A VALIDATION STUDY OF THE SHORT ASSESSMENT OF MORNINGNESS-EVENINGNESS

by

Victoria J. Horneck & Jill M. Mackey-Feist

A Masters' Research Project

presented to
Oregon Health Sciences University
School of Nursing
in partial fulfillment
of the requirements for the degree of
Master of Science

May 7, 1992

APPROVED:

[redacted]

Linda Felver, Ph.D., R.N., Research Advisor

[redacted]

Una Beth Westfall, Ph.D., R.N., Committee Member

[redacted] Chairperson,
Department of Adult Health and Illness

ACKNOWLEDGEMENT OF FINANCIAL SUPPORT

Preparation of this paper was supported in part by scholarship money received from The Beta Psi Chapter of Sigma Theta Tau. Additional recognition is given to Albany General Hospital and Good Samaritan Hospital Corvallis for their continued assistance in the researchers' educational expenses.

ACKNOWLEDGEMENTS

We gratefully acknowledge the love and support of our spouses and families. Without their encouragement and cooperation, this project would not have been possible.

ABSTRACT

TITLE: A Validation Study of the Short Assessment of Morningness-Eveningness

AUTHORS: Victoria Horneck, B.S.N., R.N.
Jill Mackey-Feist, B.S.N., R.N.

APPROVED: ______________________________
Linda Felver, Ph.D., R.N., Research Advisor

Examination of human rhythmic patterns has shown a common variation among people regarding wakefulness preference. The Horne-Östberg Morningness-Eveningness Questionnaire is widely used to differentiate between morning and evening persons. However, the length of the questionnaire (19-items) makes it unsuitable for certain populations, such as the critically ill. The Short Assessment of Morningness-Eveningness, a one-question instrument, was developed by Felver and Lundstedt in 1991. Initial validation testing of this instrument demonstrated support in a predominately female population (Felver & Hoeksel, 1992). However, validity testing is lacking in other populations. The purpose of this study was to examine further the validity of the Short Assessment of Morningness-Eveningness in a male population, replicating the work of Felver and Hoeksel.

The sample consisted of healthy males ($\underline{N}=71$, ages 19-66, Mean $\pm$ $\underline{SD}=30\pm12$) tested in Corvallis, Oregon. Criterion-related validity testing was employed by using the Horne-Östberg Morningness-Eveningness

Questionnaire as the standard. Subjects completed an instrument packet comprised of consent forms, a demographic data form, the Horne-Östberg Morningness Eveningness Questionnaire and the Short Assessment of Morningness-Eveningness.

The Horne-Östberg Morningness-Eveningness Questionnaires were scored according to previously printed guidelines (Horne & Östberg, 1976). Subjects were assigned by score to one of three categories: morning, neither, or evening. The Short Assessment of Morningness-Eveningness was scored separately and subjects were given similar category assignments.

Support was added to the validity of the Short Assessment of Morningness-Eveningness by statistical significance of the Chi-square and Pearson r (both $p = .0001$). Chi-square (4 df, $N = 71$) was 47.4, indicating that a relationship was present between the Horne-Östberg Morningness-Eveningness Questionnaire and the Short Assessment of Morningness-Eveningness. The Pearson r was .80, illustrating a strong, direct relationship between the two instruments. The Cronbach alpha of the Horne-Östberg was .87, consistent with other reports in the literature. The statistical results of this study were similar to those of Felver and Hoeksel (1992).

The Short Assessment of Morningness-Eveningness is ready for research with adult hospitalized patients. The instrument may overestimate persons from the evening category who actually fit the neither category.

However, this will pose little risk to patients as presently acute care settings routinely treat patients as morning persons. The use of the Short Assessment of Morningness-Eveningness may sensitize caregivers to evaluate patient preferences when performing their care interventions. Additional validity testing of this instrument is also necessary with non-college educated/non-students and older individuals.

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CHAPTER I

INTRODUCTION

Rhythmic cycles occur constantly in all forms of life. All organisms (plants, animals and humans) have endogenous rhythms generated from within them and synchronized but not caused by external factors. Examples of external factors that influence plant and animal life are day-night patterns and seasonal changes.

The study of human biological rhythms and their importance is increasing. In humans, biological rhythms are noted in many physiological and psychological variables. Physiological rhythms are evident in secretion of hormones, respiratory parameters, cardiovascular functions, and other variables. Psychological rhythms exist in mental processing and productivity levels.

Examination of human rhythmic patterns has shown a common variation among people regarding wakefulness preference. This preference has been regarded in the literature as morningness-eveningness and is the focus of this research study. The vocabulary used to discuss rhythms is difficult to comprehend if one is unfamiliar with the field. Refer to Appendix A for a glossary of commonly used terms in this paper.

A morning person goes to bed early, arises early in the day and peaks in performance early in the day. An evening person retires later at night and prefers to arise later in the day. The evening person's level of performance is at its low point in the early morning with a gradual rise to peak in the afternoon or evening. Horne and Östberg (1976) demonstrated a morningness-eveningness difference in human body temperature rhythms. Research continues to examine the various significant differences between morning and evening individuals.

Members of the health care world are beginning to investigate human cyclic patterns and their potential effects on treatment. Experiments have been performed comparing medical treatments administered at various times in a 24-hour period. Differences in treatment effects, related to time of administration, have been explored in the fields of pharmacology and radiation therapy. Such findings are prompting health care professionals to focus on the significance of human circadian rhythms. Inferences have been made in research studies that patients progress more quickly if their cyclic patterns are not disrupted. For patient care to be adjusted appropriately, nursing is in need of a reliable questionnaire with positive validity testing to determine morningness-eveningness. The Horne-Östberg Morningness-Eveningness Questionnaire (1976) is a 19-item questionnaire to measure morningness-eveningness which has been tested for validity with strong support. However, because of its length it is not always feasible to use with some severely ill patient populations.

The Short Assessment of Morningness-Eveningness is a short questionnaire developed by Felver and Lundstedt in 1991 to assess morningness-eveningness preference. The questionnaire has been tested for validity by Felver and Hoeksel (1992) in a predominately female student and professional population. The purpose of this study was to test the validity of the Short Assessment of Morningness-Eveningness in a group of male students and professionals. If the validity testing proved favorable, it could extend the usefulness of the questionnaire.

The validation of this instrument could provide nurses with a quick mechanism of assessing a patients' morningness-eveningness preference. If nursing care can be adjusted to the patient's usual or current life patterns, the potential for earlier discharge and increased patient satisfaction is greater.

CHAPTER II

REVIEW OF LITERATURE AND CONCEPTUAL FRAMEWORK

Literature Review

The presence of exogenous rhythmic variations such as the change of seasons or the day-night cycle has been acknowledged for centuries. Less universally recognized are endogenous rhythmic variations which have been documented in practically every species and at every level of organization in organisms. Chronobiology, the study of biological rhythms, elucidates these internally-driven rhythmic processes which can be synchronized to major environmental cycles. More recently, applications of chronobiology have been recognized as pertinent to nursing practice.

The literature review will begin by discussing endogenous biological rhythms and their generation followed by entrainment of biological rhythms. An overview of circadian rhythmicity found in humans will be addressed with its health care implications. The concept of morningness-eveningness will be examined as well as the Horne-Östberg Morningness-Eveningness Questionnaire and development and testing of the Short Assessment of Morningness-Eveningness. The literature review will end with a brief discussion about questionnaire validation. Throughout the literature review, studies and their results will be presented and discussed to demonstrate nursing's need for a short assessment instrument to measure morningness-eveningness.

Endogenous Biological Rhythms and Their Generation

A rhythm (cycle, oscillation) has been defined as a repeating sequence of events through time. Endogenous biological rhythms are intrinsic rhythms generated from within the living organism. It should be noted that these biological rhythms may change characteristics, such as cycle length (Minors & Waterhouse, 1981). Many human and animal biological rhythms, such as body temperature, approximate the 24-hour period, and are therefore called circadian rhythms (Minors & Waterhouse, 1981). Descriptions of numerous identified physiological circadian rhythms can be found in several books and review articles (Minors & Waterhouse, 1981; Luce, 1971; Moore-Ede, Sulzman & Fuller, 1982; Moore-Ede, Czeisler & Richardson, 1983).

The period of circadian rhythms is often similar to the period of major environmental cycles. Therefore a number of experiments have been conducted to demonstrate the internal nature of biological rhythms independent of environmental influence. These "free-running" experiments were performed in caves and isolation units without environmental cycles in order to desynchronize the subjects from external cues. Such studies have demonstrated the existence of endogenous circadian rhythms. Multiple researchers have documented body temperature as a circadian rhythm which consistently cycles approximately every 25 hours. In the following three studies, endogenous rhythms were examined in a free-running state and demonstrate this phenomenon.

Colin, Timbal, Boutelier, Houdas and Siffre (1968) placed a 25-year-old male volunteer in a cave for six months. Among other parameters, rectal temperature was continuously recorded at 30-minute intervals during one month, and intermittently for three additional months. The period of the pre-isolation rhythm was not recorded, although the investigators stated that the rectal temperature rhythm during isolation progressively lengthened from 24 hours, 28 minutes to reach a mean of 24 hours, 44 minutes during the last four months.

Mills, Minors and Waterhouse (1974) studied seven solitary subjects (6 males, 1 female, mean age $\pm$ SD = 23 $\pm$ 5.5) and two groups of four subjects (one male group, mean age $\pm$ SD = 19.5 $\pm$ .5; one female group, mean age $\pm$ SD = 18.5 $\pm$ .5) five to thirteen days in isolation units without indications of day and night. All were asked to follow "what seemed to be" their customary rising, taking meals and retiring times. Body temperature, activity and urinary constituents were monitored and analyzed using cosinor statistical methods. Temperature rhythms remained around or slightly longer than 24 hours for all subjects, despite observed variable patterns of activity.

Another study by Minors, Nicholson, Spencer, Stone and Waterhouse (1986) examined 30 subjects, ages 18-22 years (23 males and 7 females). The subjects were studied in eight experimental groups over nine days in an isolation unit to determine the effects of irregularly imposed patterns of work and rest on rectal temperature, electrolyte excretion and performance. An average of eight hours rest was provided every 24 hours to avoid sleep deprivation. Rectal temperatures were measured hourly during work periods and by telemetry during sleep in the first two groups. Temperatures were measured every two minutes in six subsequent experiments using a vitalog TML 2 recorder. Voided urinary electrolytes and performance tests were obtained every two hours while awake. Almost all resulting fitted rhythms exceeded 24 hours, providing evidence that rhythms no longer remain synchronized to the 24-hour day in conditions of irregular work and rest schedules.

The discovery of endogenous circadian rhythms was the impetus for the search for mechanisms which generate the endogenous rhythms. A review article by Minors and Waterhouse (1986) cited studies performed on mammals and lower animals which indicated that the suprachiasmatic nuclei (SCN) of the hypothalamus act as a circadian pacemaker. There is some disagreement whether the SCN is the only controller, or whether several self-sustaining oscillators exist. Moore-Ede, et al. (1982) postulated that a network of rhythmic components normally connected by at least two pacemakers were connected to numerous oscillators that, while not autonomous, could be driven by a higher pacemaker such as the SCN.

Entrainment of Biological Rhythms

Aschoff (1969) proposed that the temporal orientation of human circadian rhythms to the environment reflected evolutionary adaptation to external cues. Examples of exogenous rhythms are the solar day, sleep-wake schedule, eating patterns and other social cues. These rhythmic environmental influences are referred to as zeitgeber, or synchronizers because they can entrain endogenous rhythms. For example, endogenous rhythms such as body temperature are usually synchronized by the exogenous cycles, such as the light-dark cycle. The peak of the body temperature rhythm occurs during the daytime in a day-active person (Minors & Waterhouse, 1986).

Human endogenous circadian rhythms were previously thought to be relatively insensitive to light-dark external cues, unlike the endogenous rhythms of many mammals. A study by Czeisler et al. (1986) renewed interest in the role of light in resetting the human circadian pacemaker(s). A healthy, medication-free 66-year-old woman with a shortened intrinsic circadian temperature period of 23.7 hours (as demonstrated by initial testing) was the subject of this laboratory controlled study. Circadian phase assessments were compared before and after entrainment to a 24-hour day, with and without four hours of exposure to bright indoor light every evening (7,000-12,000 lux). During this time, the subject lived a fully scheduled regimen in an environment free of external time cues. The intervention caused a phase-delay shift of the endogenous component of body temperature by nearly six hours. This phase shift was verified by nonparametric spectral analysis-waveform eduction of the temperature data and patterns of cortisol excretion.

Subsequent temperature monitoring indicated that the temperature cycle drifted back to its original advanced phase position over the following 7-10 days after the treatment was discontinued and the subject returned to her home environment. Further studies are necessary and caution is warranted in drawing conclusions from single case studies. Yet these data suggest a model in which the external light cycle synchronized the endogenous circadian oscillator(s).

The ability of social contact to synchronize endogenous rhythms was demonstrated in several studies conducted by Wever (1979). The investigator compiled the results of over 200 isolation experiments involving 184 volunteers under varying conditions. The average length of the experiments was 29 $\pm$ 5 days ranging from 10-89 days. Eighteen of these experiments involved two subjects, whereas three experiments studied four subjects together in isolation. The variables measured in the majority of the experiments were continuous rectal temperatures, activity and urinary constituents. In general, no noticeable differences were found between the results of individual and group experiments. For example, two identical experiments were performed with two pairs of male subjects together in isolation for four weeks under constant conditions without environmental time cues. Specific details regarding the pre-experimental individual characteristics were not readily available, although both subjects in the first experiment were age 25 and the subjects in the second experiment were age 23. In the first experiment, the rhythms of activity and rectal temperature for both subjects showed equal periods, and remained unchanged during the entire experiment. In the second experiment, internal desynchronization occurred spontaneously after approximately two weeks for both subjects. This indicated that the rhythms of each subject were synchronized internally and mutually, suggesting a sense of social compliance, even in a free-running state.

Further evidence of the effectiveness of social contact as a zeitgeber was supplied by the incidental finding of a "failed experiment" reported by Wever (1979). The 26-year-old male subject was intended to live continuously under constant conditions without time cues. The individual showed a rectal temperature period of 25.0 hours until approximately the eighteenth day when it shortened very closely to 24 hours and remained at that value. No zeitgeber had been introduced deliberately. Later it was discovered that the assistant who was responsible for checking the subject had been entering the connecting lock every morning at the same time and leaving the subject letters on these occasions. Wever's analysis supported the position that the body temperature and activity rhythms were free-running for the first 18 days, but these rhythms became entrained to a 24-hour zeitgeber after that point.

Circadian Rhythmicity and Health Care Implications

Numerous physiological circadian variations have been demonstrated in multiple body systems. For example, in the endocrine system, the circadian periodicity of pituitary-adrenal secretions has been shown to be endogenous in nature. It is also resistant to short-term entraining influences such as manipulations of the sleep/wake and feeding cycles (Krieger, 1979).

In the cardiovascular system, circadian variations for heart rate and blood pressure have been clearly established (Smolensky et al. 1976). Blood volume is affected by factors such as plasma proteins, hematocrit, blood viscosity, renal plasma flow and glomerular filtration rate which all demonstrate circadian rhythmicity (Lemmer, 1989).

In the respiratory system, multiple factors affecting airway function such as airway resistance, plasma cortisol levels, catecholamine levels, cholinergic tone, and mast cell inflammatory cell mediator release have demonstrated circadian rhythm variations (Barnes, 1985).

In the renal system, circadian variations exist for functions such as glomerular filtration rates (GFR), protein, hormone and electrolyte excretion. Urine formation is influenced by transient exogenous factors such as diet and postural changes, and by endogenous rhythms such as ADH secretion and cardiac output. The overt GFR rhythm is the result of entrained endogenous rhythms being overlaid by transient factors (Koopman, Minors & Waterhouse, 1989). Therefore, studies have been designed to hold exogenous factors constant. These studies have demonstrated that endogenous rhythms persist for GFR and electrolyte excretion, especially potassium (Koopman, Koomen et al., 1989; Minors & Waterhouse, 1982).

These and other well-characterized circadian variations have led to increased investigation of the principles underlying the rhythmicity. Entire fields of study have developed, such as chronopharmacology, in which the timing of medication is examined. Circadian rhythms in the rates of absorption, hepatic conjugation and urinary excretion of medications have been demonstrated to affect responses to medications (Moore-Ede, 1973). The vast majority of studies of this nature have been performed on animal subjects, although circadian variations are being increasingly characterized in humans.

Implications for health care are wide-spread, such as with the timing of chemotherapy in oncology, or steroid therapy for asthmatics. For example, Reinberg and Sidi (1966) evaluated the timing of the antihistamine Periactine in six subjects. Three males ages 16, 20 and 43 and three females ages 15, 21 and 42 were injected with histamine at four fixed intervals. Attempts were made to standardize subjects' routines at least one week prior to each testing period. Each individual served as his/her own control, being injected with histamine in the absence of antihistamine administration. A skin reaction, as evidenced by the presence of wheal and erythema, was noted for 15-17 hours when Periactine was given at 0700, as compared to only 6-8 hours when Periactine was given at 1900. This study was limited by sample size and the use of a somewhat subjective measure which could be affected by individual differences such as the subject's age or immunity response. However, this study supported that the duration of drug activity was dependent upon the timing of its administration, since the effect varied with the phase of each subject's circadian system.

Physiological circadian variations have also been correlated with performance and judgment variations. A study by Monk, Weitzman, Fookson and Moline (1984) evaluated the performance efficiency of three tasks: serial search, verbal reasoning, and manual dexterity in two men (ages 22 and 79) and two women (ages 52 and 56). A series of four experiments was performed in free-running isolation units, with provisions made to protect the subjects from external cues and practice effect bias. Several physiological measures were taken: rectal temperatures (sampled every minute), urine volume and timing of events such as exercise, meal requests and sleep periods. The subjects entered the data into a computer in the isolation unit, minimizing external interaction. Using a Fourier-based cosinor technique (to cope with unequal sampling intervals), the investigators were able to determine the best fitting periods of the various circadian rhythms. All the performance tasks tested except for the serial search in the 79-year-old male subject demonstrated rhythmic variation

($p < .05$). The investigators were unable to demonstrate that the best performance of tested tasks consistently coincided with temperature or sleep/wake oscillator cycles in all subjects. An interesting finding was that three out of the four experiments demonstrated dramatically shorter task periods for the cognitive verbal reasoning task, than the more simple repetitive tasks such as serial search and manual dexterity. For example, the best fitting period of the verbal reasoning task for subject four was 24.8 hours, compared to 28.5 hours for the search task. The investigators believed that these findings supported their major thesis that the different task performance rhythms are under different oscillatory control.

The first nursing studies of rhythms were designed in the late 1960's and early 1970's to verify the results of circadian rhythm studies by other researchers. The following two studies exemplify this.

Felton (1970) studied 32 healthy female nursing students, aged 20-25 for the coordination of circadian relationships between body temperature and systolic blood pressure before and after daylight saving time (DST). A presumably homogenous group who engaged in comparably similar activities were selected for intersubject comparison. The investigator hypothesized that a measurable phase relationship between the daily blood pressure and temperature curves would exist prior to DST. Although the social routine changed with clock time changes, they believed that the blood pressure and temperature curves would remain as prior to DST. Within three days after

DST, the investigator presumed that the blood pressure and temperature curves would adjust.

"Factor Analysis of Variance" was used to compare the day before and after DST. The F value was computed as interaction/error, with an established level of significance at .05. Interval sampling of blood pressure and oral temperature was performed between 0630-2130 hours during three days prior to and six days after DST. Mean curves were exhibited, except the minimum diastolic pressure did not manifest the same time of day low as the systolic. Although the social routine based on clock time changed after DST, the systolic blood pressure and temperature curves remained on the before DST clock time (i.e., F not significant at .05). The blood pressure curve shifted within two days after DST, whereas the temperature curve lagged through day six, the final day of the study.

Leddy (1977) attempted to replicate Felton's work, monitoring the effects of sleep time modification on the blood pressure and temperature of 50 nursing students. The sleep-wake cycle of 25 students was advanced one hour for ten days. Findings failed to support an alteration in the blood pressure and temperature curves for the experimental group. A methodological flaw in this study was the lack of shift in the social and work routine of the experimental group. They simply went to bed and arose one hour earlier, leaving all other exogenous synchronizers unchanged. Such a flaw may have contributed to findings reported in this study.

Nurse scholars have also been interested in the application of circadian rhythm findings to health care. Subsequently, studies related to sleep-wake impairment, circadian alteration in hospitalized populations, and the applications of chronobiology principles resulted. The following studies are examples of nursing's varied interest in biological rhythm research.

A case study by Hall (1976) chronicled her attempts to improve the rehabilitation process and outcome for her elderly client population. Peak temperature and performance trends were determined through data collected by both the investigator and the subjects. Hall used interviews and weekly vital sign measurements. The subjects provided self-recorded daily diaries of "times of feeling and performing best" and hourly sublingual temperatures, pulse and respiration measurements (while awake). From these data, the investigator planned and implemented the rehabilitation course, attempting to incorporate the client's "peak times" into the interventions. Two case studies were presented in which positive rehabilitation outcomes were noted. Due to the lack of scientific methods, it is impossible to make generalized conclusions regarding the results of the author's interventions. Yet, controlled studies investigating teaching retention and performance during "peak times" may provide fruitful information in the future.

Floyd (1984) examined the interactions between individual sleep-wake rhythms and an imposed psychiatric hospital rest-activity schedule. Thirty-five hospitalized subjects (18-64 years old, mean age $\pm$ SD=31.8 $\pm$ 13.0) were matched with 35 outpatient controls (19-70 years of age, mean age $\pm$ SD $= 38.4 \pm 13.3$), on the variables of psychiatric diagnosis and gender. Age and chemical substance effects were specified as potential covariates. Morningness-eveningness preference of the subjects was determined using the Horne-Östberg Questionnaire. Sleep measurement was determined by a subjective instrument, the Modified Sleep Chart.

The investigator hypothesized and found that wake/sleep rhythms of inpatients were shorter when compared with outpatients as measured by analysis of covariance and matched pairs t test ($F = 4.78$, $p < .05$). A second hypothesis stating that hospitalized evening types would have shorter total sleep time than the hospitalized morning types was not supported. An interesting finding showed significantly different mean times of falling asleep ($p < .05$) and awakening ($p < .001$) did exist between the outpatient morning and evening people. However, the mean times of falling asleep and awakening for the different circadian types who were hospitalized were not found to be significantly different. The investigator believed that these data demonstrated inferred phase shifts by all three hospitalized circadian types. She also believed that this shifting suggested that the hospital rest-activity rhythm functioned as a strong zeitgeber of sleep and wakefulness for this population. Further studies relating patient progression in an unaltered rest-activity schedule would be helpful.

Farr, Keene, Samson and Michael (1984) provided an example of a study relevant to nursing which adhered to the rigorous testing and use of chronobiological rhythm analysis. Eleven day-active women surgical subjects (ages 22-42, mean 30.7) and comparable age-matched controls (mean 30.9) were studied comparing changes in oral temperature, blood pressure, heart rate, urinary excretion of catecholamine metabolites 17-keto steroids, sodium, potassium and creatinine. One subject acted as her own control preoperatively. These variables were measured at two-hour intervals 0800-0200 while the subjects were hospitalized. After discharge the same variables were measured at three hour intervals on a weekly basis. Controls were sampled for either four consecutive days or two sets of two consecutive days with the interim not exceeding ten days. Findings from these data suggested that circadian rhythms in 17-keto steroids, sodium/potassium excretion ratio, urine creatinine, heart rate, and systolic blood pressure uncoupled from external cues in most of the hospitalized individuals. Rhythms appeared to return toward normal patterns during hospitalization and to a more normal profile during convalescence at home.

The investigators indicated that the study was limited by the inability to collect sufficient preoperative data for postoperative comparison within subjects. Certain extraneous factors, such as medications, diet, or activity schedules may have contributed to the variability of the findings. Even so, this study demonstrated the occurrence of rhythmic disruptions in patients experiencing stress and hospitalization. Additional studies are warranted to determine whether these disruptions are detrimental to the patient.

Moore (1982) attempted to apply principles of chronobiology when investigating the influence of the cis-platinum chemotherapy on the development of nausea and vomiting. A convenience sample of 13 subjects (ten females and three males ages 49-68 years) received chemotherapy during four main time periods: between 0840-0930; 1245-1500; 2000-2200; and 0130. The investigator compared the associations between numerous variables and nausea severity and vomiting scores using the Kendall correlation coefficient. Findings from resulting data did not support prior anecdotal reports that patients receiving chemotherapy during evening hours experienced less nausea and vomiting because they "slept off" their symptoms. A significant negative correlation at $p = .01$ significance level was found between the amount of sleep before chemotherapy and degree of nausea for all subjects.

Unfortunately, this study was limited by the lack of standardization of several variables, including the chemotherapy regimes compared and the use of antiemetics. Both variables could bias data results. A larger number of subjects would have also strengthened the findings. The investigator concluded that this study emphasized the need to examine individual circadian differences when considering the nausea and vomiting problem. This example supports the need for an instrument to classify inter-individual differences as does the Horne-Östberg Morningness-Eveningness Questionnaire.

The evaluation of chronobiological principles in nursing studies represents an area of interest which may ultimately result in multiple clinical applications. Nurses are beginning to realize the importance of knowing a patient's wakefulness preference. Additional well-planned and methodologically sound nursing studies would add to the body of knowledge to benefit patient care. Likewise, a valid short assessment of morningness-eveningness preference could be beneficial in studies aimed at timing interventions with physiological rhythms. Such an instrument would provide a feasible, accurate assessment which would require little time and energy from the individuals participating in such studies.

Morningness-Eveningness

Morningness-eveningness is an endogenous characteristic. Recent research study findings add support to this statement. Breeding studies have been performed with fruit flies (Kyriacou & Hall, 1986) regarding genetic involvement in the periods of males' wing beating rhythms. Recent hamster breeding studies (Ralph & Menaker, 1988) have attempted to identify the gene(s) involved in control of wake-sleep patterns.

Investigation into differences in sleep and waking patterns was begun in the early 1900's. Several researchers (O'Shea, 1900; Jundell, 1904; Marsh, 1906 as cited in Horne & Östberg, 1977) began to build the idea of morningness-eveningness. Most early research involved questionnaires to classify individuals as morning or evening people. In the 1930's research expanded the number of classification categories and continued to focus on when persons went to bed in the evening as compared to when they got up in the morning (Wuth, 1931; Winterstein, 1932; Léopold-Lévi, 1932; Freeman & Hovland, 1939 as cited in Horne & Östberg, 1977).

In 1939, Kleitman, Titelbaum and Feiveson studied reaction times and body temperatures. The sample consisted of five male graduate students and an instructor. Subjects alternated between acting as instructor and observer for performances of sensory-motor and sensory-mental-motor tasks at various times of day. The study showed an inverse relationship between body temperature and reaction time. When the body temperature went down the reaction time increased. Best reaction times were found in the mid-day when the temperature was highest, and worst in the morning and late evening when the temperature was lowest. This was one of the first studies linking physiological and psychological testing with level of alertness.

A study by Horne and Östberg in 1976 tested a questionnaire to classify morning and evening type people. The sample consisted of 48 subjects that were randomly selected from a group of 150. The group had equal numbers of males and females with ages ranging from 18-32 years. The study strengthened the validity of the 19-item questionnaire by comparing its morningness-eveningness classification against the body temperature curves. Morning types rose and retired earlier than evening people and had a significantly earlier peak in their temperature curve (t-test; $p = .05$).

Differences in reaction times between morning and evening persons were examined in a study by Kerkhof, Korving, Willemse-v.d Geest and Rietveld (1980). A sample of 18 subjects, nine extreme morning types and nine extreme evening types (with four females in each group) was selected from a larger group of 250 students. The subjects were classified into morning and evening types by the Horne-Östberg Questionnaire. The subjects' reaction times were tested with auditory and visual cues. Morning types showed better reaction times in the morning while evening types performed better in the afternoon.

Other research on the morningness-eveningness concept covers a variety of variables. A study by Pátkai (1971) tested several variables with particular emphasis on two, performance reaction-times and urinary catecholamines excretion. Twenty-two female psychology students were selected from a pool of 186. The subjects were classified as morning or evening types by a questionnaire previously developed and tested by Pátkai in 1970. Eleven morning and eleven evening types were chosen ranging in age from 19-43 (mean age 23.3). Adrenaline excretion was found to be significantly different between morning and evening people ($t = 2.00$, $df = 20$, $p < .05$, one-tailed). Morning types excreted more adrenaline during the morning with declining levels throughout the day, while evening types showed fairly constant excretion levels. In performance reaction-time testing, the morning types demonstrated consistent reaction-times during testing sessions throughout the day, while the evening types' times decreased throughout the day. Practice effects may have played a role in the reaction-time results, while seasonal variations may have influenced the adrenaline excretion. The author's presentation of multiple factors detracted from the main focus of the study and made it difficult to follow.

The endogenous nature of morningness-eveningness is exemplified in a study by Kerkhof, Korving, Willemse-v.d Geest and Rietveld (1981). Subjects were selected from a group of 250 students. The group was given the English version of the Horne-Östberg Morningness-Eveningness Questionnaire and nine extreme morning types and nine extreme evening types were chosen. Each extreme group had four females and five males. Age range of the subjects was not discussed.

Each subject went through two testing sessions, one in the morning (8:00-9:00AM) and one in the evening (7:30-8:30PM). During each testing session, the subjects were monitored for electroencephalogram (EEG) waveforms, electrooculogram (EOG) readings, Galvanic Skin Responses (GSR), heart rate (HR) and Blood Volume Pulse (BVP). During each session, the subjects performed 20 trials of a reaction-time test while being monitored. The subjects' oral temperatures were also measured before and after the reaction time testing. After completion of the reaction-time trials, the subjects completed an Activation-Deactivation Adjective check list. The list consisted of several activation-descriptive adjectives in which subjects rated their immediate feelings.

Morning types were shown to have significantly quicker reaction-times in the morning while evening-types reaction-times were the opposite ($F(1,16)=11.16$, $p<.01$). Evening types demonstrated a significantly higher temperature in the evening than the morning people ($F(1,16)=7.21$, $p<.05$). Morning and evening people tested out to be inversely related in their activation levels with morning people scoring high in the morning ($F(1,56)=7.82$, $p<.01$) and evening people scoring high in the evening ($F(1,56)=28.46$, $p<.01$). Morning people demonstrated less deviation in their cardiovascular functions when influenced by external factors than evening people. EEG activity was shown to be high in the morning for morning people with the inverse for evening people. This study showed that central information processing and physiological factors differ in morning and evening people, which may lead one to believe that a genetic mechanism could be involved.

The previous two studies mentioned (Pátkai, 1971; Kerkhof, Korving, Willemse-v.d. Geest & Rietveld, 1981) also tried to link introversion/extroversion with morningness/eveningness. Other studies

(Kerkhof, 1985; Horne & Östberg, 1977) have also explored this possibility. To date, no conclusive data have been replicated to support this linkage.

Most of these studies of morningness-eveningness involved healthy subjects, usually students, chosen from a larger group. Individuals from within the larger groups were classified as morning or evening types by questionnaire. People with extreme characteristics were chosen as subjects to compare physiological or psychological variables. The resulting data not only helped to support the concept of morningness-eveningness but were also utilized to establish content validity of the various questionnaires.

Several morningness-eveningness scales exist with varying purposes for development. In a study by Smith, Reilly and Midkiff (1989), three morningness-eveningness type scales were compared. One of the scales critiqued was developed by Folkard, Monk and Lobban (1979). Originally, the 20-item questionnaire was administered to 48 night nurses to predict their adjustment to shift work by measuring three characteristics (rigidity or flexibility of sleeping habits, ability to overcome drowsiness and morningness). These characteristics' scores were correlated with subjective (alertness and sleep disturbance) and objective (oral temperature and urinary variables) data. The sample size was criticized as small and homogenous. The items of the questionnaire were poorly correlated (coefficient alpha = .40) (Smith, Reilly and Midkiff, 1989).

A questionnaire by Torsvall and Åkerstedt (1980) was also reviewed (Smith et al., 1989). The questionnaire was developed to provide a concise instrument to measure resistance to change in sleep/work patterns and its effect on circadian type. The questionnaire had seven items and was administered to 375 steel workers with varied shift schedules. The study was criticized for incomplete data reporting. Internal consistency reliabilities ranged from .56 to .76; the test-retest reliabilities averaged .79 (the only reported reliability statistic in the study). The review also questioned the authors' validity measurements and the use of subjective data (sleep difficulties) to determine external validity.

The Horne-Östberg Morningness-Eveningness Questionnaire was also critiqued by Smith et al. (1989). The purpose of this instrument was to determine a person's morningness-eveningness preference as opposed to the two previous assessments which examined shift work adjustment. The review was favorable, discussing the use of both subjective (perceived alertness) and objective (oral temperature) data to determine external validity. The items of the scale were found to be homogenous with a coefficient alpha of .82. The Smith et al. (1989) study confirmed previous data regarding the Horne-Östberg and its reliability and validity. The main criticism of the Horne-Östberg Morningness-Eveningness Questionnaire was its length. The questionnaire consists of 19-items which is too lengthy for many situations. The questionnaire takes a healthy educated adult 15 minutes to complete.

After review of the three instruments, Smith et al. (1989) developed their own 13-item scale combining items from the Horne-Östberg and Torsvall-Åkerstedt questionnaires. The new questionnaire tested out comparable to the Horne-Östberg but the authors believed the shorter length made it more desirable.

Horne-Östberg Morningness-Eveningness Questionnaire

In 1973 (a) Östberg developed a Swedish-language questionnaire to study the inter-individual differences in adjustment to night shift work. The questionnaire was first given to a large group of 150 students with equal numbers of males and females. Forty-eight subjects were selected from the extreme morning and evening types. Subjects recorded their oral temperatures and food intake over varying periods of time. This information was correlated with the classification from the questionnaire. The investigator determined that the questionnaire had the potential to classify individuals into morningness-eveningness types.

Östberg (1973b) continued to develop the questionnaire with computer operators and outputhandlers working various shifts. This study investigated differences in patterns of activity, sleep, oral temperature, time estimation, physical fitness, and food intake. This information was used to help differentiate between the morningness-eveningness types determined by the questionnaire. The study determined that morning types had the most difficulty adjusting to alternate shifts. Again Östberg reported that he felt the questionnaire had potential to classify people into morningness-eveningness types.

In 1976, Horne and Östberg revised the Östberg questionnaire and translated it into English from Swedish (See Appendix B). The questionnaire was administered to 150 students between the ages of 18-32 with approximately equal numbers of males and females. Subjects answered 19 questions, of which the majority were multiple choice with four responses. A few questions used a time scale in which 15 minute intervals were to be marked. The completed questionnaires were scored and subjects classified as definitely morning type, moderately morning type, intermediate type, moderately evening type, or definitely evening type.

Validity of the questionnaire was tested by randomly selecting forty-eight subjects from the pool of 150. Subjects were paid to take their oral temperatures routinely at half-hour intervals for three weeks. Temperatures were recorded from waking until retiring. In the sample there were 18 moderate to definite morning types, 20 moderate to definite evening types, and 10 intermediate types. The results of the study demonstrated that the average temperature curve of morning types peaked earlier than the curve of the evening types. There were also significant differences noted between rising and retiring times of morningness-eveningness types (t-tests, both $p = .001$). Morning subjects arose earlier, retired earlier and slept longer.

Posey and Ford (1981) noted that Horne and Östberg (1976) did not state reliability information or descriptive statistics. Therefore, Posey and Ford (1981) administered the English version of the Horne-Östberg Morningness-Eveningness Questionnaire to another sample group so this information could be computed. The questionnaire was administered to a total of 259 college students (62 men and 187 women) at an American college over a period of three months during the winter. The study showed no significant differences between genders, college classification or time of day the questionnaire was given. However, the authors did not confirm subjects' morningness-eveningness classification by the temperature curve as done in the Horne and Östberg (1976) study. The Posey-Ford study demonstrated a good reliability level (.89) for the questionnaire in addition to favorable descriptive statistics. This study supported the use of the Horne-Östberg Morningness-Eveningness Questionnaire to classify college students as morning or evening individuals.

The Morningness-Eveningness Questionnaire has been translated into several languages including Japanese, Italian, Dutch and Thai (Ishihara, Saitoh, Inoue, & Miyata, 1884; Mecacci & Zani, 1983; Kerkhof, Korving, Willemse-v.d Geest & Rietveld, 1981; Paikemsirimongkol & Rerkjirattikal, 1990), further strengthening the validity of the instrument. Two examples will be cited.

Mecacci and Zani (1983) administered an Italian version of the Horne-Östberg Morningness-Eveningness Questionnaire to 300 college students (ranging from 20-30 years, mean age $\pm$ *SD* = 25.1 $\pm$ 3.9) and 175 workers (ranging from 20-30 years, mean age $\pm$ *SD* = 26.2 $\pm$ 4.9). The gender distribution of the sample was not discussed. Morning and evening classified individuals were chosen from each group (in the student sample 32 morning type and 54 evening type; in the workers sample 32 morning type and 30 evening type) to log their rising and retiring time each day for two weeks during the winter. The study findings supported data from previous studies on differences in rising and retiring times between morning-evening types in addition to verifying the use of the Morningness-Eveningness Questionnaire to determine individuals' waking preference. The authors also hypothesized that workers' rhythms affected by morningness-eveningness are influenced by their job schedules while the rhythms of students are better able to follow their own circadian pattern.

Ishihara et al. (1984) administered a Japanese translation of the Morningness-Eveningness Questionnaire to 25 students (ranging from 18-27 years) of unknown gender distribution. The sample consisted of seven morning types, seven intermediate types, and eleven evening types. The purpose of the study was to validate the Japanese version of the

Morningness-Eveningness Questionnaire. The authors selected 25 subjects from previous experiments which involved sleep deprivation, advanced-shifting, advanced- and delayed-shifting, and normal sleep-wake patterns. Morningness-Eveningness Questionnaire scores and body temperatures (some oral and some rectal) measured every 30 to 90 minutes were correlated. In none of the experiments were the subjects isolated from the external environment. The authors' data demonstrated a high correlation between Morningness-Eveningness Questionnaire scores and peak body temperatures (Spearman rank-order correlation was -.646 with $p < .001$), and demonstrated significant differences in acrophases of body temperature rhythms between morning and evening types. Validation for the Japanese version of the Morningness-Eveningness Questionnaire was supported by this study.

Certain variables such as age and gender are recorded frequently when administering the Horne-Östberg Questionnaire or other circadian instruments. Subject age was considered by Torsvall and Åkerstedt (1980) and Tune (1969). Tune's study involved 600 subjects (ages 20-79) examining their duration and quality of sleep comparing three variables: age, gender and temperament. From the original group of 600 subjects, 240 individuals' data were chosen and analyzed statistically by age (six groups with 20 females and 20 males in each decade category from the 20's to the 70's), gender (two groups), and temperament (two groups). This research study showed that older people retired and awoke earlier. Torsvall and Åkerstedt (1980) confirmed Tune's (1969) findings; however their study did not present the age statistics of their subjects. Torsvall and Åkerstedt demonstrated a correlation between age and morningness-eveningness type. They showed older individuals tend to be morning-types.

Gender is another variable examined by authors performing circadian studies (Posey & Ford, 1981; Tune, 1969). No significant differences in morningness-eveningness due to gender have been reported. Posey and Ford (1981) reported no significant differences in morningness-eveningness between 187 female and 62 male college students. Tune (1969) found that males tended to go to sleep earlier than females but the difference was not significant. Tune did not discuss gender awakening time differences. Research examining the effects of age and gender on morningness-eveningness type is limited. Therefore, it appears further investigation of these variables is warranted.

Seasonal differences in morningness-eveningness have not been examined. However, seasonal differences in oral temperatures have been demonstrated by Horne and Coyne (1975). They measured oral temperatures of 26 subjects (12 males and 14 females, ages ranging from 18-24 years) during three seasonal periods (December, March, and June). Subjects measured their temperatures in half-hour intervals every day from awakening to retiring, for three weeks during each seasonal period. Sleeping times were monitored and remained constant during the sample periods. All subjects oral temperature peaks were noted to be later (averaging 55 minutes) in June as compared to December. The authors suggested that light-dark was not the only factor influencing this circadian difference. June in Britain has 16 hours of daylight as compared with 8 hours of daylight in December. If daylight length had been an important zeitgeber, they hypothesized that there would have been a larger peak time difference in oral temperatures between June and December. The authors also proposed that social cues were an influencing factor.

Mecacci and Zani (1983) noted bedtime differences between student subjects of their study and subjects of the Horne-Östberg study (1976). Mecacci and Zani (1983) attributed the differences to the seasons in which the two studies were administered. Morning type students in the Mecacci-Zani (1983) study went to bed almost an hour earlier than those tested by Horne-Östberg (1976). Evening students classified by Mecacci-Zani (1983) retired a half-hour earlier than Horne-Östberg (1976) students. The Horne-Östberg (1976) study was performed in Britain during summer while the Mecacci-Zani (1983) study was performed in Italy during winter. Confounding the seasonal variation were differences in longitude and culture which is not mentioned by the authors but may have had some effect on their bedtime variations.

Paikemsirimongkol and Rerkjirattikal (1990) discussed how culture can influence morningness-eveningness. The investigators studied morningness-eveningness in a Thai culture where people who awake late are perceived as being lazy. They believed that their subjects may have been entrained to the Thai cultural obligation of arising early. Cultural adaptation is another variable that has not been tested in relation to morningness-eveningness.

The Horne-Östberg Morningness-Eveningness Questionnaire is currently the most reliable questionnaire to measure whether an individual is a morning or evening person. It is important when using a circadian questionnaire that one look at variables such as age and gender. Seasonal and cultural variations may also influence results. Although some of these variables have not been fully investigated, the Horne-Östberg Morningness-Eveningness Questionnaire has become a standard instrument for testing morningness-eveningness of healthy individuals.

<u>Short Assessment of Morningness-Eveningness</u>

Felver and Lundstedt in 1991 developed a short morningness-eveningness questionnaire (Short Assessment of Morningness-Eveningness) for use with critically ill individuals. The investigators were interested in biological rhythms of critically ill adults. The length of the Horne-Östberg Morningness-Eveningness Questionnaire precludes its use with critically ill populations, thus the reason for development of the Short Assessment of Morningness-Eveningness. The Short Assessment of Morningness-

Eveningness is comprised of one question that assesses morningness, eveningness or no preference of an individual (See Appendix C). After development of the question, it was administered to 17 cardiac intensive care patients (Lundstedt, 1991). None of the patients tested had any difficulty answering or understanding the question, so it was deemed ready for validation.

Felver and Hoeksel (1992) performed a validation study of the Short Assessment of Morningness-Eveningness. The sample consisted of 136 subjects, predominately female (90%) college students and faculty members ages 18-65 (mean $\pm$ SD = 35 $\pm$ 11). The authors demonstrated criterion validity by administering both the Short Assessment of Morningness-Eveningness and the Horne-Östberg Morningness-Eveningness Questionnaire to all subjects. The questionnaires were scored separately and the results correlated. The categorization of subjects from the Short Assessment of Morningness-Eveningness demonstrated a strong correlative relationship with the scores on the Horne-Östberg Morningness-Eveningness Questionnaire ($r = .77$; $p < .0001$). The degree of independence between category assignment using the two questionnaires was also assessed using chi-square analysis. Those results also yielded favorable data (chi-square 90.0, 4 df, $p < .0001$), indicating that the category assignment of the Short Assessment of Morningness-Eveningness was strongly related to the category assignment of the Horne-Östberg Morningness-Eveningness Questionnaire.

Further validity testing of the Short Assessment of Morningness-Eveningness is required in more populations to enhance its generalizability. Validity has not been established with males, elderly people and persons without a college education. Validation of this instrument in various populations could be helpful to nursing. The question would be useful in individualizing nursing care for patients to improve effectiveness of nursing therapies and patient teaching. However, prior to the use of this assessment by nurses, further validity testing in various populations should be completed.

Validation of Questionnaires

Validity indicates how well an instrument measures what it is supposed to measure while reliability demonstrates the degree of consistency of the instrument (Polit & Hungler, 1987). A questionnaire cannot be valid without being reliable, and validity of an instrument can be strengthened but not proven. Reliability of a questionnaire can be assessed in three ways: stability, internal consistency and equivalence (Woods & Catanzaro, 1988). Validity is not as easily demonstrated, but is assessed through content, criterion and construct testing.

Criterion-related validity involves two instruments, one that has demonstrated reliability and validity and another that is being tested. Both instruments are administered to subjects and scores are correlated to demonstrate validity of the tested instrument (Polit & Hungler, 1987).

This research study will use criterion-related validity to evaluate the Short Assessment of Morningness-Eveningness with the Horne-Östberg Morningness-Eveningness Questionnaire. Strong evidence exists for the reliability and validity of the Horne-Östberg Morningness-Eveningness Questionnaire, but the validity of the Short Assessment of Morningness-Eveningness has been tested in only one study. This study will replicate the methods used by Felver and Hoeksel (1992). The morningness-eveningness classification from the two questionnaires will be compared in a different population in order to add support to the validity of a shorter and more applicable questionnaire for assessment of morningness-eveningness.

Conceptual Framework

For the purpose of this study, the investigators have devised a conceptual model to represent the complex relationships which result in the biological rhythms observed in humans. Exogenous factors influence the naturally-occurring endogenous rhythms. In turn, these endogenous rhythms may affect some characteristics endogenous to the individual (morningness-eveningness), or be affected by these characteristics (age, gender). The resulting interaction provides the basis for the overt rhythms that are demonstrated in humans. The conceptual framework model is depicted in Figure 1.

Statement of the Problem and the Research Question

The problem is that the Short Assessment of Morningness-Eveningness lacks validity testing in some populations. One of the populations in which testing is lacking is male subjects. If validity testing is positive in a male population, support will be added to widespread use of the question. Consequently the research question of this study is, What is the validity of the Short Assessment of Morningness-Eveningness in a male student and professional population?

CHAPTER III

METHODS

Study Design

This was a replication of the validation study done by Felver and Hoeksel in 1992. The same instruments and data analysis were used as their study. The difference was in the sample composition. The purpose of this study was to expand the validity testing data of the Short Assessment of Morningness-Eveningness.

Sample and Setting

The desired convenience sample was 60 healthy male adults. A total of 105 questionnaire packets were returned, of which the gender distribution consisted of 75 males, 29 females and one unspecified. Five questionnaires were excluded due to failure to meet inclusion criteria and failure to complete the questionnaires. Two subjects declared they were rotating shift workers, and were excluded to be consistent with Felver and Hoeksel's 1992 study. A total of 71 males and 27 females completed the questionnaire packets. The sample was comprised of college students and other adult males. Data were collected in Corvallis, Oregon at the end of various meetings and classes. Subjects were recruited from two college classes, two hospital meetings and one small group gathering. For purposes of our study, the 71 males were the subjects of interest. Data from the 27 females were not included in this analysis.

Inclusion criteria consisted of subjects between the ages of 18 and 90 and able to read, write and understand English. Exclusion criteria included being less than 18 or older than 90, unable to read, write or understand English, and having a current illness requiring hospitalization.

Protection of Human Subjects

The study was presented to the Oregon Health Sciences University Institutional Review Board for approval, and fell under category #2 exemption regulations. Informed consent procedures were followed and participation was strictly voluntary. No costs were incurred by the subjects. The only risk was the inconvenience of filling out forms for 20 minutes. The consent forms were separated from the rest of the packet by the subject and placed in a separate collection box. The questionnaires did not contain the subjects' names and data were kept in the possession of the researchers without any connection of subject names to questionnaires. This process was to insure the confidentiality of the data.

The subjects did not benefit directly from the study, but their participation provided information which has helped to support validation of a shorter assessment of morningness-eveningness. A one question assessment will require less time and energy from individuals who participate in future biological rhythm studies aimed at timing therapy with physiological rhythms.

Instruments

A questionnaire packet was used which was comprised of the following: two identical consent forms, a demographic data record, the Short Assessment of Morningness-Eveningness and the Horne-Östberg Morningness-Eveningness Questionnaire (See Appendices B, C, D, & E). This packet which was originally developed by Felver and Hoeksel (1992) for use in their morningness-eveningness questionnaire validation study, was used with the permission of the authors.

Each subject was asked to complete all portions of the packet. All subjects were able to complete these forms in less than 20 minutes, with the majority requiring 10-15 minutes.

Procedures

Most subjects were from Oregon State University, with others from Good Samaritan Hospital committees. Access to Oregon State University subjects was gained through professors and facility members. Hospital Committee Chairpersons and Department Managers were approached to gain access to other subjects.

Subjects received a standardized verbal explanation of the study, had an opportunity to ask questions, and signed two copies of the informed consent forms prior to participating in the study. They completed the packet previously described with a writing utensil (the researchers had writing utensils available if needed). Upon completion of the questionnaire, the subjects separated their consent forms from the questionnaires. Subjects retained one of the consent forms if desired and placed the other in a collection box provided and marked by the researchers. The rest of the packet was placed in a different collection box appropriately marked and provided by the researchers.

Participation in the study was voluntary and those individuals who did not wish to participate left the room. One individual reviewed the packet before deciding not to participate; a blank questionnaire was returned.

Data Analysis

The Horne-Östberg Morningness-Eveningness Questionnaire, the Short Assessment of Morningness-Eveningness and the Demographic data were all scored in duplicate by the investigators. The scoring criteria were unchanged from that used in Felver and Hoeksel's study (1992; See Appendix F for complete scoring criteria). The Horne-Östberg Morningness-Eveningness Questionnaire data were tabulated using the scoring criteria of Horne and Östberg (1976; See Appendix G for complete scoring criteria), while the demographic data and the Short Assessment of Morningness-Eveningness were scored using the criteria of Felver and Hoeksel (1992).

Totals from the Horne-Östberg Morningness-Eveningness Questionnaire scores were used to classify subjects into one of three categories; morning, neither, or evening (See Appendix F). Subjects were identified as early, no preference, or late persons when tabulating the answers from the Short Assessment of Morningness-Eveningness.

The demographic data "best time of day" question yielded five additional subject responses not given in the Felver and Hoeksel study (1992). Interpretations of these responses were converted into early, no preference or late categories. This determination was made with the assistance of Dr. Felver, in order that these scoring responses would not stray from the original investigators' intent. The "best time" data and the female responses were not the foci of this study, but were collected to be used as part of a series of validation studies.

Prior to data analysis, interrater reliability was established for all scoring criteria. Total interrater reliability from the 71 male subjects' packets was 99%. Any discrepant responses were discussed and determined, using the guidelines provided in Appendix F. Sources of discrepancies were: differences in photocopy template sizes when compared to the questionnaire visual analogue scales, legibility difficulties, and investigator error.

The relatedness of the category assignments from the Horne-Östberg Morningness-Eveningness Questionnaire and the Short Assessment of the Morningness-Eveningness were measured using a Chi-square 3-by-3 contingency table. The strength of the relationship between the Horne-Östberg Morningness-Eveningness Questionnaire and the Short Assessment of Morningness-Eveningness was assessed by Pearson's correlation using the category assignment of the Short Assessment of Morningness-Eveningness with the actual scores of the Horne-Östberg Morningness-Eveningness Questionnaire. Descriptive statistics were computed from the demographic data. The Cronbach alpha of the Horne-Östberg Morningness-Eveningness Questionnaire scores was computed on male data as a measure of its internal consistency.

Data analysis was performed on a Macintosh IIsi computer (Apple Computer, Inc.) using StatView (Cricket Software). The Cronbach alpha was computed on a 386 IBM compatible computer using CRUNCH (Crunch Software Corporation).

CHAPTER IV

RESULTS

The study sample consisted of 71 males with a mean age (± SD) of 30 (± 12). Examination of the demographic data led to the division of the male subjects into two groups: students and non-students. The majority of the sample was students (79%) with 21% of the subjects being non-students (See Table 1). The mean age of the non-student group was higher than the student group, with the student group having a wider age range. Interestingly, the non-students' age was bimodal, with both peaks in the 40's age range.

In this study, subjects indicated whether they were full or part-time students, an addition to the demographic data collected by Felver and Hoeksel (1992). Only one part-time student was identified, and he was added to the non-student group for data analysis.

According to the Short Assessment of Morningness-Eveningness, the highest percentage of males were found to be early persons (See Table 2). This trend changed as the male sample was divided into two groups. The students were almost evenly divided into early, no preference and late persons. The majority of non-students were early persons with an earlier bed and wake time (See Table 1). However, it was important to maintain the perspective that the non-student group was a relatively small sample easily altered by data from a single outlier. Additional caution must be applied in this study when interpreting the means of ordinal data (e.g., category assignment). Strength was added to the present analysis of the ordinal data, as similar mean and median scores reflected a normally distributed population.

Table 2 demonstrates that the percentage of all male subjects categorized as morning individuals by their Horne-Östberg scores was similar to the percentage sorted by the Short Assessment, differing by 7%. Greater differences were noted in the categorization of subjects into neither/no preference and evening/late persons, with the largest difference in the evening/late category. The student group demonstrated a larger range of Horne-Östberg scores (student=47, non-student=36). This group also was more diverse as the Horne-Östberg scores were trimodal, with peaks falling within each Horne-Östberg type (morning, neither and evening; See Appendix F).

Tables 3 and 4 demonstrate selected variables by the Horne-Östberg and Short Assessment categories. When comparing these data, the n values were different in all categories, but greatest in the evening/late category (See Figure 2). It is helpful to visualize the matched and unmatched categories of the Short Assessment of Morningness-Eveningness and the Horne-Östberg Morningness Eveningness Questionnaire by viewing the matrix in Figure 3. Clearly, subjects categorized as morning persons by the Horne-Östberg were also categorized as early persons by the

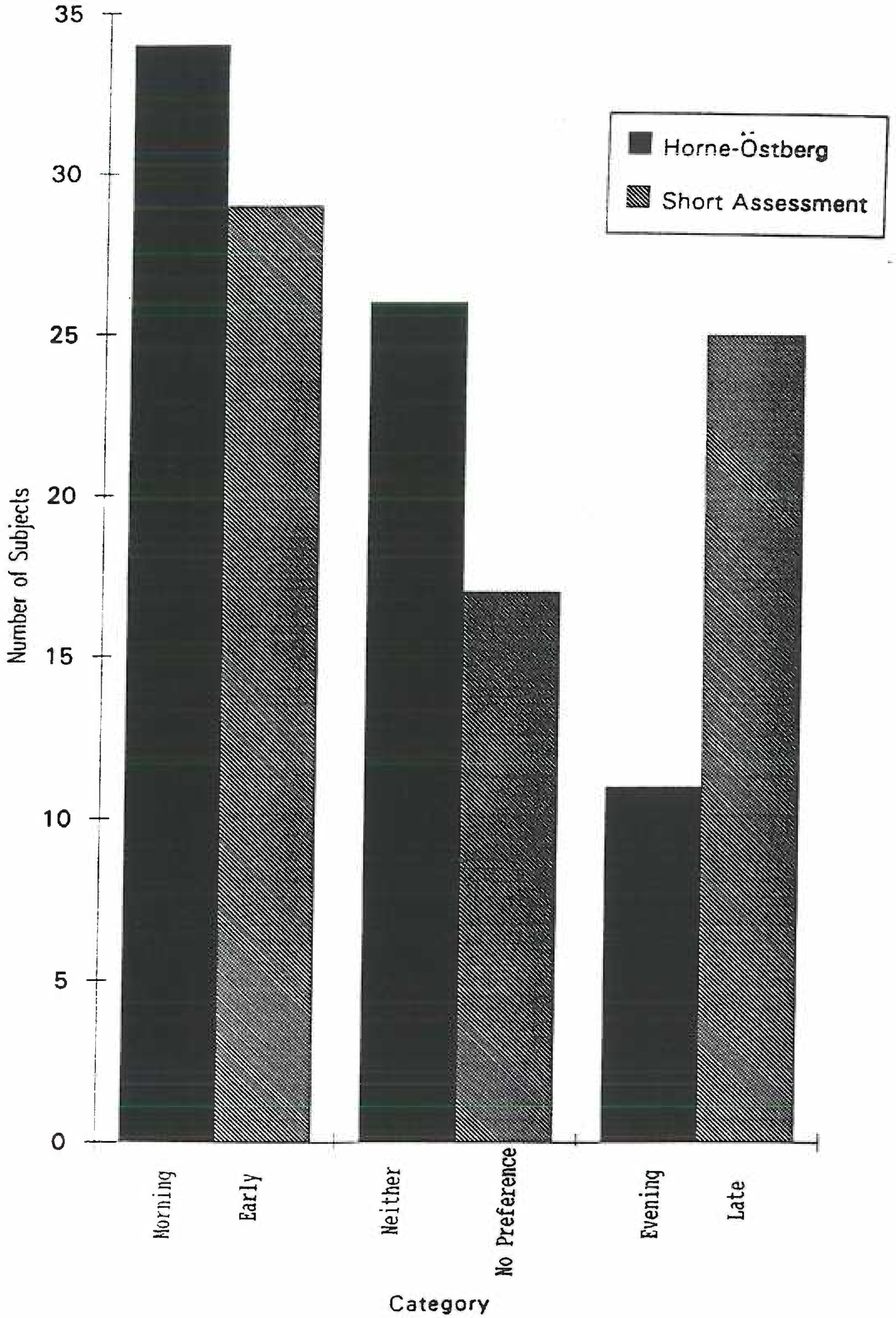

Figure 2. Histogram comparing the categorization of adult males using the Horne-Östberg and Short Assessment instruments.

Short Assessment

Horne-Östberg	early	no preference	late	Totals:
morning	26	8	0	34
neither	3	8	15	26
evening	0	1	10	11
Totals:	29	17	25	71

Figure 3. Three-by-three frequency matrix comparing category assignments by Horne-Östberg and Short Assessment instruments

Short Assessment. Less evident is the agreement within the neither/no preference and evening/late categories. Most importantly, subjects who were categorized as morning persons by Horne-Östberg were never categorized as late persons by the Short Assessment. The inverse was also true: subjects that were evening persons by the Horne-Östberg were never categorized as early persons by the Short Assessment.

Further examination of the variables, divided into the Horne-Östberg and Short Assessment categories, demonstrated that the mean ages of early and morning persons were greater than those found with the late and evening group (See Tables 3 and 4). As one would expect, the bedtimes of the late and evening people were later than the early and morning people with the same trend seen with waking times. The means and standard deviations for both Short Assessment and Horne-Östberg categorization were similar for age, bedtime and waking time. There was more inconsistency of these variables in the neither/no preference category.

For purposes of this study, as eluded to previously in the methods section, best time data were not analyzed separately. It is, however, intriguing to note the similarity between the best time means and the Short Assessment and Horne-Östberg morning/early category results (See Tables 3 and 4). The morning/early category results were identical in best time response at 1.2, with differences of .3 and .2 in the neither/no preference and evening/late categories respectively.

As expected, there was strong agreement between the Short Assessment and Horne-Östberg morning/early category when comparing mean Horne-Östberg scores (See Table 5). Differences became apparent in neither/no preference and evening/late categories. In both of these later categories, the mean Horne-Östberg scores obtained from the Short Assessment categorization were higher than the scores obtained from the Horne-Östberg categorization. When these means were compared to the type divisions of the Horne-Östberg scores (Appendix F), the mean Horne-Östberg score of the subjects that were identified as late persons by the Short Assessment, actually fell into the neither Horne-Östberg category.

The Chi-square analysis for all male subjects indicated a statistically significant relationship between the category assignment for the Horne-Östberg and the Short Assessment instruments, with Chi-Square (4 df, $N=71$) = 47.4, and $p=.0001$. The Chi-square three-by three matrix is presented in Figure 3. Level of significance prior to the study was set at $p<.05$. When analyzing the subjects by student and non-student groups, the category assignment between the Horne-Östberg and Short Assessment instruments again demonstrate statistical significance, with Chi-square (4 df, $n=56$) = 37.8, and $p=.0001$, and Chi-square (4 df, $n=15$) = 10.94, and $p=.03$, respectively. Because the non-student group n was 15, a larger sample would provide increased confidence in the Chi-square level achieved.

The Pearson's correlation coefficient (r) between the groups was significant at $p < .05$. This indicates the degree of relatedness by using the group assignment of the Short Assessment instrument with the actual scores of the Horne-Östberg Morningness-Eveningness Questionnaire. The r for all males was .80 with $p = .0001$. The male student and non-student groups also both had r equal .80 with p's of .0001 and .0003 respectively. The Cronbach's alpha of the Horne-Östberg Morningness-Eveningness Questionnaire scores was computed on all male data and showed good internal consistency at a level of .87.

In summary, when comparing categorizations of the Short Assessment and Horne-Östberg instruments, statistical significance was demonstrated. The most similarity was seen in the morning/early category, with more variation in the neither/no preference and evening/late categories. The Chi-square demonstrated that a relationship existed between the two instruments and the r of .80 demonstrated the strength of the relationship. Thus, this study of adult males, statistically demonstrated that there is a strong direct relationship between the Short Assessment of Morningness-Eveningness and the Horne-Östberg Morningness-Eveningness Questionnaire.

CHAPTER V

DISCUSSION AND SUMMARY

Discussion

The purpose of this replication study was to test the validity of the Short Assessment of Morningness-Eveningness in a male population. Criterion-related validity testing was performed using the Horne-Östberg of Morningness-Eveningness as the standard. Data were collected and analyzed from 71 adult males. The Chi-square test was used to determine if a relationship was present between the category assignments of the Horne-Östberg of Morningness-Eveningness and the Short Assessment of Morningness-Eveningness. The Pearson correlation coefficient was used to demonstrate the degree of relatedness.

Significance was demonstrated in the male sample as indicated by the chi-square ($p = .0001$) and the Pearson's correlation coefficient ($p = .0001$) test results. When the male population was analyzed separately as student and non-student groups, statistical significance persisted ($p = .0001$, $p = .03$, respectively). The significant chi-square results demonstrated that a relationship does exist and the r equal .80 indicated that the relationship is strong and direct. These results support and strengthen the validity testing of the Short Assessment done previously by Felver and Hoeksel in 1992.

The chi-square and Pearson's r values obtained in this study are consistent with Felver and Hoeksel's (1992) results with 136 predominately female subjects (See Table 6). Table 6 compares some of the sample demographics and key statistics of this study with those of Felver and Hoeksel (1992). The Pearson correlation coefficients are almost identical with .80 in the present study and .77 in the Felver and Hoeksel study. The level of significance for both the Chi-square and Pearson's r for the Felver and Hoeksel study was less than .0001. This corresponds with the findings from the current study which achieved a $p = .0001$. Results in both studies were significant and support the validity of the Short Assessment of Morningness-Eveningness.

The Cronbach alpha of the Horne-Östberg Morningness-Eveningness Questionnaire was .87 in the present study. Posey and Ford (1981) and Smith et al. (1989) reported reliability levels of .89 and .82 respectively in their studies which used the Horne-Östberg Morningness-Eveningness Questionnaire. The Short Assessment validation study by Felver and Hoeksel (1992) demonstrated a Cronbach alpha of .89 for the Horne-Östberg Morningness-Eveningness Questionnaire. The Cronbach alpha of this study is consistent with other reports in the literature, indicating that the Horne-Östberg questionnaire has good internal consistency, and continues to be a reliable questionnaire to use in different sample groups.

Specific Study Trends

Some interesting trends, which may have clinical significance are worthy of note. The Short Assessment of Morningness-Eveningness appeared to overestimate the number of evening persons when compared to the Horne-Östberg categories. The major lack of category agreement occurred between neither/no preference and evening/late categories. One hypothesis as to why this occurred is that the Short Assessment no preference category might have been an unacceptable label. Perhaps the subjects felt obligated to select a definite answer, rather than be classified as without a preference. Another possibility is that "no preference" does not imply a time frame choice. When reviewing the Short Assessment categories in comparison to the Horne-Östberg scores, again it became clear that the late category overlapped the no preference category. Upon discussion, the investigators believed that the use of additional demographic information might assist to delineate the division between no preference and late individuals.

The "best time of day" question, which was not the focus of this study, might be an additional way to provide helpful categorization information. Felver and Hoeksel are planning to use these data in further analysis to explore improving the agreement between the Short Assessment and the Horne-Östberg categories.

The variable of age in relation to wake and bedtimes has been previously discussed in the literature. Tune (1969) illustrated that older people awoke and retired earlier. Torsvall and Åkerstedt (1980) demonstrated a correlation between age and morningness-eveningness type, showing older individuals to be more morning type. The tendency for the older subjects to go to bed and arise earlier, in this sample, is in agreement with the study by Tune (1969). However, few studies are available and limited by flaws, examining the effects of age or the aged on morningness-eveningness.

Additional interesting trends among variables were apparent when examining the student and non-student groups, suggesting that this was not a homogenous sample. College students comprised the majority of this study population. There was a tendency for the student wake and bed times to be later than the non-students. A trimodal result in the Horne-Östberg scores for students occurred within the morning, neither and evening type classifications. One possible explanation for these results might be the decreased effect of entrainment to a job schedule as hypothesized by Mecacci and Zani in 1983. However, caution must be taken with this assertion as the demographic information was limited to asked items and did not reflect other obligations of the students, such as part-time jobs or required courses which were offered only in early hours, and any other personal commitments.

Early in development of the Horne-Östberg Morningness-Eveningness Questionnaire (Östberg, 1973a; Östberg, 1973b), shift workers were studied to determine their ability to adjust to working various shifts. The final focus of the questionnaire (Horne & Östberg, 1976) changed to determine morningness-eveningness preference. As a group, shift workers have been given questionnaires specifically developed to determine their adjustment to shift work (Folkard et al., 1979; Torsvall & Åkerstedt, 1980). Such adjustments were not the focus of this study. Felver and Hoeksel (1992) excluded this population to minimize variability. In replication, the present study excluded the two self-identified rotating shift workers. It is possible that some rotating shift workers may have remained in the sample because the investigators had no mechanism by which to identify them.

As previously discussed, the investigators believed that this sample of students and non-students were essentially two different populations. Felver and Hoeksel (1992) also studied students and professionals together as a group. Students as a group have often been studied due in part to their accessibility to researchers. The investigators believe that a greater representation of the non-student group in this study would strengthen the generalizability of the results.

Summary

The identified problem of this research study was that the Short Assessment of Morningness-Eveningness lacked validity testing in some populations. The research question was, What is the validity of the Short Assessment of Morningness-Eveningness in a male student and professional population? Using criterion-related validity, a strong and direct relationship was demonstrated between the Short Assessment of Morningness-

Eveningness and the Horne-Östberg Morningness-Eveningness Questionnaire.

The Short Assessment of Morningness-Eveningness is a feasible and expedient measure of an individual's morningness-eveningness preference, which is an endogenous characteristic (See Figure 1). In humans, endogenous characteristics influence endogenous rhythms, which have readily accessible forms of measurement. The Horne-Östberg Morningness-Eveningness Questionnaire has been used in the past to measure morningness-eveningness; however, it has not been a feasible form of measurement for certain populations. The Horne-Östberg Morningness-Eveningness Questionnaire is lengthy and not appropriate for use with acutely ill individuals. This study has added support to the validity of the Short Assessment of Morningness-Eveningness, which was designed and tested to be used with critically ill individuals.

Health care institution routines may serve as exogenous entraining factors. Health care interventions, if timed to correspond with a patient's morningness-eveningness preference, may minimize disruption of the individual's overt biological rhythms. The Short Assessment of Morningness-Eveningness could be used with patients upon admission to the hospital to adjust timing of care. This has been postulated to expedite recovery and increase teaching retention. Further studies are necessary to test this hypothesis. Use of the Short Assessment of Morningness-Eveningness could allow for that experimentation with minimal risks.

Direction for the Future

The investigators believe that the Short Assessment of Morningness-Eveningness has demonstrated its usefulness in this healthy adult male population. Additional testing in other geographic regions with different groups would help broaden its utility. The careful use of demographic information could help detect cultural bias within the questionnaire and strengthen its validity.

The gathering of additional demographic information would be helpful including a question to identify rotating shift workers. Questioning regarding the subjects' regularity of recent schedules might assist to identify students or adults with irregular time commitments. In future studies it would be helpful to identify these groups and foster further studies of these populations. Validity testing with non-college educated/non-students and older individuals is also needed.

Clarification and more precise direction in answering questions, such as with the "best time" question, may also be beneficial (i.e., "in clock time"), as approximately half of this study sample did not respond in clock hours. "Clock time" and "time of day" data could both be collected, analyzed and compared to augment the preference selected on the Short Assessment of Morningness-Eveningness.

ANOVA statistical analysis of the present data might provide insightful information regarding the relationships between variables. ANOVA statistical analysis of a variety of larger groups would help to determine differences and similarities among groups.

Method and design factors must be monitored for potential sources of study error. In this study, the scoring templates were one source of difficulty. Photocopying of photocopies should be avoided, as variations of scoring scales may occur. Researchers must be mindful of the timing of studies, in relation to demands upon their subjects. Data collection for this study occurred during the week prior to finals for the student sample. This may have affected how individuals responded to the questionnaires. This may have also contributed to the number of incomplete questionnaires that needed to be excluded from the sample.

The Short Assessment of Morningness-Eveningness is believed to be ready for research with hospitalized adult patient populations. It may be argued that this group is increasingly vulnerable due to health reasons, and that the Short Assessment may misidentify those individuals who are in the "no preference" category. In reality, acute care settings generally have standardized care to treat all individuals as if they were morning people, regardless of preferences. The use of this questionnaire may actually sensitize caregivers to evaluate individual patient preferences when performing their care interventions.

Implications for Nursing

If the Short Assessment of Morningness-Eveningness is found to be useful in the acute care setting, it would provide an efficient and feasible way to procure patient information about their morningness-eveningness preference. Nursing philosophers and theorists have traditionally advocated the need for care interventions focused on the individual, as evidenced in the works reviewed in Chinn & Jacobs (1987). In contrast, nurses often work within systems which are not amenable to individual differences. The patient information provided by the Short Assessment of Morningness-Eveningness could be useful in identifying individual preferences and influencing system changes to enhance individual service. Additionally, it may be used to augment patient teaching and retention, or to affect recovery time. Nursing research in these areas of interest could utilize the Short Assessment of Morningness-Eveningness to help identify subjects' preferences. The nurse who is practicing within a tertiary care setting could use the Short Assessment to individualize his/her approach to patient care as a function of research utilization.

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Appendix A

Glossary

Acrophase -	Time of maximum of a fitted cosine curve; often expressed in clock time or degrees (Minors & Waterhouse, 1981, p. 320).
Circadian rhythm -	Endogenously generated biological rhythm with a period of about one day, either free-running or entrained to a zeitgeber (Wever, 1979, p. 267).
Cosinor analysis -	The fitting of a cosine curve to a rhythm by the method of least squares regression (Minors & Waterhouse, 1981, p. 320). Statistical method often used in chronobiological studies
Desynchronization -	Steady state in which different rhythms run with different periods. external - steady state in which a biological rhythm runs with another period then an external zeitgeber. internal - steady state in which different biological rhythms within one organism, or different components of the same biological rhythm run with different periods (Wever, 1979, p. 266).
Endogenous rhythm -	Biological rhythm driven by an internal timing mechanism (Minors & Waterhouse, 1981, p. 321).
Entrainment -	Steady state in which a self-sustained (endogenously generated) rhythm runs synchronously to another rhythm (zeitgeber), with an equal period and a temporally constant phase relationship (Wever, 1979, p. 266).
Exogenous rhythm -	Biological rhythm driven by an external oscillator (Minors & Waterhouse, 1981, p. 321).
Free-running rhythm -	Biological rhythm which is continuing self-sustaining rhythm with an inherent frequency at least slightly different from that of known environmental frequencies (Minors & Waterhouse, 1981, p. 321).

Oscillator -	Mechanism generating a rhythm, characterized by a feed-back system guaranteeing the self-sustainment capacity (Wever, 1979, p. 267).
Overt rhythms -	Body rhythms which are observable and accessible to direct measurements and maybe influenced by transient stimuli (Minors & Waterhouse, 1981, p. 321).
Period -	The time to complete one cycle of a rhythm (Minors & Waterhouse, 1981, p. 321).
Phase -	Instantaneous state of an oscillation within a period, represented by the value of the variable and all its time derivatives. Instantaneous value of a rhythm at a fixed time (Wever, 1979, p. 267).
Phase shifting -	A displacement of a rhythm along the time axis maybe qualified as a phase-advance, when all aspects the rhythm occur earlier in time, or a phase-delay when all aspects of the rhythm occur later in time (Minors & Waterhouse, 1981, p. 321).
Rhythm -	A sequence of events which in a steady state repeat themselves in time in the same order and same interval. Synonymous with oscillation and cycle (Minors & Waterhouse, 1981, p. 321).
"Waveform Eduction"-	A way of extracting underlying trends from complex data to successfully detect circadian rhythmicity. If the period of the expected rhythm is known and data have been collected from several cycles, the average waveform can be derived from averaging corresponding points from each cycle and the averages (with standard errors) plotted over a single cycle (Minors & Waterhouse, 1981, pp. 7, 159)
Zeitgeber -	External periodicity with the capacity to entrain an endogenously generated biological rhythm (Wever, 1979, p. 268).

Appendix B

Horne-Östberg Morningness-Eveningness Questionnaire

Instructions:

1. Please read each question very carefully before answering.
2. Answer ALL questions.
3. Answer questions in numerical order.
4. Each question should be answered independently of others. Do NOT go back and check your answers.
5. All questions have a selection of answers. For each question place an X alongside ONE answer only. Some questions have a scale instead of a selection of answers. Place an X at the appropriate point along the scale.
6. Please answer each question as honestly as possible. Both your answers and the results will be kept in strict confidence.
7. Please feel free to make any comments in the section provided below each question.

The Questionnaire:

1. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?

AM 5 6 7 8 9 10 11 12

2. Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?

PM 8 9 10 11 12 AM 1 2 3

3. If there is a specific time at which you have to get up in the morning, to what extent are you dependent on being woken up by an alarm clock?

____Not at all dependent
____Slightly dependent
____Fairly dependent
____Very dependent

4. Assuming adequate environmental conditions, how easy do you find getting up in the mornings?
   ____Not at all easy
   ____Not very easy
   ____Fairly easy
   ____Very easy

5. How alert do you feel during the first half hour after having woken in the mornings?
   ____Not at all alert
   ____Slightly alert
   ____Fairly alert
   ____Very alert

6. How is your appetite during the first half-hour after having woken in the mornings?
   ____Very poor
   ____Fairly poor
   ____Fairly good
   ____Very good

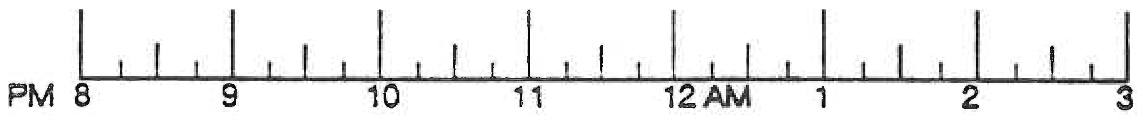
7. During the first half-hour after having woken in the morning, how tired do you feel?
   ____Very tired
   ____Fairly tired
   ____Fairly refreshed
   ____Very refreshed

8. When you have no commitments the next day, at what time do you go to bed compared to your usual bedtime?
   ____Seldom or never later
   ____Less than one hour later
   ____1-2 hours later
   ____More than two hours later

9. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 7:00 - 8:00 AM. Bearing in mind nothing else but your own "feeling best" rhythm how do you think you would perform?

___Would be in good form
___Would be in reasonable form
___Would find it difficult
___Would find it very difficult

10. At what time in the evening do you feel tired and as a result in need of sleep?



11. Your wish to be at your peak performance for a test which you know is going to be mentally exhausting and lasting for two hours. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the four testing times would you choose?

___8:00 - 10:00 AM
___11:00 AM - 1:00 PM
___3:00 - 5:00 PM
___7:00 - 9:00 PM

12. If you went to bed at 11:00 PM at what level of tiredness would you be?

___Not at all tired
___A little tired
___Fairly tired
___Very tired

13. For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning? Which ONE of the following events are you most likely to experience?

___Will wake up at the usual time and will NOT fall asleep
___Will wake up at the usual time and will doze thereafter
___Will wake up at the usual time but will fall asleep again
___Will not wake up until later than usual

14. One night you have to remain awake between 4:00 - 6:00 AM in order to carry out a night watch. You have no commitments the next day. Which ONE of the following alternatives will suit you best?

    ___Would NOT go to bed until watch was over
    ___Would take a nap before and sleep after
    ___Would take a good sleep before and nap after
    ___Would take ALL sleep before watch

15. You have to do two hours of hard physical work. You are entirely free to plan your day and considering your own "feeling best" rhythm which ONE of the following times would you choose?

    ___8:00 - 10:00 AM
    ___11:00 AM - 1:00 PM
    ___3:00 - 5:00 PM
    ___7:00 - 9:00 PM

16. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 10:00 - 11:00 PM. Bearing in mind nothing else but your own "feeling best" rhythm how do you think you think you would perform?

    ___Would be in good form
    ___Would be in reasonable form
    ___Would find it difficult
    ___Would find it very difficult

17. Suppose that you can choose your own work hours. Assume that you worked a FIVE hour day (including breaks) and that your job was interesting and paid by results. Which FIVE CONSECUTIVE HOURS would you select?

12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12

MIDNIGHT NOON MIDNIGHT

18. At what time of the day do you think that you reach your "feeling best" peak?

12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
MIDNIGHT												NOON												MIDNIGHT

19. One hears about "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?
    ____Definitely a "morning" type
    ____Rather more a "morning" than an "evening" type
    ____Rather more an "evening" than a "morning" type
    ____Definitely an "evening" type

Appendix C

Short Assessment of Morningness-Eveningness

Some people get up early in the morning, are energetic soon after they get up, and like to go to bed early. Other people prefer to get up later, are most energetic later in the day, and like to stay up late. Do you consider yourself an early person, a late person, or do you have no preference?

____

Appendix D

OREGON HEALTH SCIENCES UNIVERSITY
3181 SW Sam Jackson Park Road, Portland, OR 97201
School of Nursing, Dept AHI, L456

Consent Form
TITLE OF STUDY: Morningness-Eveningness Questionnaire Validation Study

PRINCIPAL INVESTIGATORS: Vicki Horneck, B.S., R.N., (503)757-5116
Jill Mackey-Feist, B.S., R.N., (503)753-1518
Faculty Research Advisor: Linda Felver, Ph.D., R.N., (503)494-3723

PURPOSE: You are being asked to participate in this research study because you are a healthy adult between the ages of 18 and 90. The purpose of this study is to compare two ways of asking people about their preferred daily schedule. We believe that this study will provide information that will help nurses give better care to their patients.

PROCEDURES: To perform this study, you will fill out questionnaires that ask about your usual sleep-wake patterns and your preferred daily schedule. This will take about 20 minutes.

RISKS AND DISCOMFORTS: The only risk of participation in this study is mild inconvenience from spending about 20 minutes filling out forms.

BENEFITS: You will not benefit personally from this study. The results of this study may benefit other persons in the future by providing information that nurses can use to plan care for their patients.

CONFIDENTIALITY: Neither your name nor your identity will be used for publication or publicity purposes. You will place this signed consent form in a box separate from the questionnaires. Your name will not appear on the questionnaires.

COSTS: No research costs will be charged to you.

LIABILITY: (This statement is required by law.) The Oregon Health Sciences University, as an agency of the State, is covered by the State Liability Fund. If you suffer any injury from the research project, compensation would be available to you only if you establish that the injury occurred through the fault of the University, its officers or employees. If you have further questions, please call Dr. Michael Baird at (503)494-8014.

OTHER: Vicki Horneck, Jill Mackey-Feist or Dr. Felver has offered to answer any questions that you might have about the study. You may reach Vicki Horneck at (503)757-5116, Jill Mackey-Feist at (503)753-1518 or Dr. Felver at (503)494-3723.

Your participation in this research study is voluntary. You may refuse to participate, or you may withdraw from this study at any time without affecting your relationship with Oregon Health Sciences University.

You will receive a copy of this consent form.

Your signature below indicates that you have read the foregoing and agree to participate.

______________________________ ________________
Subject Date

Appendix E

Demographic Data Record

Age ____________

Gender: _______male _______female

Occupation ____

Are you a student?_______yes _______no

________full time________part-time

What is your usual bedtime? _________________________

What is your usual waking time?__________________________

What do you consider the best time of day for you, i.e., the time that you feel the most energetic? ____________________

Appendix F

Morningness-Eveningness Questionnaire Validation Study

Linda Felver and Renee Hoeksel

Scoring Instructions for Short Assessment of Morningness-Eveningness

early person	=	1
no preference	=	2
late person	=	3

Scoring Instructions for Demographic Data Record

gender:	male	=	0	female	=	1
full time student:	yes	=	0	no	=	1

usual bedtime: use 24-hour decimal time (2 decimal places); use midpoint if range given.

usual waking time: use 24-hour decimal time; use midpoint if range given.

best time of day (besttime): Use midpoint if range given

code as 1	code as 2	code as 3
0500-1000	1001-1600	1602-0459
am	day	evening
morning	midmorning	early evening
early to mid am	late morning	late day through evening
semi-early	midmorning-midafternoon	
early-late morning	midmorning, evening	
	late morning, early evening	
	early-mid	
	midday	
	afternoon	
	early afternoon	
	midafternoon	
	biphasic	
	pm	
	late afternoon	

best time of day (bestclock): if answer given in clock hours, score besttime (above) and also bestclock; use 24-hour decimal time; use midpoint if range given.

Linda Felver and Renee Hoeksel

Scoring Instructions for Horne-Östberg Morningness-Eveningness Questionnaire

For questions 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, and 19, the appropriate score for each response is displayed beside the answer box on the transparency template.

For questions 1, 2, 10, and 18, the cross made along each scale is referred to the appropriate score value range below the scale.

For question 17 the most extreme cross on the right hand side is taken as the reference point and the appropriate score value range below this point is taken.

The scores are added together and the sum converted into a five point Morningness-Eveningness scale:

TYPE	SCORE
Definitely Morning Type	70-86
Moderately Morning Type	59-69
Neither Type	42-58
Moderately Evening Type	31-41
Definitely Evening Type	16-30

If three point Morningness-Eveningness scale is desired, use the following:

TYPE	SCORE
Morning Type	59-86
Neither Type	42-58
Evening Type	16-41

Additional Scoring Instructions

For questions 1, 2, and 10:	if mark is between	score as
	4 and 5	5
	3 and 4	4
	2 and 3	2
	1 and 2	1

For questions 11 and 15: if subject writes in 9-11 am, score as if it were marked 8-10 am.

Appendix G

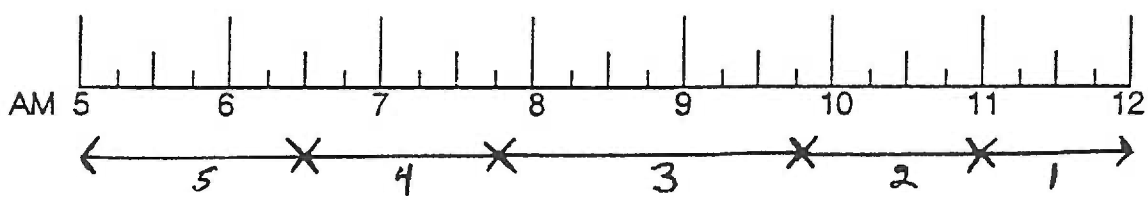
Horne-Östberg Morningness-Eveningness Questionnaire

Instructions:

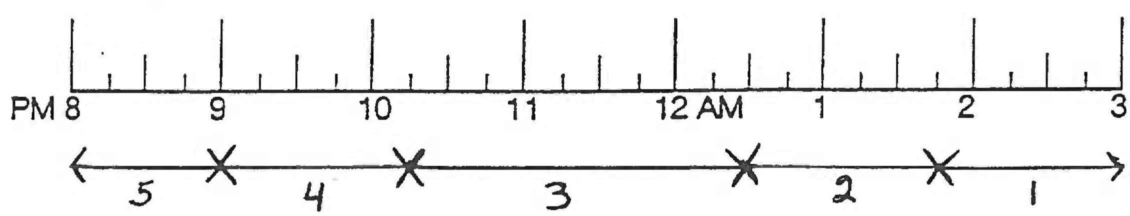
1. Please read each question very carefully before answering.
2. Answer ALL questions.
3. Answer questions in numerical order.
4. Each question should be answered independently of others. Do NOT go back and check your answers.
5. All questions have a selection of answers. For each question place an X alongside ONE answer only. Some questions have a scale instead of a selection of answers. Place an X at the appropriate point along the scale.
6. Please answer each question as honestly as possible. Both your answers and the results will be kept in strict confidence.
7. Please feel free to make any comments in the section provided below each question.

The Questionnaire:

1. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?



2. Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?



3. If there is a specific time at which you have to get up in the morning, to what extent are you dependent on being woken up by an alarm clock?

4 ___Not at all dependent
3 ___Slightly dependent
2 ___Fairly dependent
1 ___Very dependent

4. Assuming adequate environmental conditions, how easy do you find getting up in the mornings?
   1 ___Not at all easy
   2 ___Not very easy
   3 ___Fairly easy
   4 ___Very easy

5. How alert do you feel during the first half hour after having woken in the mornings?
   1 ___Not at all alert
   2 ___Slightly alert
   3 ___Fairly alert
   4 ___Very alert

6. How is your appetite during the first half-hour after having woken in the mornings?
   1 ___Very poor
   2 ___Fairly poor
   3 ___Fairly good
   4 ___Very good

7. During the first half-hour after having woken in the morning, how tired do you feel?
   1 ___Very tired
   2 ___Fairly tired
   3 ___Fairly refreshed
   4 ___Very refreshed

8. When you have no commitments the next day, at what time do you go to bed compared to your usual bedtime?
   4 ___Seldom or never later
   3 ___Less than one hour later
   2 ___1-2 hours later
   1 ___More than two hours later

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Horne-Östberg Morningness-Eveningness Questionnaire

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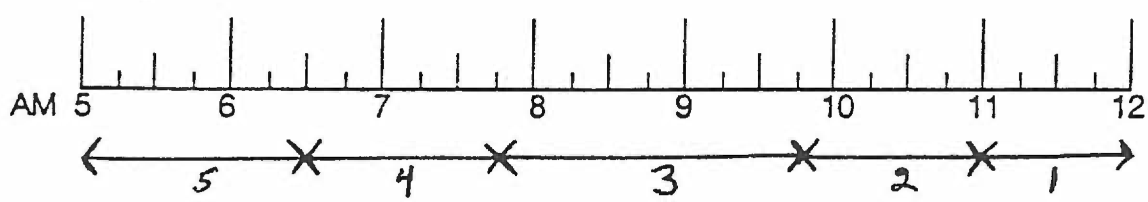

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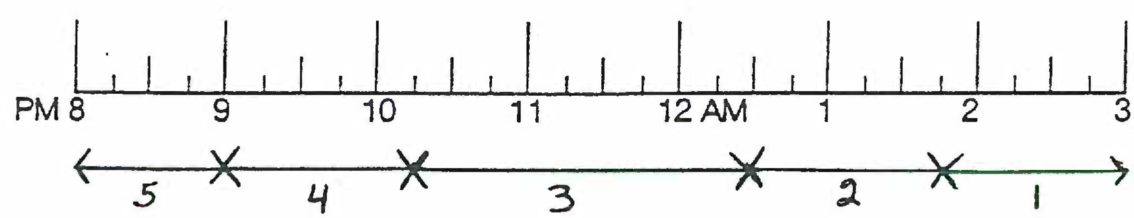

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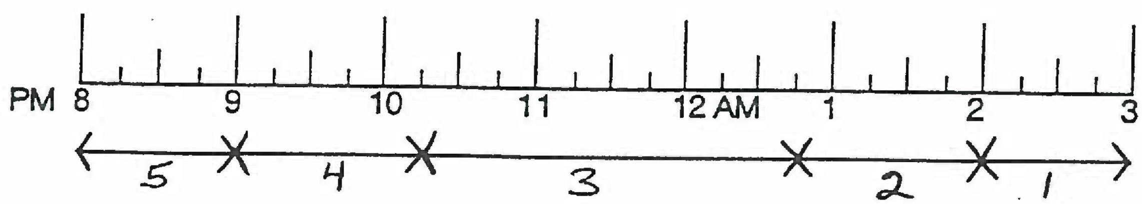
   4 ___Seldom or never later
   3 ___Less than one hour later
   2 ___1-2 hours later
   1 ___More than two hours later

9. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 7:00 - 8:00 AM. Bearing in mind nothing else but your own "feeling best" rhythm how do you think you would perform?
   4 ___Would be in good form
   3 ___Would be in reasonable form
   2 ___Would find it difficult
   1 ___Would find it very difficult

10. At what time in the evening do you feel tired and as a result in need of sleep?



11. Your wish to be at your peak performance for a test which you know is going to be mentally exhausting and lasting for two hours. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the four testing times would you choose?
   6 ___8:00 - 10:00 AM
   4 ___11:00 AM - 1:00 PM
   2 ___3:00 - 5:00 PM
   0 ___7:00 - 9:00 PM

12. If you went to bed at 11:00 PM at what level of tiredness would you be?
   0 ___Not at all tired
   2 ___A little tired
   3 ___Fairly tired
   5 ___Very tired

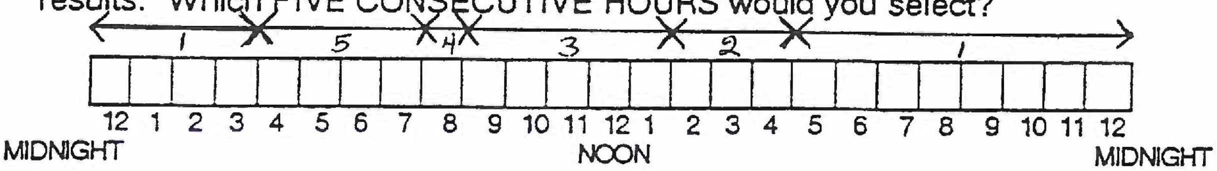
13. For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning? Which ONE of the following events are you most likely to experience?
   4 ___Will wake up at the usual time and will NOT fall asleep
   3 ___Will wake up at the usual time and will doze thereafter
   2 ___Will wake up at the usual time but will fall asleep again
   1 ___Will not wake up until later than usual

14. One night you have to remain awake between 4:00 - 6:00 AM in order to carry out a night watch. You have no commitments the next day. Which ONE of the following alternatives will suit you best?
   1 ___Would NOT go to bed until watch was over
   2 ___Would take a nap before and sleep after
   3 ___Would take a good sleep before and nap after
   4 ___Would take ALL sleep before watch

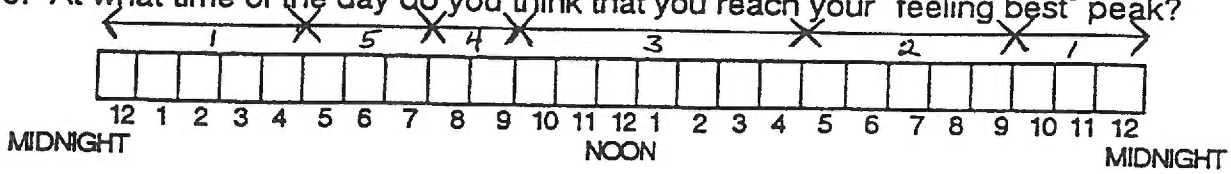
15. You have to do two hours of hard physical work. You are entirely free to plan your day and considering your own "feeling best" rhythm which ONE of the following times would you choose?
   4 ___8:00 - 10:00 AM
   3 ___11:00 AM - 1:00 PM
   2 ___3:00 - 5:00 PM
   1 ___7:00 - 9:00 PM

16. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 10:00 - 11:00 PM. Bearing in mind nothing else but your own "feeling best" rhythm how do you think you think you would perform?
   1 ___Would be in good form
   2 ___Would be in reasonable form
   3 ___Would find it difficult
   4 ___Would find it very difficult

17. Suppose that you can choose your own work hours. Assume that you worked a FIVE hour day (including breaks) and that your job was interesting and paid by results. Which FIVE CONSECUTIVE HOURS would you select?



18. At what time of the day do you think that you reach your "feeling best" peak?



19. One hears about "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?

6 ___Definitely a "morning" type
4 ___Rather more a "morning" than an "evening" type
2 ___Rather more an "evening" than a "morning" type
0 ___Definitely an "evening" type