causal models of relationships between happiness and its correlates. Experimental Aging Research, 12, 23-29.

Stones, M. J., Kozma, A., & Stones, L. (1985). Preliminary findings on the effects of exercise program participation in older adults. Canadian Journal of Public Health 76, 272-273.

Strickland, B. R., Hale, W. D., & Anderson, L. K. (1975). Effect of induced mood states on activity and self-reported affect. Journal of Consulting and Clinical Psychology, 43, 587.

Svensson, E. (1977). Response format and factor structure in mood adjective check lists. Scandinavian Journal of Psychology, 18, 71-78.

Templer, D. I., Ruff, C. F., Ayers, J. L., & Beshai, J. A. (1981-82). Diurnal mood fluctuation and age. International Journal of Aging and Human Development, 14, 189-193.

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

Thorndike, E. L., & Lorge, I. (1944). The teacher's work book of 30,000 words. New York: Bureau of Publications, Teachers College, Columbia University.

Tiller, D. K., & Campbell, J. F. (1984). Response scale effects on the factor structure underlying adjective check lists: Contributions to a taxonomy of mood. Paper presented at the annual meeting of the Canadian Psychological Association, Ottawa, 1984.

Velton, E. (1968). A laboratory task for induction of mood states. Behavior Research and Therapy, 6, 473-482.

Walton, T. R., Tinklenberg, J. R., Doyle, C. M., Horvath, T. B., & Kopell, B. S. (1976). Mood states and 24-hour cardiac monitoring. Journal of Psychsomatic Research, 20, 179-186.

Watson, D., Clark, L. A., & Tellegen, A. (1984). Cross-cultural convergence in the structure of mood: A Japanese replication and a comparison with U. S. findings. Journal of Personality and Social Psychology, 47, 127-144.

Watson, D., Tellegen, A. (1985). Toward a consensual structure of mood. Psychological Bulletin, 98, 219-235.

Watts, C., Cox, T., & Robson, J. (1983). Morningness-eveningness and diurnal variations in self-reported mood. The Journal of Psychology, 113, 251-256.

Wiens, A. N., & Banaka, W. H. (1960). Estimating WAIS IQ from Shipley-Hartford scores: A cross-validation. Journal of Clinical Psychology, 16, 452.

Woodruff, D. S. (1985). Arousal, sleep, and aging. In J. E. Birren & K. W. Schaie (Eds.), Handbook of the psychology of aging (pp. 261-295). New York: Van Nostrand Reinhold.

Zevon, M. A., Tellegen, A. (1982). The structure of mood change: An idiographic/nomothetic analysis. Journal of Personality and Social Psychology, 43, 111-122.

Zuckerman, M., & Lubin, B. (1965). Validation of the multiple affect adjective check list in clinical situations. Journal of Consulting Psychology, 29, 594.

MOOD ADJECTIVE CHECKLIST
****

Name.....Age.....Male...Female...

Married.....Widowed.....Single.....Divorced.....

Highest Level of Education Achieved: (check one)

.... Less than Grade 9
.... Grade 9 to 12
.... Extra education beyond high school, but no university
.... Some University

Please write in time of day.....am/pm

INSTRUCTIONS: On the following four pages, please report how you are feeling <u>right now</u> for each word by circling <u>one</u> of the three responses:

1. no, I do not feel, or "NO"
2. cannot decide, or " ? "
3. yes, I do feel, or "YES"

Don't spend too long on any one word, but give the first response that comes to you.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
chearful	NO	?	YES
boastful	NO	?	YES
blue	NO	?	YES
inspired	NO	?	YES
restful	NO	?	YES
comfortable	NO	?	YES
playful	NO	?	YES
ashamed	NO	?	YES
dull	NO	?	YES
aroused	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
quiet	NO	?	YES
witty	NO	?	YES
dejected	NO	?	YES
egotistic	NO	?	YES
elated	NO	?	YES
contented	NO	?	YES
energetic	NO	?	YES

Please Go To Page 3....

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
uneasy	NO	?	YES
relaxed	NO	?	YES
interested	NO	?	YES
active	NO	?	YES
peaceful	NO	?	YES
affectionate	NO	?	YES
contemplative	NO	?	YES
sad	NO	?	YES
lively	NO	?	YES
annoyed	NO	?	YES
carefree	NO	?	YES
fearful	NO	?	YES
grouchy	NO	?	YES
calm	NO	?	YES
regretful	NO	?	YES
delighted	NO	?	YES
sociable	NO	?	YES
pleased	NO	?	YES
aloof	NO	?	YES
forgiving	NO	?	YES

Please Go To Page 4....

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
placid	NO	?	YES
proud	NO	?	YES
alert	NO	?	YES
nonchalant	NO	?	YES
jittery	NO	?	YES
sorry	NO	?	YES
defiant	NO	?	YES
tense	NO	?	YES
peppy	NO	?	YES
tired	NO	?	YES
joyful	NO	?	YES
attentive	NO	?	YES
bothered	NO	?	YES
downhearted	NO	?	YES
rebellious	NO	?	YES
irritated	NO	?	YES
still	NO	?	YES
excited	NO	?	YES
refreshed	NO	?	YES

Please Go To Page 5....

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
vigorous	NO	?	YES
nervous	NO	?	YES
quiescent	NO	?	YES
satisfied	NO	?	YES
apprehensive	NO	?	YES
dubious	NO	?	YES
leisurely	NO	?	YES
sleepy	NO	?	YES
slow	NO	?	YES
confident	NO	?	YES
distressed	NO	?	YES
strong	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
talkative	NO	?	YES
intense	NO	?	YES
worried	NO	?	YES
drowsy	NO	?	YES
angry	NO	?	YES

Please Go To Page 6....

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
happy	NO	?	YES
overjoyed	NO	?	YES
warmhearted	NO	?	YES
sluggish	NO	?	YES

PLEASE STOP

Thankyou for participating in this research

Appendix B

68-Item Mood Adjective Checklist

MOOD ADJECTIVE CHECKLIST

****

Age..... Male...Female... Time.....

MARITAL STATUS:
....Married
....Widowed
....Single
....Divorced

EDUCATION:
.... Less than Grade 9
.... Grade 9 to 12
.... Beyond high school, but no university
.... Some University

Have you taken any "nerve pills" (tranquilizers or sedatives) or alcohol today? YES.... NO....

INSTRUCTIONS: Please report how you are feeling right now for each word listed below by circling one of the three responses:

1. no, I do not feel, or "NO"
2. cannot decide, or " ? "
3. yes, I do feel, or "YES"

Don't spend too long on any one word, but give the first response that comes to you. Try to respond to every word.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
cheerful	NO	?	YES
boastful	NO	?	YES
blue	NO	?	YES
inspired	NO	?	YES
restful	NO	?	YES
comfortable	NO	?	YES
playful	NO	?	YES
ashamed	NO	?	YES
dull	NO	?	YES
aroused	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
quiet	NO	?	YES
witty	NO	?	YES
egotistic	NO	?	YES
contented	NO	?	YES

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
energetc	NO	?	YES
uneasy	NO	?	YES
relaxed	NO	?	YES
interested	NO	?	YES
active	NO	?	YES
peaceful	NO	?	YES
affectionate	NO	?	YES
contemplative	NO	?	YES
sad	NO	?	YES
lively	NO	?	YES
carefree	NO	?	YES
fearful	NO	?	YES
grouchy	NO	?	YES
calm	NO	?	YES
delighted	NO	?	YES
sociable	NO	?	YES
pleased	NO	?	YES
forgiving	NO	?	YES
proud	NO	?	YES
alert	NO	?	YES
jittery	NO	?	YES
sorry	NO	?	YES
tense	NO	?	YES
peppy	NO	?	YES
tired	NO	?	YES
joyful	NO	?	YES
attentive	NO	?	YES
bothered	NO	?	YES

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
downhearted	NO	?	YES
irritated	NO	?	YES
still	NO	?	YES
excited	NO	?	YES
refreshed	NO	?	YES
vigorous	NO	?	YES
nervous	NO	?	YES
quiescent	NO	?	YES
satisfied	NO	?	YES
leisurely	NO	?	YES
sleepy	NO	?	YES
confident	NO	?	YES
distressed	NO	?	YES
strong	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
talkative	NO	?	YES
intense	NO	?	YES
worried	NO	?	YES
drowsy	NO	?	YES
angry	NO	?	YES
happy	NO	?	YES
overjoyed	NO	?	YES
warmhearted	NO	?	YES

How would rate your mood <u>right now</u>: (circle one of the seven choices)

1. Extremely Good Mood	2. Very Good Mood	3. Fairly Good Mood	4. Even Mood	5. Fairly Bad Mood	6. Very Bad Mood	7. Extremely Bad Mood

THANKYOU FOR YOUR HELP

Appendix C

Appendix C-1

Analysis of variance of mean global mood by age group

Source	df	SS	MS	F-Ratio	p
Between	2	40.892	20.446	17.865	.0000
Within	1379	1578.215	1.145		
Total	1381	1619.106			

Appendix C-2

Analysis of variance of mean vigor by age group

Source	df	SS	MS	F-Ratio	p
Between	2	631.766	315.883	36.057	.0000
Within	1361	11926.677	8.763		
Total	1363	12558.443			

Appendix C-3

Analysis of variance of mean affect by age group

Source	df	SS	MS	F-Ratio	p
Between	2	440.992	220.496	17.053	.0000
Within	1398	18075.759	12.930		
Total	1400	18516.751			

Appendix D

Mood Questionnaire Package

(Experiment One)

MEMORIAL UNIVERSITY MOOD SCALE: (MUMS)

---

1. AGE _____

2. MARITAL STATUS (circle one)

Married Widowed Single Divorced Separated Other

3. SEX (circle one) Male Female

4. YOUR OCCUPATION IS OR WAS BEFORE RETIREMENT

___Homemaker
___Professional
___Managerial
___Clerical Worker
___Small Business Owner
___Tradesman or Labourer
___Other (please specify)
(_____)

5. SPOUSE'S OCCUPATION IS OR WAS BEFORE RETIREMENT

___Homemaker
___Professional
___Managerial
___Clerical Worker
___Small Business Owner
___Tradesman or Labourer
___Other (please specify)
(_____)

PLEASE GO TO NEXT PAGE

BEFORE EXERCISE RECORDING

Please record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

Name.....

AFTER EXERCISE RECORDING

Please record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

THANKYOU FOR YOUR HELP

Appendix E

Muscular relaxation: Written instructions for home use with outline of muscle groups

PROGRESSIVE MUSCULAR RELAXATION EXERCISES

Instructions

1. Go to a quiet room

2. Prevent interuptions. For example, unplug your phone, tell people you don't want to be disturbed for awhile, etc.

3. Its best to lie down for these relaxation exercises, however, a comfortable chair will do.

4. Always close your eyes and keep them closed. This helps you to concentrate on the feelings of tension and relaxation in your muscles, which is important.

5. For each muscle group listed below, first tense, then relax the muscle, holding the tension for about 10 seconds. Do not tense so hard so as to cause a muscle cramp.

MUSCLE GROUPS

A. Both hands
B. Both Bicepts (upper arms)
C. Shoulders - shrug upwards
D. Neck - press backwards
   - turn to the right
   - turn to the left
   - touch chest with chin
E. Breathing - take a deep breath; slowly exhale - 3 times
F. Abdomen
G. Legs - keep straight, raise 3 inches off floor
H. Calves - point toes toward your head
I. Upper Back - Push shoulders back, causing back to arch
J. Tense all muscles
K. All facial muscles

REMEMBER: If there is <u>any</u> reason you do not think you should do any or all of these exercises (for example, a disc problem), or you have any questions, speak to your doctor or to a psychologist.

Appendix F

Appendix F-1

Means, and standard deviations of vigor by group (low initial vigor [scores 0 to 5] and high initial vigor [scores 6 to 9]) before and after participation in group muscular relaxation

		M		SD	
Groups	n	Pre	Post	Pre	Post
Low	10	3.000	4.300	1.491	2.627
High	16	7.750	5.813	0.281	0.843

Appendix F-2

Summary table for the analysis of variance of vigor by time for the high initial vigor group (scores 5 to 9)

Design	Source	df	SS	MS	F
Within	Time	1	30.031	30.031	7.120*
	Error[a]	24	101.228	4.218	

[a] Within subjects error from Table 24 of text.

* $p<.05$

Appendix F-3

Summary table for the analysis of variance of vigor by time for the low initial vigor group (scores 0 to 5)

Design	Source	df	SS	MS	F
Within	Time	1	8.450	8.450	2.003
	Error[a]	24	101.226	4.218	

[a] Within subjects error from Table 24 of text.

Appendix G

Positive and Negative Recall Questionnaire

MEMORIAL UNIVERSITY MOOD SCALE: (MUMS)

---

1. AGE _____

2. MARITAL STATUS (circle one)

Married Widowed Single Divorced Separated Other

3. SEX (circle one) Male Female

4. YOUR OCCUPATION IS OR WAS BEFORE RETIREMENT

___Homemaker
___Professional
___Managerial
___Clerical Worker
___Small Business Owner
___Tradesman or Labourer
___Other (please specify)
(_____)

5. SPOUSE'S OCCUPATION IS OR WAS BEFORE RETIREMENT

___Homemaker
___Professional
___Managerial
___Clerical Worker
___Small Business Owner
___Tradesman or Labourer
___Other (please specify)
(_____)

PLEASE GO TO NEXT PAGE

INSTRUCTIONS: Please record how you are feeling RIGHT NOW for each word listed below by circling either NO, ?, or YES.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

PLEASE GO TO NEXT PAGE

Please make a list of all the BAD things that have happened to you in the past year or so.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

USE BACK OF THIS PAGE IF NECESSARY

Please record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

Please make a list of all the GOOD things that have happened to you in the past year or so.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

USE BACK OF THIS PAGE IF NECESSARY

Please record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

THANKYOU FOR YOUR HELP

Appendix H

Diurnal Mood Questionnaire Package

ID# _____ ALL

1. NAME _____ INFORMATION KEPT

2. PHONE _____ STRICTLY CONFIDENTIAL

3. AGE _____

4. MARITAL STATUS (circle one)

Married Widowed Single Divorced Separated Other

5. SEX (circle one) Male Female

6. YOUR OCCUPATION IS OR WAS (write "R" for retired)

___Homemaker ___Small Business Owner
___Professional ___Tradesman or Labourer
___Managerial ___Other (please specify)
___Clerical Worker (_____)

7. SPOUSE'S OCCUPATION IS OR WAS (write "R" for retired)

___Homemaker ___Small Business Owner
___Professional ___Tradesman or Labourer
___Managerial ___Other (please specify)
___Clerical Worker (_____)

8. PLEASE READ AND ANSWER THE FOLLOWING QUESTION:
****

One hears about "morning" and "night" types of people. Morning people are usually out of bed early, feel alert, and full of energy in the early morning. Night people usually go to bed late, feel alert, and full of energy at night, up until bedtime.

Which ONE of the following do you consider yourself to be ?

____ Definitely a morning type.

____ More of a morning type than a night type.

____ Neither a morning nor a night type.

____ More of a night type than a morning type.

____ Definitely a night type.

MEMORIAL UNIVERSITY MOOD SCALE: (MUMS)

ID# _____ Date_____

INSTRUCTIONS:

On the following five pages are lists of words.

Each page has exactly the same list of words.

These words describe your mood, or how you are feeling right now.

Circle your answer beside each word - either No, ?, or YES.

EXAMPLE:
If you felt peppy at the time, circle YES

If you did not feel peppy at the time, circle NO

If you could not decide if you felt peppy at the time, circle "?"

Answer one page 5 times each day for 3 days.

WHEN TO ANSWER:

1. Whenever you wakeup in the morning; use Page 1
2. Midday (between 11a.m. and 1p.m.); use Page 2
3. Afternoon (between 3p.m. and 5p.m.); use Page 3
4. Evening (between 7p.m. and 9p.m.); use Page 4
5. Bedtime; use page 5

At the top of each page, please write in the EXACT time.

Don't spend too long on any one word, but give the first response that comes to you. Try to respond to every word.

ALL INFORMATION IS KEPT STRICTLY CONFIDENTIAL

If you need assistance, please call Kevin McNeil at 737-4472 or 579-0302.

WAKEUP RECORDING

Please record EXACT time (i.e, 7:45) _____

Remember to record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

MIDDAY RECORDING

Please record EXACT time (i.e, 12:15) _____

Remember to record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

AFTERNOON RECORDING

Please record EXACT time (i.e, 4:10) _____

Remember to record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

EVENING RECORDING

Please record EXACT time (i.e, 8:05) _____

Remember to record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

BEDTIME RECORDING

Please record EXACT time (i.e, 11:45) _____
Remember to record how you are feeling RIGHT NOW.

	NO, I DO NOT FEEL	CANNOT DECIDE	YES, I DO FEEL
peppy	NO	?	YES
downhearted	NO	?	YES
strong	NO	?	YES
refreshed	NO	?	YES
happy	NO	?	YES
pleasant	NO	?	YES
enthusiastic	NO	?	YES
blue	NO	?	YES
vigorous	NO	?	YES
contented	NO	?	YES
lively	NO	?	YES
activated	NO	?	YES
lonely	NO	?	YES
active	NO	?	YES
energetic	NO	?	YES
pleased	NO	?	YES
worried	NO	?	YES

****
PLEASE GO TO NEXT PAGE
****

Please answer the following question AFTER you have completed the final recording (Bedtime) for the day.

How would you describe today? (check one of the following two choices):

____1. About average, an ordinary day.

OR

____2. An unusual day, quite different from the ordinary (for example, starting a new job, death of someone close, feeling in unusually poor health, etc.)

If you had an unusual day, could you please briefly describe what happened, exactly when it happened, and how long it lasted or had an effect on you.

_____

_____

_____

_____

Appendix I

Appendix I-1

Analysis of variance of wakeup vigor by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	210.512	210.512	13.632*
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

* $p < .01$

Appendix I-2

Analysis of variance of noon vigor by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	239.834	239.834	15.530*
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

* $p < .01$

Appendix I-3

Analysis of variance of afternoon vigor by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	163.598	163.598	10.594*
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

* $p < .01$

Appendix I-4

Analysis of variance of evening vigor by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	71.597	71.597	4.635*
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

* $p < .05$

Appendix I-5

Analysis of variance of bedtime vigor by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	38.106	38.106	2.468
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

Appendix J

J-1. Anova: Wakeup vigor by morning/night type

J-2. Anova: Noon vigor by morning/night type.

J-3. Anova: Afternoon vigor by morning/night type.

J-4. Anova: Evening vigor by morning/night type.

J-5. Anova: Night vigor by morning/night type.

Appendix J-1

Analysis of variance of wakeup vigor by morning/night type

Design	Source	df	SS	MS	F-Ratio
Between	Groups	2	121.672	60.835	3.939*
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

* $p < .05$

Appendix J-2

Analysis of variance of noon vigor by morning/night type

Design	Source	df	SS	MS	F-Ratio
Between	Groups	2	21.961	10.980	0.711
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

Appendix J-3

Analysis of variance of afternoon vigor by morning/night type

Design	Source	df	SS	MS	F-Ratio
Between	Groups	2	14.449	7.224	0.468
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

Appendix J-4

Analysis of variance of evening vigor by morning/night type

Design	Source	df	SS	MS	F-Ratio
Between	Groups	2	19.401	9.700	0.628
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

Appendix J-5

Analysis of variance of bedtime vigor by morning/night type

Design	Source	df	SS	MS	F-Ratio
Between	Groups	2	1.953	0.977	0.063
	Error[a]	165	2548.027	15.443	

[a] Between subjects error from Table 40 of text.

Appendix K

K-1. Anova: Wakeup affect by age group.

K-2. Anova: Noon affect by age group.

K-3. Anova: Afternoon affect by age group.

K-4. Anova: Evening affect by age group

K-5. Anova: Night affect by age group

Appendix K-1

Analysis of variance of wakeup affect by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	64.310	64.310	12.449*
	Error[a]	165	847.175	5.166	

[a] Between subjects error from Table 42 of text.

* $p < .01$

Appendix K-2

Analysis of variance of noon affect by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	47.980	47.980	9.288*
	Error[a]	165	847.175	5.166	

[a] Between subjects error from Table 42 of text.

* $p < .01$

Appendix K-3

Analysis of variance of afternoon affect by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	83.733	83.733	16.208*
	Error[a]	165	847.175	5.166	

[a] Between subjects error from Table 42 of text.

* $p < .01$

Appendix K-4

Analysis of variance of evening affect by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	70.398	70.398	13.627*
	Error[a]	165	847.175	5.166	

[a] Between subjects error from Table 42 of text.

* $p < .01$

Appendix K-5

Analysis of variance of bedtime affect by age group

Design	Source	df	SS	MS	F-Ratio
Between	Groups	1	63.753	63.753	12.341*
	Error[a]	165	847.175	5.166	

[a] Between subjects error from Table 42 of text.

* $p < .01$

Appendix L

Instructions to Judges and Subjects' Descriptions of Unusual Days

Instructions Below is a list of descriptions of people's days. Based upon the information provided, please indicate the most likely interpretation of each description as positive (+), negative (-), neutral (0), or unable to decide (?).

ID#	Description	(+,-,0,or ?)
008	Upset about professor who was marking down paper	.....
009	Frustrated with exams, assignments, and work load	.....
013	Hard test	.....
028	Stopped by police for traffic violations	.....
041	Had fight with boyfriend	.....
050	Broke up with boyfriend	.....
057	Made up with girlfriend	.....
061	Nervous about a French test	.....
067	Working at library as monitor; very stressful job	.....
069	Had 3 tests	.....
074	Got money in mail	.....
075	Visit from friend that hadn't seen for long time	.....
115	Meeting with supervisor, who early in the day had given indications it would result in negative evaluation - which was confirmed	.....
238	Headache all day today, worse since 8 p.m.. Usual meds. don't help. Called in sick at 1045 p.m. (won't go to work tomorrow)	.....
286	Had a full day of work then had a dinner party for eight, and two couples invited had problems so had to have or get last replacements	.....
330	Had a dinner party for 8, so very happy all day	.....
431	Aftermath of an attack of M???????? Syndrome	.....
514	Spent all day at country cottage. 8p.m. went square dancing at Kelligrews. Very nice time mixing with many new dancers	.....
539	I have my own square dance club. I had a pot luck supper tonight. I was worried a little that no one would come. I thinks wouldn't go right. It was the first time I did something like this on my own - It was a great success.	.....
543	I was interviewed by Ken Meeker at my home - he wants me to go on "Here and Now" - to tell of my life as an "Outdoors" woman - that was at 2 p.m. - elated all day.	.....
552	Oil tank leaked. Tank had to be pumped and floor washed. Leak occurred at 3:45 p.m.. Work will not be completed until tomorrow morning.	.....
562	Awoke with a sinus headache, so took (2) 222s and slept till 10a.m.. Our oil tank developed a leak, at 1000 a.m.. Called Harvey's Service, who removed the tank. Spent the afternoon cleaning up the spills. Also did some gardening which accounts for my feeling tired. Went out to a pot-luck supper and all evening of square dancing in the High School at Upper Gullies - a very good evening. Returned at 1130	.....

001 Received money, good news .....
003 Phone call, good news, financial .....
017 Tired. 3 term papers due by Friday .....
029 Studying Hard .....
044 Had a bad job interview today at 4 p.m. .....
050 Broke up with boyfriend .....
051 Went to birthday party .....
052 Today is my 20th birthday. Excited whole day .....
055 Job interview. Got job. .....
056 Alot of work. Feeling stressed. .....
059 Found out that there was a prowler in my building .....
061 Lab exam 9 - 1 p.m. .....
101 Stressful day due to course work and personal problems .....
104 Walking home and thought of daughter at home around Bay and got homesick. .....
107 Studying alot. Felt under stress. Pressures to get assignments done .....
113 Migraine headache all day .....
238 Off work today, Flu. .....
244 Overworked. .....
338 My daughter phoned to say she was coming home from Whitecoat, Alberta May 22 - June 6 - with my grandaughter who was one on April 10 - real happiness for me - I can hardly wait. .....
536 Slept less than two hours last nught and I´m definitely the type who needs 6 - 7 hrs.. Prior to going to bed, we were preparing (packing, etc.) for a months vacation in Flordia. Rather keyed up I guess. Not really looking foreward to the Air Travel with so much talk of terrorism. Did not go to usual exercise this morning and did not feel myself all day. .....

004 7 hours in dark room. Very tired. .....
015 Worried about lab exam .....
016 Sick all day today. An unusual day .....
031 Had to give seminar at 930 p.m. .....
034 Very sick .....
048 Found out that grandfather has one week to live .....
050 Broke up with boyfriend .....
056 Alot of work. Feeling stressed .....
057 Found out I got job .....
061 Brokeup with boyfriend .....
074 Fight with boyfriend .....
075 Had flu all day .....
077 Feeling in unusually poor health .....
096 Today was not average in that I recently had oral surgery and am therefore on medication for pain. .....
103 Frosh night. Got smeared with grease. Didn´t like it. .....
107 Studying alot. Felt under stress. Pressures to get assignments done. .....
113 Roomate upset about sick father, up all night with roomate. .....
201 News of friend being admitted to hospital for serious surgery .....
238 Off work again today. Taking antibiodics .....
413 Poor weather prevented me from walking outdoors. Planned tea party cancelled. Just not my day. .....
415 Had trouble about travel arrangements. Agent informed me that my ticket was ready. Lots of mistakes made which upset me. This happened around 1130 a.m.. Hope to get it fixed up soon. .....
422 The anniversary of my husband´s death 3 years ago always brings sad memories .....
536 Felt in unusual poor health today - the doctor thinks ´twas a reaction from pills I took yesterday. Felt improved. Not back to normal yet, however. Hope we don´t have to cancel our trip to Flordia on Sunday .....
543 Have been kind of worried and not my usual peaceful self all day and night - since 930 a.m.. To have a T.V. series about my day - exercising and swimming at Mews Centre and in the country with Ken Meeker - Tomorrow morning! CBC. "Here and Now".....
545 At 3 p.m. attended a cremation of a friend of long standing. Her ashes were scattered by her only son, at Topsail Beach where 25 relatives and friends stood in the sunlight a moving thing to watch. The effect on me was different from attending a funeral at the graveside of a departed person. More inspiring. A pensive mood ensued changed by watching arrival and greetings to the Prince of Wales and Princess Diana .....