THE EFFECTS OF AUTOGENIC RELAXATION AND
GUIDED IMAGERY ON INSOMNIA IN THE
CRITICALLY ILL ADULT

by

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To the Graduate Council of the University of Utah:

I have read the dissertation of Jean Richardson in its final form and have found that (1) its format, citations, and bibliographic style are consistent and acceptable; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the supervisory committee and is ready for submission to The Graduate School.

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ABSTRACT

This research tested the effects of progressive relaxation and guided imagery on the sleep of critically ill adults. The problem this study addressed was the discrepancy between the amount of sleep a critically ill person needs and the amount of sleep obtained.

An experimental design with repeated measures examined the following research hypotheses: (a) Sleep scores of critically ill patients who use relaxation and imagery will improve over time when compared to those who do not use these interventions, and (b) descriptions of sleep from critically ill patients who use relaxation and imagery over time will differ from descriptions from those who do not use these interventions.

A convenience sample of 36 critically ill adults from three intensive care units (ICUs) in two teaching hospitals was randomly assigned to an experimental or control group. Sleep was measured on 3 consecutive mornings via the revised Verran-Snyder-Halpern Sleep Scale (VSH Sleep Scale), which is a visual analogue paper-and-pencil tool. Each morning subjects were asked an open-ended question about their perception of the night’s sleep. The intervention consisted of a relaxation and imagery exercise delivered in person on 2 consecutive evenings. Process variables were recorded prior to and following delivery of the intervention.
Factor analysis and coefficient alpha showed that two items measured the perception of sleep in this sample. Repeated measures analysis of variance (ANOVA), using changes in sleep scores on these two items, tested for the effects of the intervention. Alpha was set at .05. There was no significant difference in sleep scores over time on the basis of the intervention. For all subjects, sleep improved significantly over time. A significant difference was seen in the pattern of improvement based on unit. An interaction between transfer and time, with sleep scores improving with transfer, was found; and there was an interaction between the intervention and gender over time, with different patterns of improvement in the experimental group based on gender. Qualitative data suggested that there were differences in the experience of sleep in ICU between men and women.
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CHAPTER I

INTRODUCTION

Humans sleep for approximately one third of their lives. Sleep is a major part of human existence. We build rooms in our homes for sleep; we have industries that are built around our need for sleep. We plan for it, look forward to it, and seek help when we cannot get it.

An inability to sleep, commonly referred to as “insomnia,” is synonymous with sleep deprivation, sleep pattern disturbance, and disrupted or disturbed sleep. In this chapter, the discrepancy between sleep needed and sleep obtained by the critically ill adult is explored, including a review of sleep, insomnia, and interventions hypothesized to lessen insomnia in the critically ill adult.

Statement of the Problem

Insomnia is a source of distress. Humans function poorly or become ill when they cannot sleep. Most of what we know about the purpose of sleep is inferred from sleep deprivation studies on healthy college-age male volunteers. Sleep deprivation subjects have suffered a range of symptoms from irritability to psychosis, from tremors to ataxia, and from nausea and constipation to immune system suppression.
In the healthy adult male, these symptoms are inconvenient at best, and quite serious at worst (Fiorica, Higgins, lampietro, Lategola, & Davis, 1968). For an ill individual, insomnia potentially worsens an already difficult situation (Assousa & Wilson, 1991; Closs, 1988a, 1988b; Phillips, Cooper, & Burke, 1987; Richards & Bainsfather, 1988; Tack & Gilliss, 1990). For the critically ill, insomnia may result in exacerbations of illnesses, in intensification of unpleasant symptoms, and in the appearance of new and undesirable disruptions to health.

Most nurses who work in an intensive care unit (ICU) agree that sleep is important for maintaining or recovering health, and many will attempt to provide uninterrupted sleep time for patients during the night. Ideally, ICU patients would be “tucked in” before midnight and allowed to sleep until 0700; nurses would monitor their patients visually and unobtrusively via the bedside or nursing-desk electronics. In practice, several elements interfere with the ideal.

First, the critically ill patient tends to require routine bedside, active nursing interventions throughout the night, many of which make sleep impossible. Examples are airway suctioning, injections, and repositioning.

Second, ICU patients usually require a number of nursing actions during the night whose timing is out of the control of the nurse. An example is finger sticks for glucose levels every 2 hours; it would be negligence on the part of the nurse to neglect this action in favor of the patients’ uninterrupted sleep.

Third, nursing care at night is sometimes based on unexamined tradition, “That’s the way we’ve always done it.” An example is the daily weight conducted
between 0400 and 0700 to track 24-hour fluid balance.

Fourth, other health-care professionals interrupt the sleep of ICU patients with their own interventions, warranted or not. Examples are respiratory treatments delivered by respiratory therapists and chest x-rays routinely done at 0530 so that the physician can view the film prior to the first office or surgical case.

Fifth, objective criteria for sleep involve the use of electroencephalography (EEG) equipment, which is not a common clinical measure of sleep. Subjective criteria for sleep, consisting of patient report, do not have a long history of development, are not readily available to nurses, and are not trusted by many nurses. Thus, it is difficult for an ICU nurse to assess the awake versus the asleep state routinely, as well as the depth of the sleep state, in the patient. Without knowing how much or how little the patient is sleeping, it is difficult to identify and treat the problem of insomnia.

Finally, critically ill patients experience a wide range of somatic and emotional stimuli that tend to interfere with sleep. Examples of somatic stimuli are pain, dyspnea, and fever, and examples of emotional stimuli are fear, grief, powerlessness, and hopelessness. Identification and treatment of these responses in ICU patients by ICU nurses is uneven (Pulling, 1991), even though these responses often can be modified or eliminated by nursing interventions.

Two nurse-prescribed interventions that may reduce insomnia in the critically ill individual are progressive relaxation and guided imagery. As distinct,
separate interventions, progressive relaxation and guided imagery are both recommended for the treatment of insomnia in several well-respected nursing texts on nursing interventions (Bulechek & McCloskey, 1992; Carpenito, 1997; Snyder, 1992). However, there is a notable lack of nursing research on nursing interventions for insomnia in the critically ill (Jensen & Herr, 1993). In fact, there is a particular lack of research regarding the effects of progressive relaxation, guided imagery, or a combination of these interventions on insomnia in the critically ill adult. There are also many different forms of progressive relaxation and guided imagery cited in nursing literature, with no real consensus on which type is safe and effective for the critically ill adult and which is accepted by patients and health-care workers.

In the investigator's practice as a critical-care nurse, the use of autogenic relaxation with guided imagery has been safe, well-received by patients, and extremely successful in lessening insomnia in the critically ill patient. The combined interventions have been more successful than either intervention used alone.

Thus, it appears manifest that sleep is desirable, even mandatory, for anyone who is critically ill. Unfortunately, the critically ill commonly experience insomnia (Johnson, 1989; Richards & Bainsfather, 1988; Richardson, 1993; Snyder-Halpern, 1985). There is a discrepancy between the amount of sleep a critically ill person needs and the amount of sleep obtained.
**Significance for Nursing**

Insomnia can be defined as a neurochemical phenomenon, involving stimulation of the reticular activating system (RAS), within a simple cause-and-effect framework. Within this framework, sleep-inducing pharmacologic agents are one solution to the problem. However, these agents are inappropriate for many critically ill patients due to the hypotension they generate. Some patients hold a philosophical antithesis to using drugs in order to induce a natural physiological phenomenon. For other patients, pharmacologic agents to induce sleep are not effective. Even when prescribed, nurses do not always provide sleep medications to hospitalized patients (Halfens, Lendfers, & Cox, 1991). Sleep medications can negatively alter the pattern and quality of sleep. Critical-care nurses have been found to lack knowledge about sleep, perceive the ICU environment to be moderately conducive to sleep, and do not relate their knowledge about sleep to the implementation of sleep-promoting nursing interventions (Pulling, 1991). Finally, nurses cannot independently prescribe and administer pharmacologic agents without advanced licensure.

Insomnia is a problem that for many patients requires a nursing intervention that nurses can independently prescribe and easily administer. For clients who receive sleep medication, the medication is not always effective in an ICU; thus, these clients also could benefit from the addition of a nursing intervention to their treatment for insomnia.
Purpose

The problem addressed by this study was the insomnia that most critically ill patients experience. The purpose of this study was to examine the effects of autogenic relaxation and guided imagery on insomnia in critically ill patients.

Conceptual Framework

The theoretical perspective of Florence Nightingale was proposed as the organizing framework for the study. An overview of the perspective and its relationship to insomnia are provided. This overview is followed by an examination of the four main concepts present in Ms. Nightingale's work: (a) person, (b) nursing, (c) health/disease, and (d) environment. Environment is discussed in detail.

Overview of the Framework

The theoretical perspective of Florence Nightingale (Nightingale, 1859/1980) provided the framework for this study. In this framework, the goal of the nurse is to place the person in the best state for nature to act. Through the natural function of sleep, health is restored. The goal of the nurse, then, is to place the patient in the best state for sleep to occur.

Within Nightingale's (1859/1980) work, the nurse must attend to the environment within and around the patient so that the reparative process that nature has instituted will not be hindered. This reparative process includes sleep.
Four Major Concepts

The four major concepts of person, nursing, health/disease, and society/environment are common to (but not equally considered in) all nursing theories. Figure 1 illustrates the relationships between these concepts, as described by Nightingale, and sleep deprivation in the critically ill adult. The relationships illustrated in Figure 1 are complex; several studies have established the complexity of the generation and maintenance of insomnia in the critically ill (Aurell & Eimqvist, 1985; Broughton & Baron, 1978; Dohno, Paskewitz, Lynch, Gimbel, & Thomas, 1979; Fontaine, 1989; Helton, Gordon, & Nunnery, 1980; Johns, Bruce, & Masterton, 1974; Kovacevic-Ristanovic, Cartwright, & Lloyd, 1991; Orr & Stahl, 1977; Richards & Bainsfather, 1988; Richardson, 1986; Topf, 1992).

In Figure 1, the person is comprised of a connected body and mind. The person exists within physical and social environments, moving within the environments along a continuum of health and disease. Movement along the continuum occurs as a result of the effects of the person's own natural reparative processes, of which sleep is one process. The ability of sleep to function as a natural reparative process is enhanced by the nursing interventions of autogenic relaxation and guided imagery. These interventions have their effects on the mind and the body of the person, as well as on the interface between the mind and the body. As a result of the effects of the interventions on the person, the person is able to experience sleep, and sleep places the person in the optimum state for healing to occur.
Figure 1. Conceptual Framework Describing the Relationship Between Concepts in Nightingale's Theory and Sleep in the Critically Ill Adult.

Note. The Person exists as mind and body, with a mind/body connection. The Person moves through the Environment along a continuum of Health/Disease. Movement along the continuum is made possible through the Person's own natural reparative processes of which sleep is one process. Sleep is enhanced by the Nursing intervention of autogenic relaxation and guided imagery that impact the body, the mind, and the strength of the mind/body continuum of the person.
**Person.** In Nightingale’s writings (Nightingale, 1859/1980), the individual is seen as having vital reparative powers to deal with disease. If placed in an optimum state, patients have within themselves the ability to recover and to heal themselves. Ill individuals are compromised in the use of their reparative powers by themselves, relying on nursing activities that remove obstacles to healing.

The body-mind connection was accepted in Nightingale’s (1859/1980) time; that is, the health of the one affected the ability of the other to heal. How the individual’s body and mind were affected by the environment was not well-understood (Torres, 1980).

Autogenic relaxation and guided imagery fit well into an holistic framework of the person (Oliver & Hill, 1992). Together, these interventions affect the person’s physical and psychological state, consciously and unconsciously, and allow sleep to occur. Exactly how this combination of interventions has this effect is unknown. The combination seems to involve physiologic functions (e.g., deep muscle relaxation); it also recruits mental abilities (e.g., autohypnosis, or at least suggestibility, and imagination) to induce sleep and to rehearse sleep; it empowers patients to shut out the environment and to control physiologic functions; finally, it is a life skill that patients can use independently when they choose, thus placing themselves in the best state for nature to act.

In this framework, the mind and body are inseparable. The intervention depends upon the coordinated actions of the emotional, thinking, and physiologic selves to calm the RAS. Once calmed, RAS functions are replaced by
neurochemical activities that induce sleep, and then sleep occurs. The nurse, of course, is the facilitator of the intervention until the patient masters the intervention such that the nurse is no longer needed.

**Nursing.** The goal of nursing for Nightingale (1859/1980) was to place the individual in the best condition for nature to act by affecting the environment. Sleep, as a restorative concept, is instrumental in patient healing (Benor, 1996; Evans & French, 1995); thus, the nurse promotes healing by promoting sleep.

Promoting sleep in an ICU is done in three ways. First, the environment (defined below) can be influenced in a positive way through actions such as reducing the environmental stimulations of the neurochemical pathways that maintain wakefulness. These stimulations include light and noise, dyspnea and pain, and the effects of the depersonalization and paternalism inherent in the health care system. Reducing these environmental stimuli allows sleep to occur.

Second, nursing activities that result in stimuli that threaten the quantity and quality of sleep can be eliminated at night. These nursing activities include the stimuli of venipuncture, daily weights, and other monitoring and treatment activities. Removing these stimuli from the night routines allows sleep to occur.

The first and second means of promoting sleep act by providing the opportunity to sleep. Research has shown that ICU patients do not sleep, even when given the opportunity (Aurell & Elmqvist, 1985; Culpepper-Richards & Bairnsfather, 1988; Fontaine, 1989; Richardson, 1986). Therefore, it appears that current methods of changing the environment of the ICU and of changing nursing
routines in the ICU to promote sleep are not necessarily effective in the treatment of insomnia. While continued testing of these types of interventions is necessary, a third means of promoting sleep is needed, which provides the patient with the ability to initiate and maintain neurochemical sleep mechanisms when the opportunity presents itself. An intervention is needed that acts directly and indirectly on the neurochemical mechanisms that initiate and maintain sleep. The intervention also needs to promote sleep indirectly by modifying the patient’s response to stimuli that disturbs sleep.

The danger in testing an intervention designed to alter the patient’s response to stimuli rather than testing interventions to eliminate ICU stimuli altogether is that it threatens to place the onus for insomnia on the patient and to excuse nurses from responsibility for the stimuli associated with insomnia. Nurses need to continue to test interventions to change the ICU environment, to change their care routines, and to change the patient’s response to stimuli in order to promote sleep.

Autogenic relaxation and guided imagery result in deep relaxation, which is characterized by a decrease in the level of neurochemicals, humoral chemicals, and neural activity that stimulates the RAS (Holden-Lund, 1988; Lehrer, Schoicket, Carrington, & Woolfolk, 1980). By directly decreasing stimulation of the RAS, the patient is placed in the best position for sleep to occur. The intervention also may decrease stimulation indirectly of the RAS in complex ways. During and after experiencing the intervention, the patient is less stimulated by environmental factors, such as noise and light, and patient responses, such as pain, dyspnea,
anxiety, and depression are experienced less intensely (Bridge, Benson, Pietroni, & Priest, 1988; Burish & Lyles, 1981; Carey & Burish, 1987; Daake & Gueldner, 1989; Gift, Moore, & Soeken, 1992; Holden-Lund, 1988; Hyman, Feldman, Harris, Levin, & Malloy, 1989; Lehrer et al., 1979; Leja, 1989; Lerman et al., 1990; Lyles, Burish, Krosely, & Oldham, 1982; Miller & Perry, 1990; Renfroe, 1988; Sims, 1987). When the response of the patient to all these stimuli is reduced, the RAS may be less stimulated, and sleep may be more likely to improve in quantity and quality.

Evidence that loss of personal control affects sleep patterns directly is not overwhelming (Topf, 1992), but loss of personal control is associated with higher stress in the ill individual (Averill, 1973; Folkman, 1984). Stress has been associated with insomnia in the critically ill individual (Topf & Davis, 1993). Possibly an intervention that increased personal control would decrease insomnia.

With the intervention under the control of the patient so that the patient can reexperience the intervention as needed, the effects of stressful stimuli on insomnia may be ameliorated. These stressful stimuli may include the nursing diagnoses of powerlessness and hopelessness. In particular, because the interventions require personal contact between patient and nurse, the patient may experience powerlessness and similar nursing diagnoses less dramatically, which would improve insomnia.

There is evidence that the effects of the intervention are long-lasting. Hypertension, nausea, absences from school due to sickness, and mood states have
been altered in a positive way for up to 6 months following treatment (Bailey, 1984; Bridge et al., 1988; Burish & Lyles, 1981; Carey & Burish, 1987; Crowther, 1983; Lyles et al., 1982; Munro, Creamer, Haggerty, & Cooper, 1988; Renfroe, 1988). This evidence suggests that the patient’s response to stimuli has been altered and that, over time, the RAS is being stimulated by fewer adverse responses as a result of the intervention.

Health/disease. Nightingale’s (1859/1980) writings did not focus upon the health or disease state of the patient, even though health and illness are seen as existing for the patient on a continuum (Chinn & Kramer, 1995). Instead, the focus was on the reparative process, which would lead to a state of health and absence of disease. In contemporary care, some interventions could be classified as reparative such as an appendectomy, chemotherapy, wound care, antibiotics, psychotherapy, and humor. Other interventions are seen as palliative or comforting such as narcotics, analgesics, support groups, music therapy, and cardiotonics. Yet, other interventions are preventive such as immunizations and incentive spirometry.

Nightingale’s (1859/1980) framework relies heavily on the theory that sleep is reparative in nature. The idea that sleep is healing (restitution theory) is commonly accepted in nursing literature (Benor, 1996; Evans & French, 1995; Wallace, 1993). Even though it is justified by the indirect evidence of sleep deprivation studies, most nurses are comfortable with this explanation of sleep.
The use of energy conservation theories of sleep is unusual in nursing literature, nurses are relatively unfamiliar with these theories, and little research evidence (direct or indirect) has been presented to support or refute these theories (Kryger, Roth, & Dement, 1989; Wallace, 1993). However, Nightingale was aware that a person's store of energy could be exhausted, particularly by the "chattering hopes and advices" of visitors. In reference to Figure 1, a person's energy reserves may be instrumental in moving one along the health/disease continuum, and the purpose of sleep is to conserve energy or to limit energy expenditures rhythmically so that movement towards health can occur.

**Environment.** Environment was a core concept in Nightingale's (1859/1980) writings. The physical environment surrounding the patient was emphasized more than the psychological or social environment (Chinn & Kramer, 1995; Torres, 1980). In the conceptual framework for this study, all three types of environments were considered relative to their effects on the sleep of the critically ill adult.

Sleep is believed to have two components: (a) sleep disturbance and (b) sleep effectiveness. Sleep disturbance includes sleep latency, mid-sleep awakenings, and depth of sleep. Sleep effectiveness includes rest upon awakening, the subjective quality of sleep, and total sleep period (Snyder-Halpen & Verran, 1987). Disturbance and effectiveness depend upon the quality of the physical, psychological, and social environments around and within the patient.
The sleep of all adults admitted to a critical care unit (CCU) depends upon the quality of the environment around and within the patient, but this study was limited to the stable critically ill. The unstable critically ill are subject to so many environmental interruptions that sleep may not be an appropriate outcome measure for them. The intervention of autogenic relaxation and guided imagery may not be powerful enough to induce sleep for unstable patients; possibly only general anesthesia would be effective, even though the intervention could increase these patients' sense of well-being, control, and calmness.

The physical environment surrounding the patient, for Nightingale (1859/1980), included the concepts of ventilation, warmth, effluvia, noise, and light. These factors affect sleep of the critically ill individual (Cohen, 1968; Dlin, Rosen, Dickstein, Lyons, & Fischer, 1971; Hilton, 1976; Reimer, 1987; Richardson, 1986, 1993; Theissen, 1970; Topf, Bookman, & Arand, 1996; Woods & Falk, 1974). They also are frequently under the control of the nurse.

The effects of increasing personal control over hospital noise on sleep in the laboratory have been tested (Johnson, Christman, & Stitt, 1985; Kovacevic-Ristanovic et al., 1991; Topf, 1992; Lindquist, Jeffery, Johnson, & Haus, 1985). Theoretically, an increase in control over noise should promote sleep by limiting environmental stimuli to disturb sleep and by increasing the patient's sense of control over the environment. Results did not support the use of the intervention, but further established the relationship between noise and insomnia.
The effects of personal control interventions on surgical patients were tested in an attempt to establish a relationship between gaining personal control and positive patient outcomes (Johnson et al., 1985). The personal control interventions did not include relaxation and imagery, but one intervention (concrete sensory information) did allow patients to form a mental image of an impending experience. Results were uneven. Increased personal control resulted in decreased use of analgesics, better physical recovery, but longer hospitalization.

Unfortunately, insomnia as a clinical problem presents a recursive characteristic. Without sleep, health is threatened, but for the critically ill adult, the ICU environment and nighttime nursing interventions are necessary to protect, restore, or preserve health. These nighttime nursing interventions, involving noise, touch, and light, awaken patients or lighten their sleep. It is neither desirable nor practical to remove the critically ill patient from the ICU nor to eliminate most nursing interventions so that critically ill patients can sleep. An intervention is needed that can help patients sleep so deeply that these interventions do not disturb sleep or that these interventions help patients return to deep sleep quickly after a necessary interruption.

The psychological environment that influences sleep was not made explicit by Nightingale (1859/1980), even though she recognized that a negative environment could cause physical stress, thereby affecting the patient’s emotional climate (Torres, 1980). Fear and anxiety often accompany a critical illness due to uncertainty over impending death, suffering, and other consequences of the disease.
or illness itself. Fear and anxiety are common responses to the physiologic symptoms of pain, dyspnea, fever, and nausea that accompany critical illnesses. These factors can be intensified by insomnia (Lichstein & Rosenthal, 1980); in fact, for many critically ill patients, these factors seem even more intense while lying awake, in the dark, among strangers.

Few sleep researchers have addressed psychological factors directly, even though they appear to be important in affecting the quality and quantity of sleep in the critically ill (Hilton, 1976; Reimer, 1987; Richardson, 1986). Lichstein and Rosenthal (1980) found that subjects with chronic insomnia (mainly onset insomnia) rated intrusive cognitions as much more important in the genesis of insomnia than somatic factors. An intervention is needed to help patients control the psychological factors, as well as their physiologic antecedents, so natural sleep can take place.

The social environment was addressed by Nightingale (1859/1980) in her writings of the values of Victorian women. She discussed complacency and the acceptance of status quo as social factors that contributed to illness. Such a broad definition of social environments allows an examination of several negative social factors that potentially disrupt the sleep of the critically ill patient. The depersonalization and paternalism of the health care system, in general, and the ICU environment, in particular, can contribute to the generation and maintenance of patient responses of powerlessness, hopelessness, and frustration. Other social factors such as racism, sexism, and economic inequities are not necessarily
inherent in the ICU, but do influence the patient’s experience of health care and also can generate powerlessness, anxiety, fear, loneliness, and hopelessness in the ICU patient. Finally, the social value placed on saving lives at any cost and its resultant emphasis on “high-tech/low-touch” standards of care for the critically ill may contribute directly to the generation of negative patient responses, as well as more sleep-disrupting physical and psychological factors. ICU patients experiencing these responses to social factors may find their quantity and quality of sleep to be affected adversely.

The psychological and sociological environmental factors combine in a powerful way to prevent sleep. Powerless over their health and uncertain about the future, many patients find that feelings of helplessness intrude on their sleep. Fear, worry, planning, and anticipation keep their minds so active that sleep is impossible. As the night wears on, aware that they need to sleep to heal, many patients begin to worry about not sleeping. This added worry becomes a positive feedback loop, making sleep an impossibility. Other patients may worry that sleep will promote death or that they will die in their sleep.

An intervention is needed that would interrupt this cycle of emotional and intellectual exertion, empowering patients with control over their awake/sleep state. This intervention would be most empowering if it was a life skill that could be employed beyond hospitalization and without the presence of a nurse. The present study was designed to answer questions about the efficacy of an intervention to promote sleep in this population. From these questions, the following research
hypotheses were formed:

1. Sleep scores of critically ill patients who use autogenic relaxation will improve over time when compared to those who do not use these interventions.

2. Descriptions of the quality of sleep during nighttime from critically ill patients who use autogenic relaxation and guided imagery over time will differ from descriptions from those who do not use these interventions.
CHAPTER II

REVIEW OF LITERATURE

This chapter begins with an overview of sleep stages and types of insomnia in adults. The sleep of hospitalized and critically ill adults is reviewed, followed by studies of contributing factors to insomnia in these populations. The literature about progressive relaxation, autogenic training, and guided imagery is described. A synthesis of the control of variables, power, and generalizability in studies of relaxation and/or imagery follows. The chapter concludes with a list of assumptions drawn from the conceptual framework and literature review upon which the study was based.

The Awake State

No one theory exists to explain wakefulness and sleep in humans (Chuman, 1983). Consciousness is believed to be mediated by the RAS (Boss, 1990; Chuman, 1983). Via ascending neurons, stimuli external to the body such as light and noise, as well as somatic events such as pain and fever, are translated into neural transmissions that synapse onto the RAS and prolong or initiate consciousness.

The RAS is believed to have an intrinsic ability to initiate and maintain wakefulness every 24 to 48 hours (Jones, 1989). When activated, the RAS sends
neural transmissions (probably via acetylcholines and catecholamines) through the diffuse thalamic projection system upwards to the cortex. The RAS also sends signals of an inhibitory nature to areas responsible for sleep.

Sleep

Sleep has commonly and traditionally been defined as a rhythmic suspension of consciousness, with restorative properties usually occurring at night. Sleep has been believed to be a passive suspension of consciousness. Research concerning the electrical and chemical functions of the brain has shown that sleep is an active process. As with the awake state, no one theory is accepted as the explanation for how and why sleep occurs. There is good evidence that sleep occurs in stages.

When summarizing one theory of the generation, maintenance, and termination of sleep, the awake state is produced by the RAS. The RAS is activated by stimuli internal to itself, by neural stimuli in the cerebral cortex, by stimuli in other parts of the body transmitted along ascending sensory tracts, and by stimuli external to the body translated by the sensory system into ascending signals. The RAS is inhibited by serotonin released from the diencephalon, medulla, thalamus, and forebrain (DMTF).

When the RAS is inhibited, the DMTF produces slow-wave sleep and triggers cyclical activity of the raphae nuclei (RN). The RN rhythmically produces rapid eye movement (REM) sleep and provides the stimulus for a decrease in serotonin levels. When levels fall below a certain point, the RAS again becomes active and, in turn, inhibits the sleep-producing areas of the brain via
catecholamine and acetylcholine release.

**Different Stages of Sleep**

Through subjective and objective observations it is known that not all sleep is uniform. Subjectively, people report that they sometimes dream, that on some nights they sleep deeply and long, and that on other nights every small noise seems to awaken them.

Objectively, sleeping people are observed to sleepwalk occasionally; whereas at other times all limbs are flaccid. Periodically, a sleeper's eyes will move rapidly and breathing will become irregular while the sleeper will lie quietly, breathing deeply and regularly.

**Electroencephalographic Sleep Stages**

EEG data, summarized in textbooks of sleep, neurophysiology, and EEG revealed the stages of sleep and the characteristics of the awake state (Epstein & Andriola, 1983; Eyzaguirre & Fidone, 1975; Gibbs & Gibbs, 1941; Guyton, 1971; Passaouant, 1977a, 1977b; Rechtshaffen & Kales, 1977; Vander, Sherman, & Luciano, 1980). EEG data have been correlated to other objective data and some subjective data.

**Alert.** The subject is awake and concentrating, highly alert. Eyes may be open or closed. Beta waves are present on EEG. Sympathetic activity may be high. Normal or high large muscle tonus is present.
Stage W. The subject is awake and relaxed, with eyes closed, and may be falling asleep. Alpha waves and/or low voltage, mixed frequency activity are present on EEG. Respirations and heart rate are regular.

Stage I. The subject is asleep, but if awakened, which is easy to do, reports being lightly asleep and aware of even soft aural stimuli. Alpha wave amplitude is attenuated on EEG. Parasympathetic activity begins with a slowing of respiratory rate and heart rate, along with a drop in blood pressure.

Stage II. The subject is asleep and is easily awakened. If awakened, a person reports being asleep, but unaware of soft aural stimuli. K-complexes, V-waves, and sleep spindles are present on EEG. Parasympathetic activity increases.

Stage III. The subject is asleep and comparatively difficult to arouse; if awakened, the subject will report being deeply asleep. The EEG shows delta waves in moderate amounts. Parasympathetic activity continues to increase.

Stage IV. The subject is asleep and very difficult to arouse. If awakened, the subject will report being deeply asleep and will report dreams 20% of the time. These dreams are not detailed and are difficult to describe and recall. Sleepwalking, sleeptalking, and nocturnal enuresis may occur. Delta waves predominate the EEG. Parasympathetic activity peaks. Heart rate and respiratory rate are slow and even. Large muscle tonus is maintained at a low rate.

Stage rapid eye movement. The subject is asleep and difficult to awaken. If awakened, the subject will report being asleep and will report dreams 80% of the time. These dreams are vivid, detailed, and easy to recall. Beta waves are
present on EEG, and the EEG resembles that of an alert individual; this paradox accounts for the common name for this sleep stage, paradoxical sleep. Sympathetic activity is high. Blood pressure varies; heart rate and respiratory rate increase, whereas respirations may become irregular. Large muscles become hypotonic. Rapid eye movements occur, which is another name for this sleep stage, REM sleep.

The Average and Healthy Sleep Pattern

The average and healthy sleep pattern has been well-documented in young healthy males (Armstrong-Esther & Hawkins, 1982; Fiorica et al., 1968; Littler, Honour, Carter, & Sleight, 1975; McGhie & Russell, 1962; Mills, 1966; Wurtman, 1975). A healthy sleep pattern begins with an active RAS, producing the awake state, until the evening when internal and external stimuli inhibit the RAS and activate the DMTF. During this transition, the subject is said to be falling asleep. The time it takes for the subject to move from being awake to Stage I is called sleep onset or sleep latency. Sleep onset includes Stage W. The length of this stage varies from person-to-person. The average length for an adult ranges from 5 to 15 minutes.

The subject progresses in order from Stage I through Stage IV to REM sleep. Inhibition of the DMTF and activation of the RN produce REM sleep. REM sleep is followed by a reactivation of the DMTF, with the subject again progressing from Stage I through Stage IV to REM. This cycle repeats itself four to six times each night.
Towards morning DMTF and RN are inhibited and the RAS is activated during the process of “waking up.” The remainder of the day is spent in the awake state with an active RAS.

Therefore, one sleep cycle consists of Stages I, II, III, IV, and REM, in that order, and lasts from 60 to 120 minutes. The amount of time the subject spends in each stage of sleep varies. In the early night, slow-wave sleep predominates, with REM lasting for 10 minutes only. Towards morning slow-wave sleep quantity is reduced, with the subject spending up to 20 to 25 minutes in Stage REM (Carskadon & Dement, 1989).

**The Function of Sleep**

In order to describe the function of sleep, in general, and the stages of sleep, in particular, sleep deprivation studies have been conducted on normal, healthy volunteers (Luby, Frohman, Grisell, Lenzo, & Gottleib, 1960; Sassin, 1970; Webb & Agnew, 1965). When the human is deprived of sleep, symptoms occur. In normal, healthy volunteers kept continuously awake from 24 hours to 11 days symptoms were documented such as weakness of neck flexion, hand tremors and dysdiadochokinesia, horizontal nystagmus, ptosis, and dysarthria. Mental status changes with sleep deprivation studies include irritability, decreased attention span, apathetic appearance, and decreased tolerance to pain. More alarming mental changes are frank psychosis, delusions, and paranoia. Sleep deprivation, on a cellular level, is related to decreased levels of adenosine triphosphate and serotonin in the brain, as well as an impaired immune system.
Studies have provided information about what lack of sleep does, as opposed to what the presence of sleep does. Even though sleep can be described, timed, prevented, observed, induced, and disturbed, it is not possible to state with absolute certainty the purpose and function of sleep. Instead, physiologists generally accept the premise that sleep is important in preventing the detrimental symptoms that arise when it does not occur.

Two theories have been proposed to explain the function of sleep: (a) restitution theory and (b) energy conservation theory. Restitution theory is based mainly on deprivation studies. Adam (1980) and Adam and Oswald (1977, 1983, 1984) cited the increased cell division, protein synthesis, human growth hormone release, and cell energy charge that all occur during sleep as evidence to support restitution theory. However, it is not clear that these physiologic changes are due solely to sleep and not to extraneous variables (Horne, 1978, 1985).

Energy conservation theory is found in two variations. Because both theories are related to the evolution of endothermy, or warm-bloodedness, they are difficult to tell apart. The first theory postulates that slow-wave sleep and its necessary companion (dormancy behaviors) such as hibernation evolved in warm-blooded animals to offset the costs of endothermy (Walker & Berger, 1980). Exotherms, particularly reptiles, do not experience slow-wave sleep, perhaps because their very low energy needs do not require them to conserve energy periodically through sleep and dormancy. The essential function of sleep is the reduction of energy expenditure below the level attainable by rest alone. Quiet
sleep and hibernation are related dormant states that reduce energy expenditure and lower body temperature to conserve energy. As criticism, dormancy without sleep would be sufficient to save the energy expended in temperature regulation among endotherms (Zepelin, 1989). The second form of energy conservation theory states that sleep sets a ceiling on metabolic expenditures. Sleep evolved as a way for individual mammalian species to become inactive periodically and, thus, "balance the energy budget" of that species (Rechtshaffen, Bergmann, Everson, Kushida, & Gilliland, 1989; Zepelin, 1974). The research upon which this theory is based has yet to be replicated.

**The Function of the Different Stages of Sleep**

What is known about the function of different stages of sleep also comes from sleep deprivation studies (Luby et al., 1960; Sassin, 1970; Webb & Agnew, 1965). In order to deprive a subject of slow-wave sleep, stimuli sufficient for arousal such as buzzers, shaking, and cold water to the face are applied just as the subject's EEG begins to show slow-wave sleep. With judiciously applied stimuli, the subject will not awaken, but will move backwards in the sleep cycle to Stages I or II or move forwards in the cycle to Stage REM.

The same principle is used to deprive a subject of REM sleep. When the EEG shows that the subject is entering Stage REM, stimuli are applied, and the subject will wake up, or move back into slow-wave sleep, or move forwards to Stages I or II.
After 48 hours of slow-wave or REM sleep deprivation, it is very difficult to keep a subject further deprived. The EEG will show extremely rapid movement into the stage of sleep that has been prevented, with stronger and stronger stimuli required to continue the deprivation study.

Deprivation of slow-wave sleep for 24 or more hours is associated with physical symptoms, including nausea, diarrhea, constipation, headache, vertigo, discoordination of extremities, and neck muscle weakness. Deprivation of REM sleep for 24 or more hours is associated with psychological disturbances, characterized by delusions, paranoia, irritability, and illogic (Luby et al., 1960; Sassin, 1970; Webb & Agnew, 1965).

The symptoms of REM deprivation are similar to the symptoms of a syndrome called “ICU psychosis.” ICU psychosis affects patients in the ICU, especially postoperative patients; it also is called postoperative delirium. ICU psychosis is characterized by disorientation, delusions, inattentiveness, neuroses, and hallucinations. Because of the similarity of symptoms between REM loss and ICU psychosis, attempts have been made to implicate REM deprivation in the development of the syndrome (Dlin et al., 1971; Hansell, 1984; Helton et al., 1980; Johns, Large, Masterton, & Dudley, 1974; Lazarus & Hagens, 1968; Morse & Litin, 1969).

Investigations into the sleep patterns of selected groups of humans such as the aged, morphine addicts, insomniacs, and dry alcoholics, as well as the sleep patterns of some healthy adults, have been conducted (Davignon & Bruno, 1982;
These studies have demonstrated the consequences of insomnia rather than the function of sleep. Factors such as advanced age, the female gender, alcoholism (active or not), barbiturate withdrawal, the presence of stress, and over- or understimulation are related to loss of sleep. This loss may be in quantity (fewer cycles per night) or quality (loss of one stage of sleep) or both. The term “sleep loss” or “sleep deprivation” covers many types of sleep-pattern disruptions; there are many types of insomnia, as well.

**Types of Insomnia**

In popular and professional literature, the terms sleep disturbance and insomnia are used interchangeably and without a great deal of accuracy. It is useful to place sleep disturbance under the label of insomnia. Insomnia is an inability to sleep whenever or for as long or deeply as one needs to sleep. When this concept is explored, five types of insomnia are revealed.

**Onset Insomnia**

Onset insomnia is a sleep disturbance in which the patient has a long sleep onset or latency period; that is, it takes more time than usual to fall asleep. The usual prodrome or sleep onset period for the adult is from 5 to 15 minutes. Once asleep, sleep is normal in quality, but the individual suffers from a lack of overall sleep time. The critically ill adult is prone to suffer from this insomnia because of
the presence of many internal and external stimuli affecting the RAS.

**Conclusion Insomnia**

Conclusion insomnia is characterized by very early awakening after which sleep is not resumed. Nightingale (1859/1980) identified this insomnia, admonishing nurses to “never let a patient be waked out of his first sleep” (p. 33) because the patient would rarely have any more sleep. Since the ratio of REM sleep to slow-wave sleep increases as the night progresses, conclusion insomnia may result in a loss of REM sleep, as well as a loss of overall sleep time. The critically ill adult often experiences very early (0430 or 0530) morning arousal times due to ICU routines.

**Interruption (Maintenance) Insomnia**

Interruption or maintenance insomnia is characterized by frequent awakenings throughout the night. Whenever the patient is aroused, sleep begins again with Stage 1. REM sleep may become a rarity because each sleep cycle is cut short. The critically ill adult is particularly prone to this type of sleep disturbance due to multiple internal and external stimuli occurring throughout the night.

**Transposed Insomnia**

Transposed insomnia is less common than the three types of sleep disturbances discussed above. This insomnia can be the result of work patterns (specifically working night shifts) or it can be the result of prolonged nighttime
insomnia. Daytime sleep is shorter than average by 1 to 3 hours in the well adult (Carvalhais, Tepas, & Mahan, 1988; Khaleque, 1991; Mahan, Carvalhais, & Queen, 1990), and it has not been studied in the ill adult. In the critically ill adult, this pattern develops as a result of insomnia during the night, which is compensated for by multiple daytime naps.

**Phase-Advanced Sleep**

Phase-advanced sleep occurs among the elderly. Studies of sleep patterns in the elderly have established differences in the way the elderly experience sleep (Clapin-French, 1986; Johnson, 1991a; Kedas, Lux, & Amodeo, 1989; Locsin, 1988; Shaver & Giblin, 1989). As humans age, Stage IV sleep shortens; thus, the individual advances through that phase of sleep more quickly than when young. Some individuals lose Stage IV sleep altogether. Decreases in the length of Stage IV occur rapidly in women after menopause and begin gradually in men after age 30. All other stages of sleep occur normally. Studies have established phase-advanced sleep, but they have not established that phase-advanced sleep is accompanied by signs and symptoms of sleep deprivation. A relationship appears to be between Sundown Syndrome and aging. Sundown Syndrome is known to ICU nurses as an increase in a patient’s confusion, agitation, and sleeplessness coinciding with nighttime, most often occurring in the elderly. Statistically this syndrome occurs more frequently among those with Alzheimer’s disease or dementia (Evans, 1987; Vitiello, Bliwise, & Prinz, 1992). Phase-advanced sleep is probably not an insomnia at all, but a normal part of aging. Because many
critically ill adults are elderly, they experience phase-advanced sleep.

This categorization of the types of insomnia clarifies the many ways in which sleep can be disrupted, setting the stage for a review of literature that deals with sleep loss among a special group: the physically ill. In order to study ill subjects, criteria for sleep need to be described and selected that are appropriate for use in the clinical setting.

**Sleep Criteria**

Sleep has been, and continues to be, documented using varying sets of criteria. One example of criteria for sleep is drawn from Eyzaguirre and Fidone (1975): (a) a loss of critical reactivity to events in the environment, (b) a decreased reflex irritability and sensibility, and (c) the capacity to be aroused. Other criteria include (a) eyes closed, (b) body generally quiet and large muscles relaxed, (c) the presence of snoring, (d) respiration deep and heart rate regular, and (e) the sleeper's report of sleep or sleep with dreaming. With the exception of criterion (e), these criteria are not always accurate; some have the added disadvantage that in order to assess them, the sleeper must be awakened.

EEG traditionally has been considered to be the most accurate and reliable method for measuring sleep. For nurses to access the necessary (and expensive) equipment for EEG measurement can be different. In a review of sleep literature in nursing, Shaver and Giblin (1989) (51 references) noted that the use of EEGs has mainly been confined to the sleep laboratory and that EEG is not a practical and accessible measure of sleep for nurses in practice settings. In another review
of sleep literature in nursing, Webster and Thompson (1986) (89 references) noted the difficulty and expense of using EEG as an objective sleep measure.

There are other reasons EEGs are not always the best source of sleep data in nursing research. These reasons include the following: (a) EEGs are invasive if needle electrodes are used, and they are uncomfortable if collodion glue is used; (b) it takes time and practice to learn to apply and operate the equipment and to score and interpret EEG data; (c) EEG use confounds results because it requires the presence of an investigator at the bedside and occasional adjustments of equipment attached to the subject during the duration of use; (d) EEG use does not duplicate the usual sleep environment; (e) EEGs do not provide information about satisfaction with sleep or fatigue upon awakening; and (f) EEGs are not a monitoring device that nurses can implement independently (Richardson, 1993).

Probably because of the difficulties just cited, field studies relying on EEGs for measurement of sleep are composed of very small sample sizes, ranging from 9 to 20 subjects (Broughton & Baron, 1978; Fontaine, 1989; Hilton, 1976; Hyman et al., 1989; Johns et al., 1974; Kedas et al., 1989; Orr & Stahl, 1977; Richardson, 1986; Walker, 1972). Studies relying on paper-and-pencil measures of sleep have larger sample sizes, ranging from approximately 25 to 100 (Clapin-French, 1986; Johnson, 1991a, 1991b; Rogers, Caruso, & Aldrich, 1993).

Subjective reports of sleep quality and quantity would seem to solve many research difficulties for nurses interested in sleep in hospitalized patients, but it is traditionally (if not accurately) acknowledged that subjective tools are associated
with questionable reliability and validity, particularly when compared with EEG data (Shaver & Giblin, 1989; Webster & Thompson, 1986). Evidence is available that persons with chronic insomnia significantly underestimate the amount of time they sleep, overestimate the length of their sleep prodrome, and underestimate the number of arousals they experience (Carskadon et al., 1976). However, several researchers have established beginning concurrent validity for paper-and-pencil tools for measuring sleep, particularly if the individual has acute insomnia (Closs, 1988c; Fontaine, 1989; Johns, 1971; Johnson, 1991a; Richards, 1992, 1995; Rogers et al., 1993; Snyder-Halpem & Verran, 1987; Topf, 1992); therefore, the EEG need not be the primary source of sleep data in nursing research. Paper-and-pencil tools demonstrating reliability and validity for sleep research include visual analog scales (Closs, 1988c; Fontaine, 1989; Lee & Kieckhefer, 1989; Snyder-Halpem & Verran, 1987), Likert-type scales (Closs, 1988c; Topf, 1992), nurses' observations of sleep (Fontaine, 1989), open-ended questionnaires (Clapin-French, 1986; Johnson, 1991a, 1991b; Richards, 1995), and sleep diaries (Rogers et al., 1993).

Using nurse observations to document sleep may be possible. Researchers have found some reliability and validity in staff observations of patients' sleep when compared to EEG data (Carroll, Bliwise, & Dement, 1989; Cohen-Mansfield, Waldhorn, Werner, & Billig, 1990; Edwards & Schuring, 1993). These studies took place in nursing homes and in one CCU. However, two difficulties surface when using this method in a field study. The first and most
daunting in a large study is the time and expense involved in training each nurse who will care for each subject in recording nursing observations. The second difficulty is conceptual in nature. In 1993, Spenceley reviewed nursing research on sleep in the critically ill adult, concluding that in order to understand sleep in these patients more research is needed on the meaning of sleep and disturbed sleep to the patient. In 1994, Signoret, Blois, Merica, and Gaillard studied subjects' reports of sleep in 70 healthy subjects. They discovered three important concepts: (a) quality of sleep, (b) importance of dreams, and (c) sleep efficiency. In their study, women evaluated general events related to sleep efficiency better than men, who evaluated more circumstantial events related to sleep efficiency. Obtaining such information from EEG data is not possible. A patient-scored tool that gives contextual information, coupled with open-ended questions about sleep, could further nursing knowledge about sleep in ways that nurse observations of sleep cannot.

**Sleep Patterns of Hospitalized Adults**

The ill are particularly susceptible to sleep loss. The hospital, in general, and ICUs, in particular, are places of great change, noise, and light. Similarly, ill people, no matter what the environment, are subject to internal stimuli such as pain, anxiety, nausea, and depression. These stimuli may interfere with normal sleep by arousing the patient from sleep.

Accordingly, Lamb (1982) studied the sleeping patterns of hospitalized patients with and without malignancies. One group had a variety of malignant
diseases, whereas the nonmalignant disease group had a variety of medical, surgical, and gynecological problems. In general, subjects were matched by diagnosis for system involvement such as lung cancer with emphysema and endometrial cancer with a fibroid uterus. Regardless of a diagnosis associated with more depression and anxiety than the patient with no malignancy, cancer patients had no greater incidence of insomnia, as indicated by self-report. This finding argues against the association of anxiety or stress with loss of sleep. However, the data may be interpreted to mean that, since all hospitalized patients experience insomnia, the environment of the hospital may cause insomnia to such a degree that it is not possible to determine the effects of depression and anxiety alone on sleep. Lamb acknowledged that the data may have been unreliable due to the use of a subjective sleep assessment tool that had not been compared to EEG for validity.

Sheely (1996) investigated the relationship between nocturnal disturbances and sleep in 50 hospitalized patients with cancer using a descriptive design. The Verran and Snyder-Haipern Sleep Scale (VSH Sleep Scale) was used to measure sleep. No correlation was found between length of sleep and other variables, but there was a significant negative correlation between disturbances and measures of sleep quality, indicating that the disturbances by staff prevented the subjects from enjoying deep sleep.

Murphy, Bentley, Ellis, and Dudley (1977) studied the sleep patterns of 93 adults undergoing elective surgical procedures for 10 days. The St. Mary’s Sleep
Questionnaire was used to collect sleep data. Results confirmed that the environment of the hospital is associated with a high degree of insomnia. Subjects' preoperative and postoperative sleep quantity and quality were significantly disturbed when compared to usual sleep at home for the duration of the study. The deficits were due primarily to early awakening and difficulty in getting to sleep. Patients also recorded increased awakenings, particularly due to pain and noise.

Pacini and Fitzpatrick (1982) interviewed 76 hospitalized- and nonhospitalized-aged individuals. Using subjective measurements of sleep and without controlling for type of illness, this study documented that 38 hospitalized patients experienced disrupted sleep patterns throughout the night. One significant finding was that subjects were awakened 1.5 hours earlier than the nonhospitalized control group, which duplicates the onset of insomnia found by Murphy et al. (1977). This evidence supports the existence of insomnia in the majority of hospitalized adults, as well as the existence of onset, interruption, and conclusion insomnias in this population.

In 1992, Closs interviewed 100 patients following their abdominal surgery about their experiences of pain and sleep. Pain was identified most commonly as the cause of sleep disturbance. Pain worsened at night for approximately half the sample, even though they all received fewer doses of analgesic medications at night.
Sleep Patterns of the Critically Ill Adult

Many more sleep studies have been conducted with the critically ill adult than with any other type of patient, which may reflect the magnitude of the problem of sleeplessness in these patients as perceived by the research community. Most of these studies employ an extremely small sample size, but results are uniform across studies.

Aurell and Elmqvist (1985), using EEG data, reported that all nine postoperative cardiac patients studied had severely disturbed sleep patterns, that nurses consistently overestimated sleep time, and that patients were unable to sleep even when given the opportunity. Similarly, Fontaine (1989) found that all 20 trauma subjects were severely sleep disturbed and that patients did not sleep even when given the opportunity, which may indicate that measuring patient satisfaction with sleep may be important information. Aurell and Elmqvist also found that 40% of sleep occurred for subjects in the daytime, suggesting that a measurement of daytime sleep in an ICU sleep study would reveal important data.

Orr and Stahl (1977) found that even slight disruptions awakened patients after open-heart surgery. Eight of nine patients studied with EEGs did not sleep at all until the second postoperative night. Insomnia in open-heart surgery patients was corroborated by Johns et al. (1974). They observed, using EEG criteria, that five patients experienced Stages I and II for 48 hours after surgery. Walker (1972) also documented no sleep in four postcardiotomy patients, defining sleep without the use of EEG. Externally observable criteria developed by the investigator were
used to define sleep. No sleep was documented during any of three 8-hour periods up to 3 days postoperatively. In fact, the greatest uninterrupted length of sleep time observed in these subjects during their first postoperative 24-hour period averaged only 43 minutes.

Broughton and Baron (1978) established that the noncardiotomy ICU patient was particularly at risk for insomnia using EEG. They followed 12 patients with new myocardial infarctions for 13 days, beginning with admission to the ICU and continuing on the ward and after discharge to home. While in ICU, subjects experienced a significant decrease in total sleep time and REM sleep. Sleep improved markedly after discharge to home.

Dohno et al. (1979) found that subjects in an open coronary care ward had less slow-wave and REM sleep than subjects in semiprivate rooms. Unlike Helton et al. (1980) who found the amount of sleep deprivation in an ICU to be proportional to the severity of the patient's pathology, Dohno et al. reported no relationship between insomnia severity and the patient's length of stay, degree of pathology, or drug use. Helton et al. were also at odds with other researchers; that is, they found insomnia in only 58% of ICU patients compared to 100% found in studies discussed previously. Helton et al. did not document sleep using EEGs or subjective reports, but relied on an interruption checklist filled out by the staff nurse on duty. Thus, nurses may have been recording a sleeping state in the subject when the subject was awake and resting with eyes closed. Subjects also may have awakened, unobserved, between the times that the nurses assessed them
as sleeping. Helton et al. admitted that the use of this checklist and involvement of the nurse giving care to the subject were weaknesses in their study.

Richardson (1986) examined the sleep patterns of nine critically ill adults with medical and surgical diagnoses in a mix of private and ward rooms. When using EEG criteria, all subjects were sleep deprived, experiencing a mean sleep time of 28 minutes. Two subjects achieved no sleep and one subject achieved 1 minute of sleep. The longest amount of sleep achieved was 73 nonconsecutive minutes. The average amount of stimulus-free time that these subjects experienced was 14 minutes, with a range of 50 to 29 minutes, which is similar to uninterrupted opportunities to sleep found in other studies. The majority of sleep experienced was Stage I, and no REM sleep occurred for any subject. There was no relationship between age, diagnosis, type of room, or length of ICU stay and insomnia in these subjects.

In contrast to the studies just cited in which subjects uniformly slept very poorly in ICUs, Richards and Bainsfather (1988) found wide variability in sleep quantity and quality in 11 male CCU patients. One subject slept 404 minutes, whereas another slept only 114 minutes. One subject obtained 56 minutes of REM sleep, whereas others obtained no REM sleep. The authors offered that location of the bed, acuity level of the subject, and differences in medications received as possible explanations for the variability in the dependent variable. No significant differences were found in the sleep of subjects on the basis of first, second, or third night in the CCU, suggesting that CCU patients do not accommodate to their
environment or situation over time.

These descriptive studies of ICU patients' sleep all employed very small sample sizes, particularly when EEG criteria for sleep were used. Non-EEG sleep criteria consisted of outside observations of behaviors believed to indicate sleep or lack of sleep. Consensus was achieved regarding the severe insomnia that ICU patients experienced, regardless of age, diagnoses, acuity, or length of stay.

**Studies Focusing on the Environment**

Nightingale (1859/1980) wrote emphatically that intermittent or sharp noise, especially noise that roused a sick person from sleep, did that person "serious . . . and lasting mischief" (p. 33). Another group of researchers designed their studies to focus on the environmental stimuli, including noise believed to be related to insomnia in the critically ill. These researchers sought to identify the stimuli that were present in ICUs that prevented or interrupted sleep.

Noise has been implicated in sleep deprivation for ICU patients and patients in special care units. When Woods and Falk (1974) investigated noise in an ICU, they categorized the decibels produced by certain activities in the unit. A level of 70 decibels is capable of lightening a subject's sleep from Stage IV to Stage II. The subject whose sleep has been changed from a deeper to a lighter stage will require more time to complete one sleep cycle. The researchers found that several commonplace noises in the ICU such as a mechanical ventilator in operation or a patient coughing approached or equalled 70 decibels. In 1985, Snyder-Halpern tested the effects of taped CCU noise on the sleep of 10 young healthy female
volunteers in a laboratory using self-report of sleep as a dependent variable. CCU noise significantly decreased subjective assessment of sleep quality, with mechanical noise being the most disturbing to the subjects. In 1992, Topf reported the effects of audio tape-recorded CCU noise on the sleep of volunteers in a sleep laboratory. Sleep was measured using polysomnography. Subjects experiencing CCU noise had significantly more difficulty falling and staying asleep, more difficulty progressing from one stage of sleep to the next, more awakenings, less REM, and poorer self-reported sleep than the control group. In 1996, Topf et al. duplicated the study with 60 female subjects in a sleep laboratory using a self-rating questionnaire to assess sleep. Results were the same as for the 1992 study.

Williamson (1992) investigated the effects of ocean sounds (white noise) on the sleep of patients following coronary artery bypass grafts in a step-down unit. Sixty subjects participated in this two-group, pretest/posttest experimental design. Sleep was assessed using a visual analog scale. Using analysis of covariance (ANCOVA), significant differences were found in sleep depth, awakening, return to sleep, quality of sleep, and total sleep scores; that is, the experimental group showed improvement in these areas. In 1993, Fitzsimmons, Verderber, and Shively duplicated the Williamson study. They found that the experimental group reported significantly deeper sleep, awoke less during the night, returned to sleep more quickly, and reported higher quality sleep than the control group. Sleep onset (latency) was not affected.
In the laboratory, Topf (1992) instructed patients to exercise control over taped CCU noise by using a white-noise generator whenever they wished. Subjects in this experimental group did not report significant differences in their sleep over control subjects. Topf explained that these nonsignificant results may have been due to overwhelming aversion to CCU noise that masked the effects of the intervention, to the subject's perception of control over the white noise as the addition of another stressor, and to the effort that manipulation of the white-noise generator required on the part of the subject during the night.

Without using EEG criteria, Woods (1972) observed four postcardiotomy patients on three different shifts for 8 days, finding the most frequently observed interruptions to be those involving direct monitoring (blood pressure measurements). The second and third most common interruptions reported were indirect stimuli (noise) and measures to promote respirations.

Without using EEG criteria, Dlin et al. (1971) found deterrents to the sleep of the ICU patient to be, in order of occurrence, (a) activity and noise, (b) pain and physical condition, (c) nursing procedures, (d) vapor tents,¹ and (e) hypothermia.

Hilton (1976) used EEG criteria to document sleep loss in seven patients in a respiratory ICU. These patients were monitored continuously for 48 hours, and

¹Note the year of the study. In 1971, oxygen and humidity were commonly delivered by constructing a tent over the patient's head and neck. Even though more comfortable than masks, vapor tents decreased communication and meaningful stimulation for the patients, leading to their own set of problems.
a chart of interruptions was devised. Therapeutic procedures were found to interrupt sleep most commonly, followed in descending order by occurrence of personal care measures and noises.

Edwards and Schuring (1993) used a chart review of 40 ICU patients to determine opportunities to sleep. Sleep itself was not measured. The average number of blocks for at least 60 minutes of undisturbed time per patient per day was 2.2. Only one of those blocks per patient fell within conventional sleeping hours. For the interrupted blocks of time, 48% contained only one care procedure. Apparently, care activities preclude the opportunity to sleep.

In the investigator’s previous study of insomnia in the critically ill adult, stimuli associated with awakening or lightening of sleep were recorded through the night (Richardson, 1986). Sleep was measured using EEG. Stimuli were divided into those external to the patient (occurring outside the patient’s body, including noise and light); internal to the patient (within the patient, including pain and dyspnea); and researcher generated (for example, investigator coughing or exiting the room). External stimuli accounted for 42% of all stimuli, whereas internal stimuli accounted for 38% of all stimuli. Stimuli most commonly associated with awakening or lightening of sleep were nurses’ voices and nonvoice noises at the nursing desk.

The majority of studies on the sleep of the critically ill adult have focused on cardiotomy patients, using very small sample sizes, particularly when EEG sleep criteria were used. Insomnia was observed to be directly associated with
ICU environmental activity in all studies. Dlin et al. (1971) and Richardson (1986) reported that the second most common deterrent to sleep was the presence of stimuli internal to the patient.

**Studies Focusing on the Consequences of Sleep Deprivation**

ICU psychosis is a syndrome that closely resembles the more grave manifestations of REM sleep deprivation. In fact, sleep loss is commonly believed to be one of the factors that contributes to the development of ICU psychosis. ICU psychosis is characterized by a loss of mental acuity and an increase in confusion, disorientation, and agitation, regardless of time of day. Research has been undertaken to correlate ICU psychosis with lack of sleep in the critically ill with varying results.

Johns et al. (1974), using EEG sleep criteria in five cardiotomy patients, found no association between sleep deprivation and postoperative delirium. Conversely, Morse and Litin (1969) found patient reports of sleep deprivation and insomnia preoperatively in 19 postoperatively delirious subjects and 7 nondelirious subjects out of 60 elderly surgical subjects. McFadden and Giblin (1971), using a criteria checklist, found symptoms of ICU psychosis in three out of four postcardiotomy patients who also were judged to be sleep deprived.

These three studies show three different sets of criteria for sleep (EEG, self-report, and observed sleep behaviors) and small sample sizes. These studies also show insomnia in their subjects uniformly, but the relationship between
insomnia and ICU psychosis is difficult to establish confidently.

By estimating sleep deprivation from the nurses' notes on 100 cardiotomy patients, Heller et al. (1970) found 27% more patients with delirium in the group of patients with below-average amounts of sleep when compared to patients with average and above-average amounts of sleep. Even though this larger sample size increases confidence in the researchers' results, they also stated that observations of sleep behaviors as sleep criteria were of questionable value.

Wallace (1993), in a literature review that included seven studies of ICU psychosis in surgical patients, concluded that such studies suffered from multiple threats to reliability and validity, results were conflicting, and no real evidence linked sleep deprivation to ICU psychosis. ICU psychosis was linked to bypass time in surgery, the use of certain anesthetics in surgery, and sensory deprivation. All seven cited studies dated from 1972 or earlier. Hansell (1984) also reviewed ICU psychosis literature, but was able to state only that an ICU is clearly very noisy and that a noisy environment may potentiate behavioral aberrations in healthy adults and critically ill patients.

The early dates of many of the studies on ICU psychosis are worth noting. Most date from 1974 or earlier. In 1993, Bliwise, Carroll, Lee, Nekich, and Dement found Sundown Syndrome and insomnia to be related in a group of senior citizens in a nursing home. The nursing home environment, however, is very different from an ICU environment—even now. ICUs have changed dramatically in the last 20 years, as has bypass surgery; thus, generalizing from these studies to
an ICU of today is perhaps unwise. In an extensive literature review, Hemenway (1980) observed that rates of ICU psychosis were decreasing and postulated that the decline may have been due to an increased awareness of ICU nurses to the effects of sleep deprivation and ICU patients' sensory requirements. No mention was made of addressing internal symptomatology that might be contributing to insomnia in this population.

From the literature on ICU psychosis, perhaps the only reasonable conclusion that can be drawn is that a causal link between ICU admission and ICU psychosis, particularly as a result of sleep deprivation, has not been established. The detrimental results of sleep deprivation for ICU patients can still be inferred from deprivation studies on healthy adult volunteers in sleep laboratories.

In spite of this lack of research evidence that sleep deprivation leads to ICU psychosis, the majority of sleep researchers cited found a lack of sleep in ICU patients. Sleep deprivation seemed to occur in ICU patients regardless of their medical diagnosis or condition. Nearly all studies employed extremely small sample sizes, and widely varying sleep criteria were used across studies. EEG criteria were favored as being most reliable and valid, but every study that employed EEG criteria for sleep acknowledged the expense, time, and difficulty with access that data collection using EEGs involved. Researchers rarely reported data regarding internal stimuli such as pain, discomfort, anxiety, and grief that may have been associated with insomnia.
Control of Variables in Sleep Studies

Most published studies on sleep in nursing literature are descriptive. Women, the elderly, and non-White persons are generally underrepresented in samples due to small sample sizes of EEG studies and the overrepresentation of middle-aged White males in the common target population of cardiotomy patients. A large sample size is necessary in order to generate groups containing women, the elderly, and ethnic persons in proportions similar to that found in most CCUs. Their inclusion is not only important for later generalization to other CCUs, but also because less is known about these individuals’ sleep patterns. Stages III and IV sleep patterns change with aging (Kales & Kales, 1984; Kryger et al., 1989; Miles & Dement, 1980; Reynolds et al., 1985). Sleep patterns of premenopausal women change with menstrual cycles (Lee, Shaver, Giblin, & Woods, 1990). The sleep patterns of some women are dependent on perimenopausal status (Shaver, Giblin, Lentz, & Lee, 1988). The sleep of elderly men is more consistent than that of women (Campbell, Gillin, Kripke, Erichson, & Clopton, 1989; Mendelson, 1990). Wever (1984) found that the mean sleep-wake cycle in a sleep laboratory was shorter in women than in men and that women slept an average of 1 hour 21 minutes longer than males. The investigator is unaware of any study focused on describing the sleep patterns of different ethnic groups.

In studies on hospitalized or institutionalized adults, some samples have been limited to homogeneous diagnoses and acuity levels (Broughton & Baron, 1978; Fontaine, 1989; Johns et al., 1974; Orr & Stahl, 1977; Walker, 1972),
whereas others have included multiple diagnoses and acuity levels (Clapin-French, 1986; Dohno et al., 1979; Helton et al., 1980; Lamb, 1982; Pacini & Fitzpatrick, 1982; Richardson, 1986). Other variables that differed widely in all cited studies include age, length of hospital stay, acuity, number of roommates, number of nurses involved in care, number of researchers involved in the study, and number of treatment/support devices in use. In these mainly descriptive studies, none of these variables had any relationship to sleep patterns in any cited study, probably because insomnia is endemic and profound in hospitalized adults. No study addressed control of the variables introduced by the presence of the researcher, even though researcher presence was admitted to be a confounding factor in one study (Richardson, 1986).

A common theme among recent reviews of nursing research on sleep is a recognition of the need for intervention studies. There is a certain level of interest in interventions that nurses without advanced licensure can prescribe and implement or that are nonpharmacologic (Fitzsimmons et al., 1993; Kovacevic-Ristanovic et al., 1991; Mast, Meyers, & Urbanski, 1987a, 1987b, 1987c; Oliver & Hill, 1992; Saviers-Jones, 1993; Shaver & Giblin, 1989; Webster & Thompson, 1986). The clinical experience of this investigator suggests that progressive relaxation in the form of autogenic training with guided imagery has immediate and clinically significant effects on insomnia in the critically ill.
**Intervention Studies Involving Progressive Relaxation**

Progressive relaxation is a nursing intervention in which the nurse assists the patient in sequentially relaxing large muscle groups until a deep state of relaxation has been achieved. Although many variations exist on this technique, the best known variation is Jacobsen’s (Benson, Beary, & Carol, 1974; Jacobsen, 1929), as detailed in Bernstein and Borkovec’s (1973) training manual in which the patient is coached to tense individual large muscle groups, to note how the muscle group feels when tensed, and then to relax that muscle group as exhalation occurs, observing how the group of muscles feels when completely relaxed. This activity can be done sequentially for any number of muscle groups, depending on how the nurse divides the body’s muscles.

**Progressive Relaxation, Stress, and Coping Studies**

Very different designs and methods have been used in two studies to examine the effects of progressive relaxation on stress and coping in different populations and with differing results. In a laboratory setting, Lehrer, Schoicket, Carrington, and Woolfolk (1980) compared the effects of stressful stimuli on 32 healthy subjects. Subjects practiced progressive relaxation once weekly in a group with a therapist-instructor over 4 weeks. When compared with a group practicing meditation and a no-treatment control group, there were no differences between the relaxation and control groups. The researchers attributed this lack of effect to the lack of anxiety in subjects.
Lerman et al. (1990) studied the effects of relaxation technique on nausea, anxiety, and depression. Forty-eight subjects undergoing chemotherapy for cancer were divided into experimental and control groups. Instruction was conducted individually, once, and in person. After instruction, each subject received a tape of the therapy to use at home. Unlike the subjects in the 1979 study, the subjects in the 1990 study were anxious, instruction was individual, and they were studied in an outpatient clinic. The intervention significantly decreased nausea, but not anxiety or depression.

Griffin, Myers, Kopelke, and Walker (1988) studied the effects of progressive relaxation on general cognitive/emotional disturbance due to hospital noise. One hundred hospitalized, acutely ill patients were randomly divided into two equal groups. The experimental group was taught progressive relaxation in one, 1-hour session. The intervention significantly lowered the experimental group’s self-report of disturbance due to noise. The majority of all subjects also reported that their sleep was poor or that they were unable to sleep and that they were frequently awakened by staff at night. This study is unusual; that is, 78% of the sample were of Asian/Polynesian origin (located in Hawaii), but race was not related to outcome.

**Progressive Relaxation, Anxiety, and Dyspnea Studies**

Two studies demonstrated the effects of progressive relaxation in subjects with chronic obstructive pulmonary disease. In 1988, Renfroe found significant
lowering of dyspnea and anxiety scores following each of four sessions in the experimental group (n = 12) as opposed to the control group (n = 8). Sessions were conducted individually and in-person, and subjects also were given a tape to use at home between sessions. No long-term effects were found. In 1992, Gift et al. duplicated Renfroe’s study. The sample of 25 was divided equally between experimental and control groups. Similar results were found.

**Progressive Relaxation, Rehabilitation, and Pain Studies**

The effect of progressive relaxation on vital signs and pain has not been consistent. In 1988, Munro et al. examined the effect of taped progressive relaxation sessions on 27 experimental and 30 control subjects enrolled in a cardiac rehabilitation program. Subjects used the tapes approximately seven times a week for 12 weeks. Blood pressures were significantly lowered (statistically and clinically) in the experimental group.

Miller and Perry (1990) studied the effects of the intervention on 29 cardiac surgery patients (15 experimental and 14 control subjects). Experimental group subjects were taught the technique once in person preoperatively and then were supervised in its use on 2 successive days postoperatively. Like Munro et al. (1988), Miller and Perry also found significant decreases in blood pressure between the two groups. Significant differences also were found on other vital signs and pain.
In 1989, Guzzetta tested the effects of relaxation and music therapy on 80 coronary critical care patients using three groups. One group received Jacobsen’s (1929) relaxation therapy, one group received the same relaxation therapy followed by music therapy, and one group served as control. Subjects received the therapies three times over 2 days. Both intervention groups experienced significantly lowered heart rates and elevated peripheral temperatures.

In contrast, Lorenzi (1991) did not find significant differences between experimental ($n = 20$) and control ($n = 20$) groups for episiotomy pain, discomfort, and analgesic use in primiparous subjects for 1 day following birth. However, in this study, the technique was taught once during early labor as a jaw-drop technique, and the mode use of the technique was once or twice. Also using the jaw-drop technique, Flaherty and Fitzpatrick (1978) studied the effects of this relaxation method on postoperative pain in 42 subjects. The experimental group experienced lowered respiratory rate, less pain and discomfort, and used less analgesics after surgery than the control group. The intervention was taught only once and was used only once per subject, as in the Lorenzi study. The difference in results may be due to delivery of the intervention. Lorenzi’s episiotomy subjects were instructed to use the intervention when needed without the investigator present, whereas the investigators in the Flaherty and Fitzpatrick study were present during the time of the subject’s first ambulation, prompting and supervising the use of the intervention at that time.
Progressive Relaxation and Sleep Studies

Johnson (1991b) studied the effects of progressive relaxation on the sleep of 55 elderly women in their homes. Subjects were instructed in the technique in person on 2 successive days (Days 4 and 5), and they were encouraged to practice at home. Polysomnographic and questionnaire data were collected in a sleep laboratory (Days 1, 2, 3, 5, and 6). Using a single-group pretest/posttest design, the progressive relaxation significantly improved sleep onset, number of arousals, soundness of sleep, refreshment upon awakening, satisfaction with sleep, and amount of slow-wave sleep.

Other researchers have reported similar results in studies with healthy insomniacs as the target population. Most of these studies have compared the effects of progressive relaxation to other interventions such as sleep hygiene, biofeedback, stimulus control, triazolam, and sleep restriction (Borkovec & Fowles, 1973; Edinger, Hoelscher, Marsh, Lipper, & Ionescu-Piooggia, 1992; Engle-Friedman, Bootzin, Hazlewood, & Tsao, 1992; Espie, Lindsay, Brooks, Hood, & Turvey, 1989; Freedman & Papsdorf, 1976; Friedman, Bliwise, Yesavage, & Salom, 1991; Johnson, 1991b; Lichstein & Johnson, 1993; McClusky, Milby, Switzer, Williams, & Wooten, 1991). These studies all reported significant, positive effects of progressive relaxation on quality and quantity of sleep using Jacobsen's (1929) relaxation technique. Texts and review articles on the treatment of insomnia all concur that progressive relaxation and autogenic relaxation significantly improve sleep quality and quantity of healthy
adult volunteers (Bootzin & Perlis, 1992; Kales & Kales, 1984; Kryger et al., 1989). Relaxation compares favorably to triazolam in reducing sleep onset/latency times, with triazolam reducing latency immediately and relaxation effects beginning the second week of treatment and lasting longer (McClusky et al., 1991). In research literature and in textbooks that reviewed research literature, stimulus control was always reported to be more effective than relaxation in improving sleep quality and quantity. However, stimulus control involves waiting to go to bed until sleepy, restricting the use of bed to sleep and sex only, and getting out of bed at night when unable to sleep. These options are not open to ICU patients.

Some variables are comparable across studies. Jacobsen’s (1929) technique or a close variation was used. Sleep was usually measured by self-report such as diaries, questionnaires, and sleep logs. The population consisted of healthy, chronic, insomniac adults.

Other variables are not comparable across studies. Ages of subjects ranged from college-aged adults to older adults. Sample sizes ranged from 7 to 57. Interventions were delivered in person and by tape from once to 3 weeks. Measurements of the dependent variables occurred immediately and as much as 2 years later, with continued positive effects reported. In spite of these variations in the control of variables, the intervention was uniformly reported to be effective, which argues for the strength of the intervention in this population. However, based on these studies, it is difficult to state confidently which variables would best be used, controlled, or modified for the critically ill adult.
The studies just examined used progressive relaxation alone, testing its effects on a number of dependent measures. With such different designs, populations, analyses, sample sizes, and settings, it is difficult to predict the effects of the intervention on the sleep of the critically ill patient. However, most showed significant results on the measures of interest in spite of all the confounding variables present, most of which were acknowledged but not measured by the researchers. One study did establish significant effects of the intervention on the quality and quantity of sleep of elderly women in a sleep laboratory.

Most of the studies just examined employed Jacobsen’s (1929) relaxation technique, using sequential tensing and relaxing of muscle groups. However, as the individual is tensing large muscle groups during the intervention, blood pressure and venous return to the heart fluctuate. The Valsalva response also can be initiated by muscle tensing (Herman, 1987). These untoward effects are usually not problematic for the healthy adult, but these effects are potentially unsafe for critically ill individuals with cardiac illness, cerebrovascular illness, hypertension, and glaucoma. A variation of progressive relaxation (autogenic relaxation) is available that avoids these potential complications.

**Intervention Studies Involving Autogenic Relaxation**

Autogenic relaxation (a type of progressive relaxation) is taught using deep breathing and suggestion rather than muscle tensing and relaxing. This method avoids the transient hypertension and the potential for Valsalva initiation associated
with progressive relaxation; I have found that it is clinically effective for many patient symptoms and causes no untoward effects.

In 1984, Bailey studied the effects of autogenic relaxation on the number of absences due to sickness in 45 student nurses. Subjects in the experimental group \( n = 25 \) were taught autogenic relaxation, practicing as a group weekly over a period of 6 weeks. The experimental group experienced a significant decrease in the number of sick absences. Because sessions occurred in a classroom on healthy young female volunteers, it is difficult to apply the results of this study to the critically ill patient. However, the conceptual framework, which links autogenic relaxation to health, is unique and potentially helpful.

In 1980, Coursey, Frankel, Gaarder, and Mott examined the effects of biofeedback, autogenic training, and electrosleep therapy on sleep onset in 22 chronic insomniac (but otherwise healthy) adults. Sleep was measured in the sleep laboratory using EEG and a sleep log. The training was intensive, consisting of 6 weeks of twice weekly individual sessions plus daily home practice. Three of the six biofeedback group subjects, two of the autogenic group subjects, and none of the control group subjects achieved a significant improvement in sleep onset and sleep efficiency. This study was unusual; that is, it employed process variables such as frontalis electromyelographic (EMG) recordings, sleep log data, and therapist ratings, but found no relationship between depth of relaxation and improvement of insomnia.
Rickard, McCoy, Collier, and Weinberger (1989) studied the effects of progressive relaxation and autogenic relaxation, which they called passive suggestions of relaxation in 50 seriously mentally disturbed inpatients. Twenty-five subjects used progressive relaxation, and 25 subjects used passive suggestions of relaxation. Daily group sessions using taped exercises were conducted over a period of 7 days. The dependent variable was presence of side effects, but few were reported in general. No differences were found between the two groups. This study did not examine the effects of the interventions on any other dependent variable, but it is useful in easing popular fears about inducing hallucinations (Benson et al., 1974) and psychotic breaks from reality in this population by the use of either intervention.

**Guided Imagery**

Guided imagery has been studied much less by nurses than progressive relaxation or autogenic relaxation, but its use in nursing practice has been recommended by multiple nursing authors (Benor, 1996; Carpenito, 1997; Dossey, 1991; Heath, 1992; Mast et al., 1987a, 1987b, 1987c; Mell, 1989; Oliver & Hill, 1992; Snyder, 1992).

Guided imagery can take many forms. The following typology was detailed by Snyder (1992). *Eidetic therapy* reestablishes a richly detailed spatial image commonly experienced in childhood and repressed by conflict or neurotic rigidity before adulthood. *The chakra system and animal imagery* postulates seven energy centers within the body, each with its own function and symbolic meaning.
Feelings can be associated with each energy center that the patient imagines as represented by an animal. The patient interacts with the animal so that energy patterns become balanced and conflicts are resolved. **Visualization for control of physiologic functions** involves guiding the patient to a state of deep relaxation and, while there, allowing an image to form. The formed image may be of illness or of a symptom, or of a desired state or behavior. The nurse guides the patient in interacting with the image to achieve the desired physiologic state. For example, in order to control pain, the patient chooses to imagine a grey fog rolling in to cover and anesthetize the tender area. The nurse initially helps the patient relax and then speaks of the color, temperature, texture, movement, and smell of the fog. The nurse verbally cues the patient to remain relaxed, to focus on the image, and, finally, to return to the present reality. **Visualization for control of physiologic functions** is the most common type of guided imagery found in nursing literature.

A second typology was offered by Dossey (1991). **Receptive imagery** consists of images that “bubble up” from the pool of conscious thought without effort on the part of the patient. Such images would be highly individual and unique. **Active imagery** involves the conscious formation of a deliberate image. For example, the nurse would describe an image to the patient that had been successfully used by other patients, or the patient would visualize his or her favorite place, real or imagined. **Concrete imagery** uses correct biological detail in the formation of an image. An example would be the visualization of anatomically
accurate red blood cells perfusing an anoxic area of the body. Symbolic imagery uses unique symbols appropriate to the individual's attitudes, beliefs, and culture. An example is the image of a friendly animal (coyote or dog) standing or running to the left of the patient as a protector, a symbol common to Western American Indian cultures. Process imagery involves the rehearsal of desired behaviors or experiences. An example of process imagery is mentally experiencing an uncomplicated and comfortable cardiac catheterization from the time of entering the laboratory to returning to bed. End-state imagery requires the patient to imagine the final outcome desired such as walking without assistance for the hemiplegic patient. Finally, general healing imagery uses the event of healing as the image. For example, the patient would mentally experience the sensations of wound edges granulating and the regeneration of healthy tissue.

**Intervention Studies Involving Guided Imagery**

The effects of guided imagery have been examined by nurses and physical therapists. In a pilot study (N = 10), Leja (1989) examined the effects of one in-person session of guided imagery on depression using the Beck Depression Inventory in subjects 65+ years old. In spite of this restriction on power due to the small sample size, the experimental group of 5 subjects experienced a significant decrease in depression compared to the control group.

In 1989, Daake and Gueldner also found significant results when they tested the effects of guided imagery on postoperative pain. Pain was measured using a single visual analog scale anchored by, "I do not have any pain" and "My pain
could not be worse." Thirty-two subjects were randomly assigned in equal numbers to control and experimental groups. The intervention was taught and practiced with the experimental group once. Then the experimental subjects were encouraged to use the intervention by themselves three times daily postoperatively and were given a tape of the session for this purpose. Process imagery was used in combination with active imagery. Subjects also were encouraged to use their own image, if desired. Pain was significantly reduced for the experimental group.

Maring (1990) tested the effects of process imagery on the rate of skill acquisition in 26 healthy volunteers. The 13 subjects in the experimental group mentally rehearsed a novel tossing skill for 20 minutes prior to physically performing the skill 10 times; this sequence was repeated 5 times. The 13 control subjects were asked to memorize a poem for 20 minutes so that they could not mentally practice the skill, after which they, too, physically performed the tossing skill. For rate of improvement in accuracy and for several EMG measures, the experimental group improved significantly compared to the control group.

Moody, Fraser, and Yarandi (1993) tested the effects of guided imagery and maximal inspiratory muscle training in a group of 19 patients with pulmonary disease. Of these analyzed dependent variables, guided imagery significantly improved only the subjects’ perceived quality of life.

These studies used divergent populations, variables, methods, and small sample sizes. All but one study (Moody et al., 1993) found that guided imagery may be a significant intervention for the control of physiological functions.
In a literature review of the use of imagery and its potential for physical therapy, Warner and McNeill (1988) found that studies testing the effects of imagery on skill acquisition showed consistent significant results, whereas studies testing its effect on muscle strength varied in their results. The authors concluded that this variation in results for strength may be due to the lack of practice sessions in some studies. Further, a vivid image, as reported by the subject, was more often associated with superior results when compared to a weak image. Warner and McNeill also found that lack of significance was most often reported when imagery occurred on 1 day only, even with repeated sessions on 1 day, and when the imagery intervention was delivered by audiotape or without individualization. In 1996, Royle et al. reviewed nursing literature on the use of imagery to decrease anxiety in pulmonary patients. They used the intervention to that end on a bone marrow transplant unit as a means to explore the research utilization process. These findings suggest that, given repeated sessions, imagery may be particularly successful in the control of physiologic functions, which could include sleep and healing. Number of sessions of imagery necessary to achieve a clinical effect is not clear. Vividness of the image also may be an important covariant in imagery studies. Imagery may be most effective when experienced vividly by the subject. Finally, imagery may be most effective when the therapist delivers a personalized intervention in person.

In a review chapter, Snyder (1988) recommended that progressive relaxation is best used in combination with other nursing interventions because it
produces better outcomes on a variety of measures and in a variety of populations than the use of a single therapy. Holden-Lund (1988) reviewed the literature that reported the effects of progressive relaxation and guided imagery on stress and healing. She reported more varied results in studies that did not combine the interventions than in studies that did combine them. In a review of cancer nursing literature involving progressive relaxation and the combination of progressive relaxation and guided imagery, Sims (1987) did not reach the same conclusion about combining interventions. She did acknowledge, however, the success found in most studies, with these interventions as a strategy for helping patients to cope with the side effects of cancer chemotherapy.

Sims (1987) also reported that the major difficulty with most reported studies on progressive relaxation and progressive relaxation with guided imagery was their small sample sizes, with the majority consisting of anecdotal and single-case reports. Several studies have been found that used relatively larger sample sizes and experimental design to study the effects of the combined interventions.

**Intervention Studies Involving Progressive Relaxation and Guided Imagery**

In 1988, Holden-Lund tested the effect of four relaxation and imagery sessions on stress and wound healing in 24 adult inpatients. Subjects in the experimental group \( n = 12 \), using audiotapes, relaxed and then listened to images that moved through the stages of healing over the course of 1 “preop” and 3 “postop” days. Significant results were found on the dependent variables of stress,
urinary cortisol, and wound erythema.

Carey and Burish (1987) tested the effect of three progressive relaxation and guided imagery sessions on nausea in 45 chemotherapy patients. The authors compared methods of delivery (professional, paraprofessional, and audiotape once daily for 3 days) using a four-group design of the combined interventions. Delivery of the interventions by professionals had significant effects in lowering pulse, respirations, and anxiety, and increasing food intake, but the interventions had no effect on nausea.

Bridge et al. (1988) tested the effect of progressive relaxation, as well as progressive relaxation, with guided imagery on mood, depression, and anxiety in 154 women with breast cancer. In a three-group design, one group received relaxation training, a second group received relaxation training with active imagery, and a third group served as control. Relaxation with imagery significantly improved mood, depression, and anxiety when compared to relaxation alone and no intervention. Relaxation alone also had a significant effect when compared to no intervention.

Burish and Lyles (1981) studied the effects of progressive relaxation and guided imagery together on 16 cancer patients. One group received instruction in Jacobsen’s (1929) relaxation therapy, followed by imagery of the patient’s favorite place during five chemotherapy sessions. A second group served as control. The experimental group reported significantly less nausea, lowered pulse rate and systolic blood pressure, and less negative affect immediately and over time. Later,
Lyles et al. (1982) repeated the 1981 study with 50 chemotherapy patients, but added an attention control group in which the therapist engaged the subject in pleasant conversation. The experimental group reported significantly less nausea, lowered pulse rate and systolic blood pressure, and less anxiety immediately and over time when compared to the other two groups.

Rather than combining the interventions, Wells (1989) used a four-group design to compare interventions in 40 subjects. Divided into equal numbers, the groups consisted of a progressive relaxation group, a pleasant imagery group, an analgesic imagery group, and an attention control group. The dependent variable was pain during elective, outpatient abortion. Subjects received the intervention in person once for 10 to 15 minutes prior to the abortion. No significant differences in pain were found between groups, but a trend for decreased pain in the pleasant imagery group was reported. Wells concluded that it may be too difficult to pay attention to the intervention during an abortion, which requires that the patient respond to verbal instructions from caregivers during the procedure. With such different approaches to the question of efficacy of the interventions, it is not possible to conclude whether the combined interventions are superior to the separate interventions.

In 1983, Crowther tested the effects of stress management, autogenic training, and guided imagery in 34 hypertensive adults. One group received extensive stress management training with autogenic training and guided imagery, one group received autogenic training and guided imagery, and one group served
as a control. Autogenic training and guided imagery sessions lasted for 20 minutes once weekly for 8 weeks, and they were delivered by tape in both experimental groups. The investigator had individualized the tape for each subject, depending on the pleasant image the subject wished to experience. For both experimental groups, blood pressure significantly decreased during the study, as well as at 3 and 6 months follow-up, when compared to the control group. The experimental groups did not differ significantly from each other, which suggests the power of the combined interventions.

Richards (1992, 1995) tested the effects of two interventions on the sleep of elderly males in ICU with cardiac disease: (a) a combination of relaxation, imagery, and music and (b) back massage. EEG and a questionnaire were used to determine sleep and anxiety in a pretest/posttest, three-group experimental design. No difference in sleep was found in the subjects receiving relaxation, imagery, and music when compared with control subjects. The sleep of subjects receiving back massage improved significantly. Both experimental groups had significantly less anxiety than the control group. The relaxation, imagery, and music intervention was delivered once by a 7½-minute tape.

Control of Variables, Power, and Generalizability in Intervention Studies

All intervention studies reviewed can be collectively compared for their control of confounding variables, power of the independent variables, and generalizability of results to the intended population. These potential variables
included operationalizing and measuring the independent variable; operationalizing and measuring the dependent variable; using process variables; and defining the population, site, age, race, gender, sample size, strength of the independent variable, delivery of the independent variable, statistical analysis, and design issues.

**Definition of the independent variable.** Of the cited studies that report use of progressive relaxation as the independent variable, 11 used Jacobsen’s (1929) definition of the independent variable and with 9 reporting significant differences. Finally, 7 studies used an indeterminate or other type of progressive relaxation, with 2 reporting nonsignificance. Progressive relaxation appears to use Jacobsen’s definition, which is associated with the most consistently significant results. Jacobsen’s technique is well-defined and well-tested compared to other techniques; therefore, delivery of the intervention may be most consistent when using this definition of progressive relaxation. When other variations of Jacobsen’s relaxation therapy have been standardized, the same may be said about other types of progressive relaxation.

Four studies reported the use of autogenic relaxation as the independent variable. Only one study included the operational definition of the intervention; therefore, it was not possible to compare and contrast the studies on this point.

Guided imagery was an independent variable in eight cited studies. The type of imagery used included rehearsal imagery of the postoperative period; active controlled (a scripted beach, mountain, or autumn scene) imagery; active patient-
selected (favorite place) imagery; process (sensory preparation and physical skill acquisition) imagery; concrete (healing and transfer of hand numbness for analgesia) imagery; and unreported. Six of these studies reported significant results while using disparate images as the intervention. It is unclear if one image is preferable to another in any given clinical situation.

Bridge et al. (1988) reported that the combined interventions were more effective than the interventions alone. This is the only study found that directly investigated the possible potentiating effects of relaxation and imagery on each other.

**Definition of the dependent variable.** It is difficult to compare studies across the dependent variable because such a wide range of effects has been studied and a number of types of measurement has been used. Of those three studies that were unable to report significant effects on the dependent variable, pain was a dependent variable for two studies, and the presence of side effects such as anxiety, delusions, and concentration was the dependent variable for the other study. Researchers employed measurement tools ranging from visual analog scales to multiple-choice, criterion-based measures to biomechanical measures of vital signs, skin temperature, and sleep stages. In spite of such variation in the definition and measurement of dependent variables, relaxation and imagery were still effective in all but four studies, which possibly argues for the strength and efficacy of these interventions in multiple clinical settings.
Use of process variables. Only two of the cited studies used process measures to determine if the delivered independent variable was received by the subject. Rickard et al. (1989) used a 5-point Likert-type scale marked by the investigator to indicate adherence by the subject to intervention protocol during the treatment session. Statistically, these scores were used as evidence for equivalency between the two intervention groups, but not as process variables. Gift et al. (1992) used skin temperature, heart rate, and respiratory rate as process measures for progressive relaxation. Results were difficult to interpret, even though it appeared that only the experimental group met relaxation criteria for temperature and respiratory rate, whereas both groups met criteria for heart rate. A significant group-session-time interaction was noted for skin temperature. The researchers were unable to offer an explanation for this unusual finding. These two studies used markedly different measures of relaxation, with results that vary and are of questionable reliability and validity. Because relaxation is a complex, subjectively influenced, and experienced phenomenon, perhaps subjective measures of relaxation would be more reliable and valid. However, since significant differences were found in the majority of the cited studies, using process variables may not be a necessity, but a nicety, in order to stratify subjects according to depth of relaxation and imagery.

Definition of the population and site. Many different populations were sampled in the cited studies. Most results are difficult to generalize to the critically ill adult, with the exception of those in Miller and Perry's (1990) study,
which recruited adults in intensive care recovering from heart surgery; those in Guzzetta's (1989) study, which was conducted in a coronary CCU; and those in Richards' 1992 study, which was conducted on males in a coronary CCU. Sites ranged from the laboratory to outpatient clinics to various hospital wards. For field studies, attempts made to control environmental variables included collecting data at the same time during the day, restricting distractions during treatment periods, and limiting the population to one type of medical diagnosis. In spite of this limited control over different site variables, significant results were usually obtained, which may indicate the relative strength of the interventions.

**Age.** Several studies limited the ages of the samples deliberately such as in those interested in sampling the geriatric population, whereas a few limited the ages of subjects through the definition of the population such as in subjects experiencing abortion or first childbirth. Median ages ranged from 25 to 72, with several studies not reporting this variable. In the three studies reporting nonsignificance with variable ages of subjects, subjects tended to be younger (mean ages of 25, 44, and 25). This variable must be accounted for carefully in future studies. One study (Bridge et al., 1988) reported that women 55+ years old benefited most from relaxation, and relaxation with imagery.

**Race.** Of the eight studies that reported race, six reported all White or predominantly White subjects. If taped or scripted interventions are used, they are likely to be culturally nonspecific; thus, the strength of the intervention may be threatened. This cultural nonspecificity could be accounted for by using the
subject's description of the desired image that would, by definition, be specific to the subject's own culture.

**Gender.** Varying mixes of genders were reported in the cited studies from all male to all female. Of the four studies that reported nonsignificance of results, two had samples that were entirely female, one had an all-male sample, and one had a sample that was nearly equally balanced between the genders. Other studies with predominantly female samples reported significant results. Control of this variable may not be a critical factor in determining effects of the intervention.

**Sample size and assignment.** Sample sizes in the cited studies ranged from 10 in a pilot study to 154 in a clinical trial. Assignment of subjects to groups was usually randomized, with the exception of studies of cancer patients with different malignancies in which randomization was not strictly adhered to in order to distribute diagnoses and treatments equally among groups. Group assignments always resulted in equal or close to equal group sizes. Because most sample sizes were not large when compared to clinical trials or surveys, results demonstrate the power of the independent variables.

**Strength of the independent variable.** Strength or "dose" of the independent variable includes the number of sessions in the intervention and other opportunities or encouragement to use the intervention. No consensus was found between cited studies for the number of learning or practice sessions needed to achieve an effect. Subjects experienced the independent variable from once, to weekly for 4 weeks, to five times in 1 day, to daily for 12 weeks, with no
discernable effect on results. The effectiveness of relaxation and imagery separately, regardless of dose, implies that for these interventions power and effect size may be large and/or that only one or two doses are needed. No evidence was found linking previous experience with the interventions to significant results or lack of experience with nonsignificant results.

Strength of the intervention also includes the length of the session. In studies that reported this variable, length was usually from 15 to 20 minutes. Two studies reported a length of 30 minutes, and two reported a session length of 45 minutes. One study in which relaxation and imagery was not effective (Richards, 1993) reported a length of 7.5 minutes. Limiting sessions from 15 to 20 minutes is tolerated well by critically ill adults and controls the length of the session so that length does not become a variable.

Delivery of the independent variable. Delivery of the intervention varied between in-person and audiotape. The intervention was delivered in-person in 12 studies, by audiotape in 5 studies, and by a combination of in-person and audiotape in 5 studies. In 2 of the 4 studies that did not achieve significant results, researchers delivered their interventions in person, very briefly, and used unusual instructions and techniques. In-person delivery of the interventions may be most effective, as demonstrated by Carey and Burish (1987). For progressive relaxation, in-person delivery allows the nurse to individualize the relaxation routine, which is often important for the critically ill. For example, instructions for deep breathing will vary widely between patients on respirators or with
impaired lung function and those with intact lung function and between patients with chest or abdominal surgery and those with no torso incisions. In-person instruction may be even more crucial in the success of guided imagery, as confirmed by Warner and McNeill (1988), because the intervention relies on patients generating their own personal formed image. Further, for the nurse to reinforce the image verbally during the intervention, the patient must communicate the image to the nurse prior to the session, and the nurse must have a precise and detailed understanding of the image. In both interventions, in-person delivery allows the nurse to respond to nonverbal cues. That is, the patient requires more help relaxing, focusing, or returning to present reality, which increases the "dose" and safety of the intervention.

Arguably, individualization and in-person delivery of the intervention might threaten validity due to variations in technique. Subjects might be experiencing different interventions and different levels of the intervention on the basis of delivery variations. This threat is present, however, with taped and/or standardized interventions because of the subjective nature of the intervention. Each patient may experience the intervention differently between patients and for the same patient at various times. Further, individualization and in-person delivery appears to be part of the intervention, particularly in the case of certain types of guided imagery in which persons select their own image. Without individualization, for example, there is no receptive imagery. Measuring the experience of the intervention, as opposed to assuming that all subjects are
experiencing the intervention equally, can account for this variability.

**Statistical analysis.** The method of statistical analysis varied widely across studies. Parametric and nonparametric statistics were used. In one study with a sample size of 10, a $t$ test was used, which perhaps was not the best choice for such a small sample. Another study with a sample size of 48 used the Spearman Rho and Mann-Whitney U tests for significance without reporting why these less powerful tests were selected over their parametric equivalents; however, significance was reported in this study. Thirteen studies used some form of analysis of variance (ANOVA), and 7 studies used $t$ tests. Matching the statistical test with the design, research question, and methods used in the study and choosing the test with the most power were important.

**Design issues.** Many different forms of experimental and quasi-experimental designs were used. In the four studies that reported nonsignificance of results, two used posttest-only designs, which may have contributed to the outcome. The design used in the third nonsignificant study was unclear. Pretest measures will always increase the power of the statistical analysis. In fact, some form of repeated measures design is most desirable in terms of increasing the likelihood that significant results will be detected when present (Lipsey, 1990).

**Other variables.** Two studies examined coping style as a variable. Coping style was defined in one study as "monitoring" or "blunting," whereas in the second study it was defined as Type A or Type B personalities, which determined the coping mechanisms preferred. No relationship was found between
coping styles and effects of the intervention in either study. Accounting for coping style in the delivery of these interventions may not be necessary, but this variable should be measured in subsequent studies until consensus on this issue is reached.

Three studies reported no attrition rates, which can be a confounding variable. A third study reported that subjects unanimously would recommend the intervention to anyone in a similar situation. Researchers have commented that these interventions seem to be desirable and effective for many dependent variables that were not measured. This finding attests to the strength of these interventions.

This review of literature allows some conclusions. Insomnia is a problem for the critically ill adult, and ineffective treatment of insomnia in this population is the current standard of care. Relaxation and imagery are strong nursing interventions, with beginning evidence that they are effective in promoting sleep in other populations. Therefore, it is appropriate to test the effectiveness of relaxation and imagery for promoting sleep in the critically ill adult.

Assumptions

The present study was based on five assumptions, which were drawn from the conceptual framework and literature review:

1. Sleep is a reparative process.
2. There is a mind-body connection that relates suggestions and images to physiologic functions.
3. Participants will respond to the best of their ability on subjective tests for sleep.
4. Autogenic relaxation and guided imagery are interventions appropriate for nurses to prescribe and deliver.

5. Autogenic relaxation and guided imagery potentiate each other's effects and are most effective when done in tandem.
CHAPTER III

METHODOLOGY

This chapter is concerned with methodology. Methodology includes design, sample and setting, intervention, instruments, process variables, and procedures.

Design

The design was an experimental study with repeated measures. Subjects were randomly assigned to experimental and control groups. The dependent variables were measured three times, once as a pretest and twice following the treatment, which was delivered twice. The design is illustrated in Table 1.

Sample and Setting

The target population for this study was all adult patients admitted to ICUs. The sample was a convenience sample randomly assigned to groups by coin toss.

Criteria for patients eligible for inclusion were adults (18 years or older) admitted to ICU with a nurse-patient acuity ratio of 1:1 or 1:2. Patients who could not speak (e.g., intubated), but who could point to an alphabet board or write in a response to questions, were eligible.

Criteria for exclusion were (a) unstable patients with an acuity ratio of 2:1 or more (such as patients on an intra-aortic balloon pump or a left ventricular assist
device); and (b) patients with a history of Alzheimer's disease, dementias, psychoses, central neurological impairment (such as cerebrovascular accident, head injury, cranial surgery, or coma), severe bradycardia, severe hypotension, and non-English-speaking patients.

The study setting was multiple ICUs in two teaching hospitals in Salt Lake City, Utah. Within these hospitals, units were selected that had single-patient rooms; were of similar size, census, and acuity; and employed similar numbers of nurses. Units were avoided that had a patient population of only one gender (e.g., the Veterans Administration Medical Center admits very few women) or provided only a specific type of care (e.g., burn or trauma).

Length of stay in the unit was a potential problem in this study because it required an ICU stay of 3 nights (1 night prior to entry into the study, and two nights following delivery of the interventions). Not all patients stay this long, particularly those with angina or uncomplicated myocardial infarctions, who make up the bulk of patients in CCUs and some medical intensive care units (MICUs). This discrepancy between usual stay of these patients and stay required by the
study threatened the sample size. In response, subjects were followed out of the ICU to the general unit for the last night only. This variance in location of study was recorded and treated as an independent variable.

**Intervention**

The independent (treatment) variable was a nursing intervention. The nursing intervention was a combination of autogenic relaxation and guided imagery. Appendix A contains a script of the relaxation and imagery exercise. The design of this script was based on the use of relaxation and imagery in nursing care of the critically ill adult and on principles found in the literature review. Specifically, the intervention was designed to be from 13 to 18 minutes in length; delivered in person; and contained multiple suggestions of relaxation, well-being, control, and comfort. Further, the intervention required that the subject focus on relaxing muscle groups from toe to head on the cue of a comfortably deep breath. The image in the script allowed me to describe the selected image using five senses in the following order: (a) what could be seen; (b) what could be heard; (c) what could be smelled and tasted; and (d) what could be felt, including kinesthetic sensations.

The image was selected by the subject when asked, “What is your favorite place in the whole world to relax?” Following the answer to this question, the subject was asked, “Is this where you would like to go in the image today?” Then I confirmed with the subject the sights, sounds, smells, and physical sensations that he or she expected to encounter in that favorite place. As an example, 1 subject
wished to be laying on the bottom of a rowboat, with the boat floating gently on the surface of a deep, cold mountain lake, on a cool sunny spring morning. He wanted to hear the cheerful voices of his grandchildren on the shore, not too close to him but not too far away. For this subject, the image began with the sight of the golden-blue sky and one puffy white cloud, the sides of the rowboat, a bird or two flying quickly by, and the tops of deep green pine trees. The image continued with the sounds of the water softly slapping the sides of the boat, and voices chattering and laughing on the shore. It continued further with the smell and taste of the clean, fresh, cool mountain air. The image finished with the feeling of the warm sunshine on his face, the soft breeze on his arms, the cool wood of the bottom of the boat on his back and under his hands, and the gentle movement of the boat as it floated.

Prior to beginning the study, the script was examined for expert validity by a PhD-prepared clinical specialist, who uses the intervention in a faculty practice of symptom control in adults with oncologic diagnoses. The script was tested for face validity by performing the intervention according to the script with a staff nurse volunteer. This staff nurse volunteer session was tape-recorded, and the recording was reviewed by an intervention expert for validity, i.e., adherence to the script.

**Instruments**

One demographic survey, one sleep tool, one process variable tool, two instruments for intervention and environmental assessment, and two qualitative
questions were used in this study. Chart data were reviewed and tallied in numerical form.

**Demographic Data**

Demographic variables included data that were potential variables of concern. These variables were age, gender, acuity, site, days in hospital, days in ICU, diagnosis, respiratory support, treatments, medications, infusions, tubes and devices, and unusual occurrences. Demographic variables also included information from the subject’s history that theoretically may affect sleep patterns, including depression, Parkinson’s disease, thyroid disease, alcohol intake, anxiolytics, antihistamines, anticholinergics, and sedative hypnotics. This information was gathered from the subject’s written records, nurse on duty, and the subject.

**Sleep Data**

**The Verran and Snyder-Halpern Sleep Scale.** A paper-and-pencil test (VSH Sleep Scale) (Snyder-Halpern & Verran, 1987) was selected and revised to measure the concept of sleep quality (Appendix B). This instrument is inexpensive; easy to administer, score, and understand; and provides interval-level data. Clinically, this tool could be administered by a staff nurse independent of any other discipline and with very little (e.g., 5 minutes) training.

The “gold standard” for sleep measurement, EEGs, was not selected for this study for several reasons. The first reason is positive because a paper-and-
pencil tool is available. Other reasons not to use EEGs are the following: (a) expensive to administer; (b) difficult to access as a nurse investigator; and (c) difficult to administer, score, and interpret. The use of EEGs in a clinical setting confounds the setting and the dependent variable of sleep with its multiple attachments to the subject and the requirement that someone be continually present with the machine and the patient at the bedside. Clinically, a staff nurse could not independently collect data using this tool because it is not a nurse-ordered intervention; and it also would require extensive (e.g., greater than 30 laboratory hours) clinical training to administer, score, and interpret. Ultimately, with a valid and reliable paper-and-pencil tool available for sleep assessment, EEG data are not necessary to determine sleep quantity and quality.

The VSH Sleep Scale (Snyder-Halpern & Verran, 1987) is an 8-item visual analogue instrument that uses a 100 mm response line. Subjects are asked to place a mark on the 100 mm line for each item at a point that best reflects their feelings about that item.

A total interval-level score on the scale can be obtained, ranging from 0 to 800. The higher the total score, the better the quality of sleep. Individual items are scored at the interval level, addressing the factors of fragmentation (interrupted sleep), length of sleep, delay in getting to sleep, and depth of sleep.

**Previous reliability.** Factor analysis was used by Snyder-Halpern and Verran (1987) with the VSH Sleep Scale to identify internal consistency with 69 healthy volunteers, yielding 207 days of data. Using the principal components
method, all but one item loaded most heavily on the first extracted factor, disturbance. Loadings on this factor ranged between 0.44 and 0.84. Disturbance accounted for 44% of the variance in sleep quality. This finding is evidence that all the items may address a single concept, sleep quality (Pedhazur & Schmelkin, 1991).

Cronbach’s alpha is a measure of reliability for tools with parallel items that have identical true scores. Coefficient theta has been developed “as a special case of Cronbach’s alpha to specifically account for multidimensionality in an item set” (Ferketich, 1990, p. 438). Zeller and Carmines (1980) stated that alternate estimates of internal consistency should be used when the items are heterogeneous or when the number of items is small. Snyder-Halpern and Verran judged that the VSH Sleep Scale did not contain parallel items; in fact, items were heterogeneous. Ferketich did not provide a definition of “small,” but did provide a computational example of theta using a 10-item scale. The VSH Sleep Scale has only eight items. A coefficient theta of 0.82 provided evidence of reliability for the VSH Sleep Scale (Snyder-Halpern & Verran, 1987).

**Previous validity.** The principal components method of factor analysis undertaken by Snyder-Halpern and Verran (1987) revealed one important factor, and it supported reliability of the VSH Sleep Scale; varimax rotation resulted in the extraction of a second factor. These two subscales, disturbance and effectiveness, accounted for 60% of the variance in sleep quality. Disturbance explained 44% of the variance in sleep quality. Disturbance was a combination of fragmentation and
delay. The items of mid-sleep awakenings, sleep latency, and movement during sleep loaded on disturbance (range of loading = .04 to .87). The second factor, effectiveness, accounted for 16% of the variance in sleep quality. Effectiveness was a combination of length and depth of sleep. Three items (rest upon awakening, subjective quality of sleep, and total sleep period) loaded on this second factor (range of loading = 0.49 to 0.78).

In the same study, Snyder-Halpern and Verran (1987) compared the VSH Sleep Scale with two other instruments: the Baekeland and Hoy Sleep Log (Baekeland & Hoy, 1971) and the St. Mary’s Hospital Sleep Questionnaire (Ellis et al., 1981; Leigh, Bird, Hindmarch, Constable, & Wright, 1988). The Baekeland and Hoy Sleep Log was successfully compared to EEG sleep recordings, particularly regarding sleep latency and prolonged awakenings (Antrobus, Dement, & Fisher, 1964; Baekeland & Hoy, 1971). These findings provide evidence of the Baekeland and Hoy Sleep Log’s validity when compared with the “gold standard” of EEG recordings. The format and wording of items in the three tools are sufficiently different to provide a multimethod comparison (Campbell & Fiske, 1959; Ferketich, Figueredo, & Knapp, 1991).

The St. Mary’s Hospital Sleep Questionnaire requires recording specific times related to sleep and awakening, and answers to some forced-choice questions scored on 8-point scales. The Baekeland and Hoy Sleep Log consists of forced-choice questions scored dichotomously or on a 3-point scale. The VSH Sleep Scale consists of visual analog items scored on a 100-point scale. The questions on
the three scales are not identical.

Pearson correlation coefficients between items on the VSH Sleep Scale and the St. Mary's Hospital Sleep Questionnaire ranged from 0.50 to 0.74. These values are not extremely high, but they do indicate some evidence for convergent construct validity. Pearson correlation coefficients between items on the VSH Sleep Scale and the Baekeland and Hoy Sleep Log ranged from 0.53 to 0.68, with one exception being the measure of sleep latency ($r = 0.22$). The authors were unable to explain this exception, but it is most likely due to wording of the item on the VSH Sleep Scale, which states fell asleep immediately and didn't sleep at all. This item might better test for sleep latency if one descriptor was changed from didn't sleep at all to never fell asleep. The correlations between items on the VSH Sleep Scale and Baekeland and Hoy Sleep Log were not very high, but they demonstrated beginning evidence for convergent construct validity.

In the same study, Snyder-Halpern and Verran (1987) took a known-groups approach using one-way ANOVA to test the difference between three age groups on each sleep characteristic on the VSH Sleep Scale. Subjects were placed in three groups: (a) 20 to 35 years, (b) 36 to 60 years, and (c) 61 to 78 years. In a known-groups approach, subjects are grouped so that expected scores for each group will be widely divergent. Differences between groups, then, are used as evidence that the tool can discriminate between groups in an expected manner on the concept of interest. In general, sleep changes with age. Grouping subjects by age should provide significant differences between groups on the VSH Sleep Scale
scores.

For the characteristics of mid-sleep awakenings, sleep latency, and total sleep period, ANOVA results supported the validity of VSH Sleep Scale items; that is, the VSH Sleep Scale items of mid-sleep awakenings and sleep latency increased directly and significantly with age, as expected. The total sleep period did not change with age, contrary to expectations.

No support was found for the validity of items related to rest upon awakening, subjective quality of sleep, and soundness of sleep; that is, the items rest upon awakening and subjective quality of sleep changed with age, but not in the expected direction. There was no significant difference among groups in soundness of sleep in which a difference was expected. The authors offered no explanation for these unexpected findings. The known-groups approach to establishing validity of the VSH Sleep Scale yielded mixed results, with some items supported and some items in question.

Revisions of the tool for the study. I revised the VSH Sleep Scale for the study, and renamed it the Revised Verran and Snyder-Halpern Sleep Scale (RVSH Sleep Scale) (Appendix C). In this study, two items (method of awakening and movement during sleep) were not relevant to the project or the population; therefore, they were dropped from the VSH Sleep Scale. Method of awakening for the critically ill was a moot item for most of this population because they sleep so little. When they do sleep, nurse-generated stimuli nearly always awaken them (Richardson, 1993). Method of awakening also was not supported by factor
analysis (Snyder-Halpern & Verran, 1987). Movement during sleep is not related to sleep in the population of critically ill adults because many are physically restrained from moving at night or are too sick to move, except for nurse-initiated turning every 2 hours.

Mindful of the low correlation between sleep latency items on the Baekeland and Hoy Sleep Log and the VSH Sleep Scale (Snyder-Halpern & Verran, 1987), this item was revised. The item was changed from fell asleep immediately and didn’t sleep at all to fell asleep immediately and never fell asleep.

Three items (testing for the amount of time spent awake after sleep onset, subjective estimate of dissatisfaction with degree of disturbed sleep, and subjective estimate of dissatisfaction with time required to fall asleep) were added upon the recommendation of the tool’s authors (Snyder-Halpern & Verran, 1987). These three items were postulated to increase the range of measurement of the scale and to develop the subscale of disturbance.

The tool’s authors also recommended the addition of three items to develop the subscale of effectiveness (Snyder-Halpern & Verran, 1987). Two items (consisting of subjective estimate of adequacy of the amount of sleep received and the estimate of time asleep other than the primary sleep period) were added to the revised scale. One item, consisting of the estimate of time in bed from initial morning arousal to final awakening, was not added because it was not relevant to the bed-bound target population of the study.
Description of the revised scale. The RVSH Sleep Scale is an 11-item visual analogue instrument that uses a 100 mm response line (Appendix C). Subjects are asked to place a mark on the 100 mm line for each item at a point that best reflects their feelings about that item.

A total interval-level score on the scale can be obtained. The range of scores is 0 to 1,100. The higher the total score, the better the quality of sleep. Individual items are scored at the interval level, addressing the subscales of disturbance and effectiveness. Disturbance is comprised of fragmentation and delay. Effectiveness is comprised of length and depth of sleep. Composite scores of disturbance and effectiveness can be calculated at an interval level.

A final concern regarding the RVSH Sleep Scale must be acknowledged. Studies on healthy adults and healthy aged individuals relating movement and perception of time have been conducted (Engle, 1986; Fitzpatrick & Donovan, 1978; Newman, 1972, 1976; Schorr & Schroeder, 1991). These studies concurred that estimation of time shortened as movement increased and that estimation of time lengthened as movement decreased. If this is true for the critically ill, subjects moving in bed may have estimated time differently than paralyzed or immobilized subjects, creating error variance in the data. However, Smith (1979, 1983) was unable to establish a relationship between temporal experience and bed rest. She did find that rested individuals estimated time more accurately than fatigued individuals. Critically ill individuals who were fatigued might have estimated time on the RVSH Sleep Scale differently than those who were well-
rested.

**Other sleep measures.** Sleep disturbance also was measured by examining EEG monitoring data for interruptions in normal heart rate. Interruptions consisted of movement artifact, showing as high rates which are not physiologically possible, and electrode disconnections, showing as asystole. Artifact and disconnections are highly suggestive of interruptions to sleep or a lack of opportunity to sleep. The frequency of movement artifact and electrode disconnections was counted using cardiac monitor computer printouts of rate for the last 24 hours. This printout provided data about the opportunities to sleep during the night and during the day. Information about daytime sleep opportunities is lacking in most ICU sleep studies.

**Process Variables**

Process variables were defined as measures of how well the subject was able to experience relaxation and imagery (Appendix D). These variables included vital signs and measures of how well the subject was able to relax and experience a vivid image.

**Vital Signs**

Characteristic changes in vital signs are generally accepted as a reflection of the relaxation state. When deep relaxation occurs, skin temperature rises by at least 1.1 degrees Celsius (2 degrees Fahrenheit); heart rate decreases three or more beats per minute; and respiratory rate decreases two or more breaths per minute (Benson et al., 1974). Blood pressure also decreases when deep relaxation occurs
(Carey & Burish, 1987; Crowther, 1983; Miller & Perry, 1990; Munro et al., 1988). It is not known how vital signs respond to guided imagery.

Vital signs may not be a reliable measure of relaxation in the target population because the population experiences illnesses that have effects on vital signs regardless of state of arousal. The population also is receiving medications and treatments (e.g., dopamine and mechanical ventilation) that are designed to alter or control vital signs, or medications and treatments (e.g., morphine sulfate and dialysis) with side effects relative to vital signs. The response of vital signs in this population to autogenic relaxation is unknown, and the response of vital signs to guided imagery also is unknown in this population. Interval-level vital sign data were collected and analyzed with the above limitations and questions in mind.

**Heart rate.** Data about heart rate as a process variable were collected from the cardiac monitor already attached to each subject as part of their routine monitoring needs in the ICU. Data from the cardiac monitor regarding artifact and disconnections were used as a dependent measure of opportunities to sleep. Using Lead II or modified chest lead 1 (MCL1), a 1-minute strip of the cardiac rhythm was used to calculate heart rate, defined as the number of R waves per minute. Cardiac monitors are generally accepted to provide reliable and valid measures of heart rate on their strip recorders.

**Respiratory rate.** Data about respiratory rate were collected from the cardiac monitor already attached to each subject as part of his or her routine monitoring needs in the ICU. A 1-minute strip of the respiratory rhythm was used
to calculate respiratory rate, defined as the number of peak chest excursions per minute. Cardiac monitors are generally accepted to provide reliable and valid measures of respiratory rate on their strip recorders. If chest excursions were not shown on the cardiac monitor, this variable was measured by visually noting and counting the number of chest excursions per minute.

**Blood pressure.** Invasive arterial line measures of blood pressure were used whenever possible. When an arterial line was not present, blood pressure was measured using a mechanical sphygmomanometer over the brachial artery. Sphygmomanometers are generally accepted to provide reliable and valid measures of blood pressure when calibrated and used correctly.

**Measures of Relaxation and Imagery**

**Visual analogue measures of relaxation and imagery.** A visual analogue scale was used to provide data about how completely the subject was able to relax and how vividly the subject was able to experience guided imagery (Appendix D). The scale consisted of the markers, “I am completely relaxed” and “I am not relaxed at all,” and “My special place seems very vivid to me” and “My special place is not vivid at all.”

Visual analogue scales have been described as useful in measurement of subjective phenomenon in many populations, including the critically ill adult (Cline, Herman, Shaw, & Morton, 1992; Lee & Kieckhefer, 1989; Wewers & Lowe, 1990). These scales are associated with threats to reliability and validity. In this study, such threats were controlled by creating anchors that were bipolar
antonyms and by using simple language. Lee and Kieckhefer (1989) recommended that lines be drawn horizontally, whereas Cline et al. (1992) recommended a vertical placement. Orientation of the line came from the concern that the angle at which the line is viewed by the subject will affect the subject’s perception of length of the line. In this study, visual analogue scales were drawn horizontally in order to reduce the number of papers presented to the subject during data collection and to minimize subject fatigue at this time. The scales were presented to the subject on a clipboard perpendicular to the subject’s line of vision.

Duplication of the scales can alter the length of the line, which must be 100 mm on all copies of the scale. The sleep scale for each subject was printed directly from computer to paper, and the length of line was confirmed for each subject. Directions to subjects about marking the scale were concise, clear, and contained an example. Directions immediately preceded marking the scale.

**Intervention and Environmental Assessment Tools**

Interruptions to delivery of the treatment can be treated as a variable. Egan, Snyder, and Burns (1992) described a method of identifying how well intervention protocols are carried out in experimental designs. Scores on two scales were used to compare delivery of the intervention across time for any subject and between subjects. The first scale measured the degree of implementation of the protocol designed for the intervention using a 5-point scale (Appendix E). The second scale measured the effect of the environment on
delivery of the intervention (Appendix F). Scores from these scales were ordinal-level data, and they were used as covariates in ANCOVA analysis.

**Qualitative Questions**

All subjects were asked, upon completion of the RVSH Sleep Scale, to answer the question, “In your own words, what was last night like for you?” This information was analyzed for themes and commonalities in the sleep experience.

Progressive relaxation and progressive relaxation with guided imagery have been shown to have a positive effect on many patient responses. Intervention group subjects were asked about any other benefits they experienced as a result of the intervention, e.g., “Is there anything else you wish to tell me about what relaxation and imagery did for you?” Control group subjects were not asked a similar or alternate question.

**Procedures**

**Human Rights and Hospital Research Committees**

Approval to conduct the study was obtained from the Institutional Review Board at the University of Utah. I met formally with nurse managers and other key nursing personnel at two agencies: Hospital A and Hospital B. The purpose of these meetings was to explain the study and to elicit nurse manager cooperation with the project. Later, I met with staff nurses at Hospital A and explained the study. Requests to meet with staff nurses at Hospital B were made, but a mutually agreeable date for such a meeting was not obtained prior to beginning the study.
At Hospital B, staff nurses were individually informed of the purpose of the study as they were encountered on the unit.

Approval to conduct the study was obtained from the Research and Human Rights Committee at Hospital A. The study was presented formally to the Nursing Research Committee at Hospital B, and approval was received.

**Pilot Study**

In spring 1996, a two-phase pilot study was conducted. The pilot study served four purposes: (a) to answer several questions regarding tool use in the study population; (b) to evaluate the entire procedure of the proposed study in terms of recruitment, sampling, recording, intervention, and data management; (c) to establish routine procedures between myself and the research assistant most conducive to control of systematic error; and (d) to gain an initial impression of whether the intervention had any effect on sleep. Ten subjects were recruited purposefully from the target population. That is, the first 10 subjects who fit criteria for inclusion and who agreed to participate in the study were included as subjects.

In phase one, the first 5 subjects recruited were asked to complete the RVSH Sleep Scale on 3 consecutive mornings, duplicating the repeated measures design of the proposed study. The reliability and validity research questions that the first phase subjects answered were the following:

1. Can the critically ill adult complete the tool?
2. Are there important difficulties in completing the tool on 3 consecutive mornings?

3. Are there important difficulties in completing the tool in the study setting?

4. Are there important difficulties in scoring and analyzing the tool?

Regarding Research Questions 1, 2, and 3, the critically ill adult could complete the tool without undue hardship or difficulty over 3 consecutive mornings. Early in the first phase of the pilot study, some changes were made in the tool: (a) The font size was increased; (b) the 11 items were split between two pages; (c) “disturbances” for item 4 was changed to “interruptions”; and (d) the background was adjusted for visibility. Instructions for explaining how to mark the tool were agreed upon.

Regarding Research Question 4, there were no important difficulties in scoring the tool. A test of interrater reliability for scoring the tool was conducted and found to be at 100%. One important difficulty in analyzing the tool was dealing with missing data on individual items. Calculating a total sleep score required an answer on each item of the RVSH Sleep Scale. Two subjects did not understand an occasional item or wished to speak about their sleep experience relative to that item. Missing data eliminated these subjects from analysis that involved total sleep scores for 1 or more nights.

In the second phase of the pilot study, 5 subjects completed the tool on 3 consecutive mornings and received the intervention on 2 evenings. Research
questions that the second phase subjects answered were the following:

5. Are there important difficulties in recruiting subjects?
6. Can the critically ill adult participate in the intervention?
7. Are there important difficulties in administering the intervention in the setting?
8. Are there important difficulties in measuring the process variables?

Regarding Research Question 5, there were difficulties in recruiting subjects during the pilot study, with a refusal rate of 50% for the first 8 subjects. Explaining both the control and experimental group procedures, benefits, and risks appeared to take too long, and the detail was too overwhelming for these ill people. The procedure for recruitment was changed so that the coin toss occurred after eligibility screening with the charge nurse and patient charts, but before approaching the patient. Subjects were told that there were two groups in the study; then the procedures, risks, and benefits for their group were explained. If the subject asked for information about the other group, that information was provided. Explaining the procedures, benefits, and risks for only one group assignment at a time improved recruitment, which decreased the subsequent refusal rate to 0% for the remaining 2 pilot subjects.

Regarding Research Questions 6 and 7, the critically ill adult could participate in the intervention; also, there were no unanticipated difficulties in administering the intervention in the setting. Delivery of the intervention was adjusted for the first 3 subjects; that is, I delivered the intervention, and variations
from the script were agreed upon.

Regarding Research Question 8, there was only one difficulty in measuring the process variables: It was not possible to obtain the devices to measure skin temperature prior to the onset of the pilot; therefore, this measure was dropped from the study.

Other research questions that the pilot study subjects answered were the following:

9. How reliable is the tool for the critical ill adult?
10. Is the tool sensitive enough to detect a clinically significant and/or statistically significant effect size?

Regarding Research Question 9, internal consistency was determined by calculating a Cronbach’s alpha; it was found to be .848. This finding is a high value, indicating that the tool has high internal consistency. With such a high alpha, it is possible that the tool contained no subscales in this population. The small sample size of the pilot precluded statistical analysis for subscales. The high value for Cronbach’s alpha also possibly indicated that the number of items could be reduced in this population without affecting reliability and validity. A correlation matrix showed high correlations between 9 of the 11 items (Table 2). One item, concern over disturbances, showed low correlations with other items, ranging from -.16 to .72. One item (naps) was negatively related to the other sleep items, but not consistently, ranging from -.80 to -.04. With these two items dropped from the RVSH Sleep Scale for analysis, the tool was renamed the
Table 2

Correlation Matrix of the Revised Verran and Snyder-Halpern Sleep Scale Items for Reliability Analysis for the Pilot Study (N = 10)

<table>
<thead>
<tr>
<th></th>
<th>FRAG</th>
<th>HRSA</th>
<th>HRSL</th>
<th>CDIS</th>
<th>DELA</th>
<th>CPR</th>
<th>DEP</th>
<th>ENO</th>
<th>REFR</th>
<th>NAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRAG</td>
<td>.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRSA</td>
<td>.61</td>
<td>.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRSL</td>
<td>.00</td>
<td>-.10</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDIS</td>
<td>.69</td>
<td>.67</td>
<td>.83</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELA</td>
<td>.65</td>
<td>.68</td>
<td>.70</td>
<td>-.12</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPR</td>
<td>.56</td>
<td>.33</td>
<td>.80</td>
<td>.61</td>
<td>.67</td>
<td>.57</td>
<td></td>
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<tr>
<td>DEP</td>
<td>.65</td>
<td>.65</td>
<td>.45</td>
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<td>.36</td>
<td>.52</td>
<td>.43</td>
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<td></td>
</tr>
<tr>
<td>ENO</td>
<td>.53</td>
<td>.56</td>
<td>.42</td>
<td>.04</td>
<td>.23</td>
<td>.47</td>
<td>.43</td>
<td>.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REFR</td>
<td>-.16</td>
<td>-.61</td>
<td>-.80</td>
<td>-.29</td>
<td>-.77</td>
<td>-.57</td>
<td>-.61</td>
<td>-.17</td>
<td>-.04</td>
<td></td>
</tr>
<tr>
<td>NAP</td>
<td>.72</td>
<td>.70</td>
<td>.54</td>
<td>.12</td>
<td>.44</td>
<td>.54</td>
<td>.49</td>
<td>.99</td>
<td>.95</td>
<td>-.23</td>
</tr>
</tbody>
</table>

Note. FRAG = fragment, HRSA = hours awake, HRSL = hours asleep, CDIS = concern over disturbances, DELA = delay, CPR = concern over prodrome, DEP = depth, ENO = enough, REFR = refresh, and NAP = nap.
RVSH2 Sleep Scale.

Regarding Research Question 10, sleep scores were analyzed using the Wilcoxon-Mann-Whitney test. This nonparametric statistic tests whether two independent groups have been drawn from the same population. This test is a useful alternative to the parametric \( t \) test, with a power-efficiency level of 95.5, depending on sample size (Siegel & Castellan, 1988). The mean scores and standard deviations of scores on the RVSH2 Sleep Scale for all pilot subjects are reported in Table 3. Using the sum of all items on the RVSH2 Sleep Scale as a total sleep score, no significant difference in sleep scores on the basis of group membership (control versus experimental) was found for pretest, posttest Time 1, or posttest Time 2 (\( p \) values ranging from 1.000 to .109). Procedure changes, sample size, and tool modifications in the pilot made the nonsignificant results of the Wilcoxon-Mann-Whitney test questionable.

Evidence was found that pilot subjects were unusual. Impressions from the pilot study led the researcher to believe that conditions between nursing units would be an important variable in the study. Charting, routines, architecture, traffic patterns, and lighting were clearly different between ICUs, and they were very different between the ICUs and the general-care units to which some pilot subjects transferred.

Of the 10 pilot subjects, 3 transferred. If one third of the sample transferred, conditions in the environment could be an important sleep variable. Detecting changes in the face of such an important variable would require a larger
Table 3

RVSH2 Sleep Scale Scores for the Pilot Study Subjects (N = 10)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>8</td>
<td>498.50</td>
<td>226.93</td>
</tr>
<tr>
<td>Day 2</td>
<td>6</td>
<td>464.83</td>
<td>189.74</td>
</tr>
<tr>
<td>Day 3</td>
<td>5</td>
<td>495.00</td>
<td>172.06</td>
</tr>
</tbody>
</table>

sample.

My impression was that the 2 females in the experimental group had responded to the intervention differently than the 3 males in the experimental group. Further, my sense also was that the 3 males in the experimental group had not responded to the intervention the way males usually responded to the intervention in my nursing practice. This difference in response appeared to be important, which would require a larger sample in order to understand.

Because the VSH Sleep Scale, the RVSH Sleep Scale, and the RVSH2 Sleep Scale have never been reported in the literature as a dependent variable to test the effects of relaxation and/or imagery on sleep, no data were available in the literature for the calculation of eta squared. Eta squared is a measure of effect size. In a meta-analysis of nursing interventions and patient outcomes, Heater, Becker, and Olson (1988) found that the mean reported effect size was .59. Devine and Cook (1986) reported an effect size of .50 from a meta-analysis of clinical and cost-saving effects of psychoeducational interventions with surgical patients. Lipsey (1990) compared 102 mean effect sizes of 182 meta-analyses on
psychological, educational, and behavioral treatment effectiveness research, which summarized the results of approximately 6,700 individual treatment effectiveness studies involving nearly 800,000 subjects. The mean effect size for these studies was .45; that is, on average, the treatment group scores on the dependent variable were nearly half a standard deviation better than those of the comparison group. This “medium” effects size represents the outcomes for the middle 38% of the studies included in the meta-analysis. The upper 33% of studies in the meta-analysis showed a mean effect size of .90, which Lipsey (1990) rates as “large.” Possibly, the intervention had made a difference in sleep in the pilot experimental group, but the tool was not sensitive enough to detect the difference numerically.

Leidy and Weissfeld (1991) recommended that investigators pause before implementing intervention studies with power lower than .7 or .8. If alpha is set at .05 (.025 for a one-tailed test) and the effect size is .50 (intervention improves treatment group sleep scores by half a standard deviation), in order to have a 90% chance of detecting the treatment effect, the number of subjects in each group needs to be 85. If alpha is set at .05, power at .90, and effect size at .90, the number of subjects in each group needs to be 27 (Lipsey, 1990). Recruiting and studying approximately 40 subjects, excluding the pilot subjects, was economically and temporally feasible.

Main Study

A temporal representation of procedures is represented in Table 4. For an experimental group subject, Day 1 began with recruitment into the project,
Table 4

Sample Time Line of Progression Through the Study for One Experimental Subject

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Recruitment</td>
<td>Process variables measurement</td>
</tr>
<tr>
<td></td>
<td>Informed consent</td>
<td>Delivery of the independent variable</td>
</tr>
<tr>
<td></td>
<td>Assignment to group</td>
<td>Process variables measurement</td>
</tr>
<tr>
<td></td>
<td>Dependent variables measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 2</td>
<td>Demographic variables update</td>
<td>Process variables measurement</td>
</tr>
<tr>
<td></td>
<td>Dependent variable measurement</td>
<td>Delivery of the independent variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process variables measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 3</td>
<td>Demographic variables update</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dependent variable measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
followed by dependent variable measurement, all between the hours of 0800 and 1100. That evening, between the hours of 1700 and 1900, the subject experienced the intervention with process variable measurement. On Day 2, the dependent variables were again measured in the morning, and the intervention was experienced in the evening with process variable measurement. On Day 3, the dependent variables were measured for the last time in the morning.

**Assignment to groups.** The charge nurse on each unit was initially consulted to discover which patients would be eligible for inclusion. Coin toss was used to assign a potential subject to either group prior to recruitment.

**Recruitment and informed consent.** Each eligible patient was approached on the morning of prospective inclusion in the study. At that time, informed consent was obtained, following guidelines for obtaining consent with humans (Appendix G).

**Confidentiality of information.** Upon inclusion into the study, a code number was assigned to the subject from a list that remained in my possession for the duration of the study. After the study was completed, the list that links subjects with code numbers was destroyed.

**Measurement of the dependent variables.** The dependent variable was measured three times: (a) Day 1 between 0800 and 1100 upon inclusion in the study, (b) Day 2 between 0800 and 1100, and (c) Day 3 between 0800 and 1100.

I was responsible for recruitment, as was the individual who presented the tool to the subject on Day 1. The research assistant, without knowing group
membership of the subject, presented the tool to the subject on Days 2 and 3.

The RVSH Sleep Scale was presented to the subject on a clipboard with a pen. Subjects who could read the scale independently were encouraged to do so. For subjects who were unable to read the print on the scale, each item was read to the subject. As each of the two phrases in each item was read to the subject, the researcher pointed to the side of the scale line that the phrase indicates. I used this method of reading both ends of the scale for patients while consulting for a rehabilitation unit in a teaching hospital for symptom control management, encountering no difficulty or patient concerns while doing so.

Subjects who could mark the visual analogue scales independently did so. Those who could not grip the pen and mark with it were asked to point to the place on the visual analogue scale where they wanted their mark to be placed, and then the mark was placed for them. Correct placement of each mark was confirmed with the subject at that time.

After completing the RVSH Sleep Scale, qualitative data were gathered. I and a research assistant recorded in writing the answer that the subject gave in his or her own words. Continuous heart rate information for the previous 24 hours was collected as a paper printout from cardiac monitor computers at the nurses’ station in each unit.

**Measurement of the process variables.** The process variables were measured four time immediately prior to and following administration of the intervention. Whenever possible, vital signs were taken from oscillographic
monitors in the patient’s room via chest leads and arterial pressure lines. When
this was not possible, vital signs were measured via manual palpation of the radial
pulse, visual examination of chest excursions, and sphygmomanometric
measurement of pressure in the brachial artery.

**Measurement of the demographic variables.** Demographic data were
obtained from the patient, staff nurses, charge nurses, and patient charts. These
data were updated on the mornings of Day 2 and Day 3.

**Delivery of the independent variable/treatment/intervention.** The
independent variable was delivered twice by me: (a) Day 1 between 1700 and
1900 and (b) Day 2 between 1700 and 1900.

The intervention was delivered as closely as possible to the following
protocol:

The subject’s toileting, airway, and thirst needs were attended to.
The subject was placed in a position of comfort (proper body
alignment, extremities supported, covered or exposed as per his or
her wish, etc).
The subject was asked what his or her favorite place is and to
describe the visual, auditory, olfactory, and kinesthetic sensations
present in their place, including what the subject liked to do best in
that place (walking, sitting, floating, etc.).
The subject was instructed to listen to the investigator’s
voice, closing his or her eyes when he or she wished, and not to
become disturbed if he or she was distracted or his or her attention
wandered, but simply to acknowledge the distraction or wandering,
take a deep breath, and refocus on the investigator’s voice and
words.
The script in Appendix A was followed as closely as possible
without interruption. Walking in a mountain meadow is used as an
element of a subject’s favorite place.
As a field study, delivery of the independent variables in a consistent manner was an issue of control over confounding variables. The interventions were delivered within the same time span (1700 to 1900) for all subjects and according to a script (Appendix A) for all subjects.

Eliminating interruptions to the intervention was not possible, but they were reduced. The nature of the research was discussed with the nurses on each unit during staff meetings and individually as encountered while interacting with subjects. The nurses' help was recruited in keeping interruptions to a minimum. Clinically, interruptions in the treatment also frequently occur; therefore, this potentially confounding variable actually replicated clinical conditions in which the research is later applied. These usual interruptions were dealt with by instructing the subject to note the interruption, but not to become involved with it, to take a breath, and to refocus on my voice and his or her relaxation. This instruction occurred prior to beginning the intervention and during the intervention at the time an interruption or distraction was noticed.

Contamination between groups and changes in the normal night-shift routine were partially controlled for by conducting recruitment, data collection, and intervention during day-shift hours (0700 to 1900), being sure to complete the intervention prior to arrival of night-shift staff nurses who worked from 1900 to 0700.

Other threats to reliability and validity of the dependent variables were controlled as much as possible by the researcher. Possible researcher bias in
pretreatment data collection was partially controlled for by asking subjects to make their own marks on the RVSH Sleep Scale whenever possible. Researcher bias in posttreatment data collection possibly was controlled for by having a research assistant collect data on Day 2 and Day 3. RVSH Sleep Scale data were collected between the hours of 0800 and 1100 for each subject and as close to the same time each day for individual subjects. For example, if data for one subject were collected on Day 1 at 1000, data were collected between 0930 and 1030 on Days 2 and 3 for that subject.
CHAPTER IV

FINDINGS

The results of this study are presented in three segments. The first part contains demographic and clinical information about the sample. The second section addresses reliability and validity of the RVSH Sleep Scale. The final section is organized to correspond to the research questions on which this study was based.

Description of the Sample

The sample for this study consisted of 36 adult ICU patients with various diagnoses. Demographic and clinical data were analyzed by descriptive statistics, including frequency distributions and measures of central tendency and dispersion.

Demographic Characteristics

Demographic characteristics of the sample are summarized using descriptive statistics (Table 5). All subjects were White. Of the 36 subjects, 17 were men (47%) and 19 were women (53%). No significant group differences were found in gender. All but 2 subjects lived in Utah or nearby states and spoke English as their primary language. The exceptions were a man born, raised, and currently living in Oklahoma and a man vacationing in Utah from his native Germany fluent
Table 5

Frequency of Selected Demographic Characteristics in Critically Ill Adults (N = 36)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th></th>
<th>Control</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>White</td>
<td>16</td>
<td>44.4</td>
<td>20</td>
<td>55.6</td>
<td>36</td>
<td>100.0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>19.4</td>
<td>10</td>
<td>27.8</td>
<td>17</td>
<td>47.2</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>25.0</td>
<td>10</td>
<td>27.8</td>
<td>19</td>
<td>52.8</td>
</tr>
<tr>
<td>Residence</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermountain</td>
<td>17</td>
<td>47.2</td>
<td>17</td>
<td>47.2</td>
<td>34</td>
<td>94.4</td>
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<td>West</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Other (United</td>
<td>1</td>
<td>2.8</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>States)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other (Germany)</td>
<td>1</td>
<td>2.8</td>
<td>1</td>
<td>2.8</td>
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<td></td>
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<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All subjects</td>
<td>22-78</td>
<td>58.4</td>
<td>14.3</td>
</tr>
<tr>
<td>Control</td>
<td>24-78</td>
<td>62.4</td>
<td>13.0</td>
</tr>
<tr>
<td>Experimental</td>
<td>22-77</td>
<td>53.5</td>
<td>14.5</td>
</tr>
</tbody>
</table>
A wide range of ages was represented (22 to 78 years, $M = 58$ years). No significant differences were found in age. In the control group, the age of subjects ranged from 24 to 78 ($M = 62.4$ years); and in the experimental group, the age of subjects ranged from 22 to 77 ($M = 53.5$ years).

The refusal rate for participation was 16%. Of 43 potential subjects, 7 declined to participate in the study. All 7 who declined indicated that they were too sick or too overwhelmed, in general, to be included.

**Clinical Characteristics**

Simple descriptive statistics were used to analyze clinical characteristics. These characteristics included group membership, the unit in which the subject was recruited, the number of subjects who transferred from an ICU to a general nursing unit, the major diagnosis for which the subject was admitted, and the use of sleep-inducing medications. Clinical characteristics also included length of stay in the hospital prior to recruitment; the number of monitoring, treatment, or comfort devices to which the patient was attached; the number of interruptions experienced during the entire night; and the number of interruptions experienced after midnight.

**Group membership.** Twenty subjects were in the control group (56%), and 16 subjects were in the experimental group (44%) (Table 6).

**Critical care unit.** Subjects were well-distributed between critical care units, with 13 (36%) in Hospital A medical-surgical intensive care unit (MSICU),
Table 6

**Frequency of Group Membership, Unit, and Diagnosis in Critically Ill Adults (N = 36)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Group</td>
<td>16</td>
<td>44.4</td>
<td>20</td>
</tr>
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<td>Unit</td>
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<tr>
<td>MSICU</td>
<td>6</td>
<td>16.7</td>
<td>7</td>
</tr>
<tr>
<td>CCU</td>
<td>6</td>
<td>16.7</td>
<td>7</td>
</tr>
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<td>MICU</td>
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<td>11.1</td>
<td>6</td>
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<tr>
<td>Disposition</td>
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<td>Transferred</td>
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<td>8.3</td>
<td>6</td>
</tr>
<tr>
<td>Removed</td>
<td>3</td>
<td>8.3</td>
<td>3</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td>3</td>
<td>8.3</td>
<td>8</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>5</td>
<td>13.8</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>22.2</td>
<td>9</td>
</tr>
</tbody>
</table>

**Note.** MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
13 (36%) in Hospital A CCU, and 10 (28%) in Hospital B MICU. Table 6 shows that the control and experimental subjects were evenly distributed in the units. Disposition of the subjects over the course of their inclusion in the study was examined. By Day 2, 2 subjects had transferred and 2 had been removed from the study. By Day 3, 11 subjects (31%) had transferred and 6 subjects (17%) had been removed from the study (Table 6). Four subjects were removed because their conditions had worsened such that they were no longer eligible to continue in the study. Two experimental female subjects were removed at their request after 24 hours because they were concerned that their religion (Jehovah’s Witness and Pentecostal Christian) would prohibit participation in the intervention. The disposition of subjects by Day 3 was evenly distributed between the control and experimental groups.

**Diagnosis.** Subjects were admitted to intensive care for treatment of one or more diseases or illnesses. For subjects with multiple disease involvement, chart data were examined to determine which illness was receiving priority treatment. Eleven subjects (32%) were admitted primarily for treatment of a cardiac or cardiac-related condition such as myocardial infarct, suspected myocardial infarct, cardiomyopathy, or cardiac rhythm disturbance (Table 6). Pulmonary disease or disorder, including pneumonia, pulmonary embolism, acute respiratory failure, and asthma, accounted for the admission of 8 subjects (18%). Other diagnoses, including clotting disorders (n = 1), multiple trauma (n = 2), Goodpasture’s disease (n = 1), and diabetes (n = 3), accounted for the admission of 17 subjects
Medications received. Charted data were reviewed to determine medication administration that could have affected sleep. Medications of this nature included temazepam, alprazolam, diphenhydramine, morphine sulfate, lorazepam, triazolam, zolpidem, diazepam, Lortab, Percocet, and Darvocet-N100. The above medications were received unevenly (Table 7). No clear pattern of administration over time was found for any subject, and there also was no clear difference in the pattern of administration over time between control and experimental subjects. Of the 28 subjects who completed the RVSH2 Sleep Scale for all 3 nights, 20 (71%) received a medication that could have influenced sleep patterns at some time during their participation. Seven subjects (25%) received a sleep-inducing or sleep-promoting medication, but not necessarily the same medication, all 3 nights of inclusion in the study. Two subjects (7%) received a medication on the first night only, 2 (7%) on the second night only, 4 (14%) on the third night only, and 2 (7%) on the first and second nights only; whereas 3 (11%) received a medication on the first and third nights only. T tests showed that there were no significant differences in groups on the basis of medications received.

Length of stay. Experimental and control subjects had spent an average of 5 days in the ICU upon recruitment into the study, with a range of stay from 1 to 23 days (Table 8). However, multiple modes existed in both groups, with 6 subjects (16.7%) each having spent 1, 2, and 3 days in the ICU upon recruitment
Table 7

Frequency of Sleep-Inducing Medication Use in Critically Ill Adults by Day Three (n = 29)

<table>
<thead>
<tr>
<th>Medication use</th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Any night</td>
<td>10</td>
<td>34.1</td>
<td>10</td>
</tr>
<tr>
<td>All 3 nights</td>
<td>2</td>
<td>7.0</td>
<td>5</td>
</tr>
<tr>
<td>First night only</td>
<td>2</td>
<td>7.0</td>
<td>0</td>
</tr>
<tr>
<td>Second night only</td>
<td>1</td>
<td>3.4</td>
<td>1</td>
</tr>
<tr>
<td>Third night only</td>
<td>2</td>
<td>7.0</td>
<td>2</td>
</tr>
<tr>
<td>First and second nights</td>
<td>1</td>
<td>3.4</td>
<td>1</td>
</tr>
<tr>
<td>First and third nights</td>
<td>2</td>
<td>7.0</td>
<td>1</td>
</tr>
<tr>
<td>Second and third nights</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 8

Frequency of Selected Clinical Characteristics in Critically Ill Adults (N = 36)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Days in Devices</td>
<td>1-23</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Night 1</td>
<td>7-16</td>
<td>10.6</td>
<td>2.9</td>
</tr>
<tr>
<td>Night 2</td>
<td>0-16</td>
<td>9.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Night 3</td>
<td>0-17</td>
<td>88.4</td>
<td>4.6</td>
</tr>
<tr>
<td>Interruptions 1900 to 0659</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night 1</td>
<td>24-98</td>
<td>51.4</td>
<td>16.7</td>
</tr>
<tr>
<td>Night 2</td>
<td>37-81</td>
<td>56.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Night 3</td>
<td>18-87</td>
<td>43.8</td>
<td>22.4</td>
</tr>
<tr>
<td>Interruptions 0100 to 0659</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night 1</td>
<td>7-31</td>
<td>16.3</td>
<td>6.7</td>
</tr>
<tr>
<td>Night 2</td>
<td>6-30</td>
<td>16.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Night 3</td>
<td>1-30</td>
<td>12.8</td>
<td>8.8</td>
</tr>
</tbody>
</table>
into the study. T tests showed no significant differences in groups on the basis of length of stay.

**Number of devices.** Charted data were examined to estimate the average number of devices attached to, or implanted in, the subject each night for the purposes of monitoring, treatment, or comfort (Table 8). The number of such devices per subject dropped from an average of 10.4 (SD = 2.9) on the first night to a mean of 9.9 (SD = 3.1) on the second night and a mean of 8.2 (SD = 3.9) on the third night of the study. The ranges, means, and standard deviations were comparable for experimental and control group subjects. T tests showed that there were no significant differences between groups on the basis of number of devices.

**Interruptions.** Charted data were examined to estimate the number of interruptions per hour experienced by each subject (Table 8). Examples of interruptions were administration of a medication, intravenous fluid rate change, assessment of lung sounds, mentation or peripheral pulses, toileting, and position change. Between the hours of 1900 and 0659 the average number of interruptions changed over time from 50.1 (SD = 17.9) on the first night to 51.5 (SD = 15.4) on the second night to 45.9 (SD = 21.3) on the third night. Ranges, means, and standard deviations for interruptions for the entire night were comparable for experimental and control group subjects. T tests showed that there were no significant differences between groups on the number of interruptions between 1900 and 0659.
Usual sleep for adults begins later than 1900. Theoretically, the least busy time for patients in an ICU is between 0100 and 0700. Interruptions that occurred between 0100 and 0659 were calculated. The average number of interruptions during these morning hours dropped slightly over time and, in fact, was much less than for the entire 12 hours of the night shift. For the first night, the mean for interruptions was 15.7 (SD = 7.0), for the second was 15.3 (SD = 7.4), and for the third was 13.9 (SD = 9.2). These numbers (range, mean, and standard deviation) for interruptions during the morning hours were comparable for experimental and control group subjects. T tests showed that there were no significant differences between groups on the number of interruptions from 0100 to 0659.

**Process Variables**

Process variables for the experimental group subjects are contained in Table 9. These variables include change in heart rate, respiratory rate, systolic blood pressure, and diastolic blood pressure from Time 1 to Time 2. Negative scores for these physiologic variables indicate a lowering of the measure from pre- to postintervention times. Table 9 also includes changes in relaxation and image scores for Time 1 and Time 2. Positive scores indicate more relaxation and a more vivid image from pre- to postintervention times. Two subjects fell asleep during the first intervention, with 1 falling asleep during the second intervention. Waking sleeping subjects for process measures was judged inappropriate, which explains the variable sample sizes for the process scores. Ratings for protocol
Table 9

Mean Process Variable Scores, Protocol Scores, and Environment Scores for Experimental Group Subjects (n = 16)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heart rate change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-11.0-2.0</td>
<td>-2.5</td>
<td>3.8</td>
<td>16</td>
</tr>
<tr>
<td>Time 2</td>
<td>-8.0-12.0</td>
<td>-.2</td>
<td>5.8</td>
<td>11</td>
</tr>
<tr>
<td><strong>Respiratory rate change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-13.0-0.0</td>
<td>-5.9</td>
<td>3.6</td>
<td>16</td>
</tr>
<tr>
<td>Time 2</td>
<td>-10.0-0.0</td>
<td>-3.9</td>
<td>3.4</td>
<td>12</td>
</tr>
<tr>
<td><strong>Systolic blood pressure change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-34.0-3.0</td>
<td>-7.8</td>
<td>11.4</td>
<td>12</td>
</tr>
<tr>
<td>Time 2</td>
<td>-28.0-21.0</td>
<td>-6.7</td>
<td>13.4</td>
<td>9</td>
</tr>
<tr>
<td><strong>Diastolic blood pressure change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-17.0-6.0</td>
<td>-5.3</td>
<td>6.5</td>
<td>10</td>
</tr>
<tr>
<td>Time 2</td>
<td>-19.0-9.0</td>
<td>-4.9</td>
<td>8.5</td>
<td>8</td>
</tr>
<tr>
<td><strong>Relaxation change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-61.0-84.0</td>
<td>20.1</td>
<td>39.4</td>
<td>14</td>
</tr>
<tr>
<td>Time 2</td>
<td>-99.0-66.0</td>
<td>11.3</td>
<td>42.1</td>
<td>11</td>
</tr>
<tr>
<td><strong>Image change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-12.0-93.0</td>
<td>26.0</td>
<td>34.6</td>
<td>14</td>
</tr>
<tr>
<td>Time 2</td>
<td>-24.0-81.0</td>
<td>10.1</td>
<td>27.1</td>
<td>11</td>
</tr>
<tr>
<td><strong>Protocol score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>3.0-5.0</td>
<td>4.5</td>
<td>.6</td>
<td>16</td>
</tr>
<tr>
<td>Time 2</td>
<td>3.0-5.0</td>
<td>4.7</td>
<td>.6</td>
<td>12</td>
</tr>
<tr>
<td><strong>Environment score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>2.0-3.0</td>
<td>2.6</td>
<td>.5</td>
<td>16</td>
</tr>
<tr>
<td>Time 2</td>
<td>1.0-3.0</td>
<td>2.3</td>
<td>.7</td>
<td>12</td>
</tr>
</tbody>
</table>
adherence and contribution of environmental factors are also contained in Table 9.

**Reliability and Validity of the Tool**

Data were examined to determine the reliability and validity of the RVSH Sleep Scale. The results of the study provide evidence that portions of this tool are a reliable and valid measure of the perception of sleep and insomnia in the critically ill adult. Reliability of the RVSH Sleep Scale is addressed first, followed by validity of the tool.

**Reliability**

Pretest scores on the 11 items of the RVSH Sleep Scale for all 36 subjects were examined for means and distributions (Table 10). The items of hours awake, concern over disturbances, delay, and concern over prodrome were calculated by reversing raw scores for that item. Mean scores ranged from 30.9 for depth to 69.7 for naps. Characteristics of skew, kurtosis, and histograms showed that responses on all items were roughly normally distributed.

Interrater reliability was calculated to determine the accuracy of scoring of the RVSH Sleep Scale. All items for all subjects were scored independently by the investigator and a research assistant, with the rate of agreement being determined. Agreement on item scores for the RVSH Sleep Scale tools of all subjects was 100%.

Factor analysis was used as a test of internal consistency. Pretest scores on the RVSH Sleep Scale were subjected to factor analysis (Table 11). All but two
Table 10

Mean Pretest Responses of the RVSH Sleep Scale Items for Total Sample (N = 36)

<table>
<thead>
<tr>
<th>Characteristic of sleep</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td>0-96</td>
<td>35.9</td>
<td>27.4</td>
</tr>
<tr>
<td>Hours awake*</td>
<td>0-99</td>
<td>50.1</td>
<td>25.6</td>
</tr>
<tr>
<td>Hours asleep</td>
<td>0-95</td>
<td>40.3</td>
<td>22.3</td>
</tr>
<tr>
<td>Concern over disturbances*</td>
<td>0-100</td>
<td>59.8</td>
<td>34.6</td>
</tr>
<tr>
<td>Delay*</td>
<td>0-97</td>
<td>55.1</td>
<td>29.0</td>
</tr>
<tr>
<td>Concern over prodrome*</td>
<td>0-100</td>
<td>58.0</td>
<td>35.1</td>
</tr>
<tr>
<td>Depth</td>
<td>0-93</td>
<td>30.9</td>
<td>25.9</td>
</tr>
<tr>
<td>Enough</td>
<td>0-100</td>
<td>45.1</td>
<td>33.8</td>
</tr>
<tr>
<td>Refreshed</td>
<td>0-97</td>
<td>42.9</td>
<td>31.1</td>
</tr>
<tr>
<td>Naps*</td>
<td>10-100</td>
<td>69.7</td>
<td>22.4</td>
</tr>
<tr>
<td>Good night</td>
<td>0-98</td>
<td>42.7</td>
<td>32.8</td>
</tr>
</tbody>
</table>

*The score was computed by reversing raw scores for this item.
Table 11

Results of Common Factor Analysis of the RVSH Sleep Scale Items for Day One (N = 36)

<table>
<thead>
<tr>
<th>RVSH Sleep Scale item</th>
<th>Factor 1 loading</th>
<th>Factor 2 loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td>.75</td>
<td>.44</td>
</tr>
<tr>
<td>Hours awake</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Hours asleep</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Concern over disturbances</td>
<td>.43</td>
<td>-.51</td>
</tr>
<tr>
<td>Delay</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td>.68</td>
<td>-.40</td>
</tr>
<tr>
<td>Depth</td>
<td>.78</td>
<td>.38</td>
</tr>
<tr>
<td>Enough</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Refreshed</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Naps</td>
<td>-.39</td>
<td>.55</td>
</tr>
<tr>
<td>Good night</td>
<td>.92</td>
<td></td>
</tr>
</tbody>
</table>
items, using the principal components method, loaded heavily on one extracted factor. Loadings on this factor ranged between 0.92 to 0.68. This factor accounted for 56.2% of the variance in sleep quality. Two items, naps and concern over disturbances, loaded weakly and oppositely on a second factor. Loadings on this second factor were 0.55 for naps and -0.51 for concern over disturbances. This second factor accounted for 11.1% of the variance in sleep quality. These two factors accounted for 67.3% of the variance in sleep quality. This evidence shows that all items but two addressed a single concept: perception of sleep quality.

Cronbach’s alpha was used as a test of internal consistency. The VSH Sleep Scale has demonstrated sufficient internal consistency to justify the use of split-half measurement to determine reliability despite the low number of items on the scale. However, split-half measurement is, in general, considered to be a less useful measure of internal consistency than Cronbach’s alpha. Coefficient theta, which was used by the tool’s authors to provide evidence of reliability, is most useful for tools of small size and heterogeneous items (Ferketich, 1990; Pedhazur & Schmelkin, 1991). Because previous factor analysis and interitem correlation data indicated that the items in the tool were testing for the same construct (sleep), this could mean that this homogeneous tool was not suitable for testing via coefficient theta.

Cronbach’s alpha was found to be 0.88 (Table 12). The mean interitem correlation was 0.40, with a range from -0.44 to 0.89. Squared multiple
Table 12

Interitem Reliability of the RVSH Sleep Scale Items for Day One (N = 36)

<table>
<thead>
<tr>
<th>RVSH Sleep Scale item</th>
<th>Squared multiple correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronbach's alpha</td>
<td>.88</td>
</tr>
<tr>
<td>Fragmentation</td>
<td>.77</td>
</tr>
<tr>
<td>Hours awake</td>
<td>.82</td>
</tr>
<tr>
<td>Hours asleep</td>
<td>.76</td>
</tr>
<tr>
<td>Concern over disturbances</td>
<td>.50</td>
</tr>
<tr>
<td>Delay</td>
<td>.79</td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td>.73</td>
</tr>
<tr>
<td>Depth</td>
<td>.72</td>
</tr>
<tr>
<td>Enough</td>
<td>.87</td>
</tr>
<tr>
<td>Refreshed</td>
<td>.83</td>
</tr>
<tr>
<td>Naps</td>
<td>.44</td>
</tr>
<tr>
<td>Good night</td>
<td>.86</td>
</tr>
</tbody>
</table>
correlations for all items ranged from 0.44 to 0.87. Two items that loaded on the second factor in the factor analysis, naps and concern over disturbances had squared multiple correlations of 0.44 and 0.50, respectively. The other nine items had squared multiple correlations ranging from 0.72 to 0.87, which is evidence that naps and concern over disturbance did not measure sleep quality in this population and that the other items did measure the same concept.

After removing naps and concern over disturbance from the analysis, the tool was renamed the RVSH2 Sleep Scale. A Cronbach’s alpha for the RVSH2 Sleep Scale was 0.93 (Table 13). The mean interitem correlation was 0.59, with a range between 0.30 to 0.87. The squared multiple correlations for each of the nine items ranged from 0.57 to 0.86. This information suggests that all nine items of the RVSH2 Sleep Scale addressed a single concept: perception of sleep quality.

Test-retest reliability measures stability; therefore, it is most useful for stable constructs, subjects, and conditions. Insomnia in the critically ill is not a stable construct. Further, the population of the study was, by definition, unstable because subjects are critically ill. As a field study, the conditions of the study were not stable. However, because of the repeated measures design of the study, it was important to have data about the relationship between scores for subjects over time.

Correlation coefficients were calculated to examine the relationship between Time 1, Time 2, and Time 3 measures of sleep for all subjects. Scores were not significantly related, showing that there was no relationship between sleep scores
Table 13

Interitem Reliability of the RVSH2 Sleep Scale Items for Day One (N = 36)

<table>
<thead>
<tr>
<th>RVSH2 Sleep Scale item</th>
<th>Cronbach's alpha</th>
<th>Squared multiple correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>Hours awake</td>
<td></td>
<td>.80</td>
</tr>
<tr>
<td>Hours asleep</td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>Delay</td>
<td></td>
<td>.67</td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td></td>
<td>.57</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>Enough</td>
<td></td>
<td>.86</td>
</tr>
<tr>
<td>Refreshed</td>
<td></td>
<td>.80</td>
</tr>
<tr>
<td>Good night</td>
<td></td>
<td>.83</td>
</tr>
</tbody>
</table>
for subjects when measured on a 24-hour basis.

**Validity**

Factor analysis can be used to examine the internal consistency of a tool, whereas factors that fall out of such an analysis can be examined as a measure of tool validity. Factor analysis with varimax rotation was undertaken on the RVSH Sleep Scale pretest scores for all 36 subjects (Table 14). Two factors emerged, Factor 1 and Factor 2, that accounted for 67.3% of the variance in sleep quality. Eight items loaded most strongly on Factor 1, with the factor loading ranging from 0.87 to 0.51. Factor 1 explained 56.2% of the variance in sleep quality. Three items (naps, concern over disturbance, and concern over prodrome) loaded most strongly on Factor 2, with factor loadings ranging from 0.70 to -0.68. Factor 2 explained 11.1% of the variance in sleep quality. This information suggests that the three items that loaded on Factor 2 may not be valid indicators of sleep quality for this population and that the eight items that loaded on Factor 1 are valid measures of one concept: perception of sleep quality.

In order to further explore the validity of the tool, a common factor analysis was undertaken on the nine-item RVSH2 Sleep Scale (Table 15). Again, two factors emerged that together accounted for 76.7% of the variance in sleep quality. All nine items loaded most strongly on Factor 1, with 6 of them loading above .80. The loading range for all nine items was from .66 to .91. Factor 1 explained 65.5% of the variance in sleep quality. Four items also loaded on Factor 2, though not strongly, with factor loading ranging from .59 to -.50. Factor 2
Table 14

Results of Factor Analysis With Varimax Rotation of the RVSH Sleep Scale Items for Day One (N = 36)

<table>
<thead>
<tr>
<th>RVSH Sleep Scale item</th>
<th>Factor 1 loading</th>
<th>Factor 2 loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Hours awake</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Hours asleep</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>Concern over disturbances</td>
<td></td>
<td>.66</td>
</tr>
<tr>
<td>Delay</td>
<td>.51</td>
<td>.49</td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td>.36</td>
<td>.70</td>
</tr>
<tr>
<td>Depth</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Enough</td>
<td>.71</td>
<td>.54</td>
</tr>
<tr>
<td>Refreshed</td>
<td>.65</td>
<td>.54</td>
</tr>
<tr>
<td>Naps</td>
<td></td>
<td>-.68</td>
</tr>
<tr>
<td>Good night</td>
<td>.74</td>
<td>.55</td>
</tr>
</tbody>
</table>
Table 15

Results of Common Factor Analysis of the RVSH2 Sleep Scale Items for Day One (N = 36)

<table>
<thead>
<tr>
<th>RVSH2 Sleep Scale item</th>
<th>Factor 1 loading</th>
<th>Factor 2 loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td>.77</td>
<td>-.50</td>
</tr>
<tr>
<td>Hours awake</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>Hours asleep</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Delay</td>
<td>.69</td>
<td>.48</td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td>.66</td>
<td>.59</td>
</tr>
<tr>
<td>Depth</td>
<td>.80</td>
<td>-.32</td>
</tr>
<tr>
<td>Enough</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Refreshed</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Good night</td>
<td>.91</td>
<td></td>
</tr>
</tbody>
</table>
explained 11.2% of the variance in sleep quality.

As was done with the RVSH Sleep Scale, a factor analysis with varimax rotation was conducted on the RVSH2 Sleep Scale (Table 16). Two factors again emerged that together accounted for 76.7% of the variance in sleep quality. Five items loaded most strongly on Factor 1, with all of them having loading values greater than .70 and a range of .70 to .91. Factor 1 explained 65.5% of the variance in sleep quality. Four items loaded most strongly on Factor 2, with loading values ranging from .61 to .87. Two items, delay and concern over prodrome, loaded exclusively and strongly on Factor 2. Factor 2 explained 11.2% of the variance in sleep quality. Two items, enough and refreshed, loaded almost equally on both factors. The two factors obtained through this rotation were not the same as those reported by Snyder-Halpern and Verran (1987).

Because items in the RVSH2 Sleep Scale clustered so differently with rotation than when it was analyzed by Snyder-Halpern and Verran (1987), and based on my sense from subject reactions while scoring the RVSH Sleep Scale, I decided not to treat scores from the RVSH2 Sleep Scale as summed sleep scores. Further, scores could not be analyzed by subscales derived from the two factors because it was unclear what they were representing. Rather, I decided to use the two items that loaded most strongly on Factor 1 during factor analysis with varimax rotation of the RVSH Sleep Scale and the RVSH2 Sleep Scale: fragmentation and depth. These two items also represent the two concepts generally believed to comprise sleep.
Table 16

**Results of Factor Analysis With Varimax Rotation of the RVSH2 Sleep Scale Items for Day One (N = 36)**

<table>
<thead>
<tr>
<th>RVSH2 Sleep Scale item</th>
<th>Factor 1 loading</th>
<th>Factor 2 loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>Hours awake</td>
<td>.79</td>
<td>.39</td>
</tr>
<tr>
<td>Hours asleep</td>
<td>.76</td>
<td>.39</td>
</tr>
<tr>
<td>Delay</td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>Concern over prodrome</td>
<td></td>
<td>.87</td>
</tr>
<tr>
<td>Depth</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Enough</td>
<td>.63</td>
<td>.64</td>
</tr>
<tr>
<td>Refreshed</td>
<td>.57</td>
<td>.61</td>
</tr>
<tr>
<td>Good night</td>
<td>.70</td>
<td>.59</td>
</tr>
</tbody>
</table>
For all subjects, sleep scores as the sum of fragmentation and depth were calculated (Table 17). Higher scores indicated a perception of improved sleep.

For Time 1 (pretest), the mean was 66.74, range = 0-181, SD = 50.32; for Time 2 (first posttest), the mean was 69.24, range = 0-180, SD = 40.80; and for Time 3 (second posttest), the mean was 112.67, range = 10-200, SD = 53.58. Measures of skewness and kurtosis, as well as a visual examination of scores, showed a nearly normal distribution for all three measures.

Sleep scores as the sum of fragmentation and depth also were calculated for Times 1, 2, and 3 for the control and experimental subjects (Table 17). In order to control partially for the variance found between subjects for these items on Time 1 measurement, analysis was conducted using the change in the sum of the two items from Time 1 to Time 2, as well as the change from Time 2 to Time 3. For all subjects, change scores from the first night to the second night were $M = 2.12$, range = 168-177, SD = 67.45; and from the second night to the third night were $M = 47.70$, range = 97-200, SD = 60.25. Measures of skewness and kurtosis, as well as a visual examination of scores, showed a nearly normal distribution for both change scores.

**Differences in Sleep Scores**

Research Hypothesis 1 was the proposition that sleep scores of critically ill patients who use autogenic relaxation will improve over time when compared to those who do not use these interventions. The results of data analysis did not support this hypothesis. In general, no differences were found in sleep scores on
Table 17

Descriptive Statistics for Sleep Scores as the Sum of Fragmentation and Depth and Change in Sleep Scores (N = 36)

<table>
<thead>
<tr>
<th>Sleep score</th>
<th>M</th>
<th>Range</th>
<th>SD</th>
<th>Skewness</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>All subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>66.74</td>
<td>0-181</td>
<td>50.32</td>
<td>.64</td>
<td>35</td>
</tr>
<tr>
<td>Time 2</td>
<td>69.29</td>
<td>0-180</td>
<td>40.80</td>
<td>.54</td>
<td>34</td>
</tr>
<tr>
<td>Time 2</td>
<td>112.67</td>
<td>10-200</td>
<td>53.58</td>
<td>-.46</td>
<td>30</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>60.53</td>
<td>3-175</td>
<td>48.67</td>
<td>1.20</td>
<td>19</td>
</tr>
<tr>
<td>Time 2</td>
<td>62.21</td>
<td>7-154</td>
<td>39.91</td>
<td>.49</td>
<td>19</td>
</tr>
<tr>
<td>Time 2</td>
<td>109.28</td>
<td>11-175</td>
<td>50.97</td>
<td>-.61</td>
<td>18</td>
</tr>
<tr>
<td>Experimental</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>74.13</td>
<td>0-181</td>
<td>52.82</td>
<td>.13</td>
<td>16</td>
</tr>
<tr>
<td>Time 2</td>
<td>78.27</td>
<td>0-180</td>
<td>41.49</td>
<td>.68</td>
<td>15</td>
</tr>
<tr>
<td>Time 2</td>
<td>117.75</td>
<td>10-200</td>
<td>59.22</td>
<td>-.44</td>
<td>12</td>
</tr>
<tr>
<td>Change score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 2-1</td>
<td>2.12</td>
<td>-168-177</td>
<td>67.45</td>
<td>-.32</td>
<td>33</td>
</tr>
<tr>
<td>Time 3-2</td>
<td>47.70</td>
<td>-97-200</td>
<td>60.25</td>
<td>.25</td>
<td>30</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 2-1</td>
<td>-1.06</td>
<td>-168-79</td>
<td>57.44</td>
<td>-1.56</td>
<td>18</td>
</tr>
<tr>
<td>Time 3-2</td>
<td>48.00</td>
<td>-29-144</td>
<td>54.30</td>
<td>.49</td>
<td>18</td>
</tr>
<tr>
<td>Experimental</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 2-1</td>
<td>5.93</td>
<td>-129-188</td>
<td>79.77</td>
<td>.16</td>
<td>15</td>
</tr>
<tr>
<td>Time 3-2</td>
<td>47.25</td>
<td>-97-200</td>
<td>70.81</td>
<td>.09</td>
<td>12</td>
</tr>
</tbody>
</table>
the basis of the intervention. Differences were found, however, in sleep scores on the basis of demographic variables and interaction effects between the intervention and demographic variables.

**Practical Issues**

Missing data on one of the two items for a subject made it impossible to calculate a change in sleep score for that subject for that day, thus eliminating that subject from repeated measures analysis. Missing data on single items eliminated 6 of the 36 subjects, whereas 1 subject did not score the entire RVSH Sleep Scale on Day 3 because he had had surgery that day, which made him unavailable for measurement during the appropriate time interval.

Items not marked by more than 1 subject were delay ($n = 3$), concern over prodrome ($n = 3$), and fragmentation ($n = 3$). The wording of these items appeared to be a problem for subjects. Delay was commonly addressed verbally by many subjects such as speaking about the number of minutes or hours it took for them to fall asleep and marking the item line. One subject did not appear to see an item (depth) at the top of the page. Other items not marked at least once by single subjects were addressed verbally by the subject or the subject indicated that the item was not understood.

The question of whether or not to replace missing data with the mean score for that item for that group was considered carefully. Sleep is a very individual phenomenon, with important variations in responses even in the most stable and controlled situations. The range of scores for individual items was wide. No
information was available about the importance of individual variations in the sleep patterns of critically ill adults. Justifying the use of others’ perceptions of sleep for those who had decided not to answer an item was difficult. I decided not to replace missing items for those 7 subjects.

The decision not to replace missing data threatened the power of the analysis by reducing the sample size. Reducing the sample size also threatened to violate the assumption of multivariate normality of the distribution of the dependent variables, which is required for confident use of repeated measures ANOVA. However, MANOVA is robust to modest violations of normality attributable to skew. Skew ranged from 1.20 to -.61 for summed sleep scores. Visual examination of histograms for these scores confirmed a reasonably normal distribution.

Repeated measures ANOVA is not robust regarding the effects of outliers on creating skew in dependent variables. Scores were examined for the presence of outliers for each cell of the analysis using regression analysis, as well as calculations of Mahalanobis distances. No outliers were found.

Other tests were undertaken to assure that the major assumptions that must be met to use repeated measures ANOVA (multivariate normality, homogeneity of variance, linearity, and multicollinearity) were achieved. Box’s M was examined with each repeated measures ANOVA to determine if the assumption of homogeneity of variance/covariance matrices had been met; in all cases, this test was nonsignificant. Similarly, Mauchly’s test of sphericity was used to test the
hypothesis that the covariance matrix of the dependent variables has a constant variance. In all repeated measures ANOVA tests, this test was nonsignificant. Pillai’s criterion was used rather than Wilks’ lambda to evaluate multivariate significance.

**Intervention Response**

In order to determine if there was a difference in sleep scores over time on the basis of group membership, an ANOVA for repeated measures was used by means of SPSS For Windows™ V6.1, which is a software program for statistical analysis. For the present study, the dependent variable was the change in sum of fragmentation and depth from Time 1 to Time 2 and from Time 2 to Time 3. Group assignment (autogenic relaxation and guided imagery versus control) and other independent variables such as demographic and clinical variables were between-subject factors. Interval-level independent variables such as age were treated as covariates in repeated measures ANCOVA. Some data were categorized. Twenty-five distinct major diagnoses were reported by subjects. These diagnoses were collapsed into three categories: (a) cardiac, (b) pulmonary, and (c) other. The category of medications was collapsed from all sedatives, hypnotics, narcotics, and analgesics to categories of received medication and did not receive medication. Diagnosis and medications were tested for direct effects on sleep and for interactions with group membership using repeated measures ANOVA. The relationships between sleep scores and process variables were calculated using Pearson product-moment correlation coefficients. Alpha was set at
The results of this analysis are summarized in Table 18. A significant effect for time was found ($p = .019$), with scores improving from Day 1 to Day 3. The overall intervention effect for sleep scores was not significant ($p = .425$) nor was the interaction of the intervention with time ($p = .757$).

**Effects of independent variables.** Data were examined for the effects of demographic and clinical variables on sleep over time regardless of group membership. For all subjects, scores improved significantly over time ($p = .011$). A difference was found in sleep scores on the basis of unit ($p = .035$), with scores improving in different patterns depending on the ICU to which the subject was admitted (Table 19). A significant interaction also was found between transfer out of the unit and time ($p = .011$), with sleep scores improving as with transfer prior to the third night (Table 20).

When the data were examined for effects of the intervention and diagnosis on sleep scores, significant results were found (Table 21). Sleep scores showed different patterns of change, depending on the intervention and the diagnosis for which the subject was primarily being treated ($p = .035$); time remained significant for all subjects ($p = .077$).

When the data were examined for the effects of group membership and gender on sleep scores, significant results were found (Table 22). As before, sleep improved over time for all subjects ($p = .007$). A significant interaction was found between the intervention, gender, and time, with different patterns of change in sleep depending on the intervention and gender ($p = .003$).
Table 18

Results of Repeated Measures Analysis of Variance to Test Effects of Relaxation and Imagery Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1025.29</td>
<td>1</td>
<td>1563.42</td>
<td>.66</td>
<td>.425</td>
</tr>
<tr>
<td>Time</td>
<td>38333.52</td>
<td>1</td>
<td>38333.52</td>
<td>6.21</td>
<td>.019</td>
</tr>
<tr>
<td>Group by time</td>
<td>603.86</td>
<td>1</td>
<td>603.86</td>
<td>.10</td>
<td>.757</td>
</tr>
</tbody>
</table>

Table 19

Results of Repeated Measures Analysis of Variance to Test Effects of Unit Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>9850.89</td>
<td>2</td>
<td>4925.44</td>
<td>3.84</td>
<td>.035</td>
</tr>
<tr>
<td>Time</td>
<td>43764.42</td>
<td>1</td>
<td>43764.42</td>
<td>7.53</td>
<td>.011</td>
</tr>
<tr>
<td>Unit by time</td>
<td>16252.71</td>
<td>2</td>
<td>8126.35</td>
<td>1.40</td>
<td>.265</td>
</tr>
</tbody>
</table>

Table 20

Results of Repeated Measures Analysis of Variance to Test Effects of Transfer Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer</td>
<td>47.04</td>
<td>1</td>
<td>47.04</td>
<td>.03</td>
<td>.865</td>
</tr>
<tr>
<td>Time</td>
<td>55153.07</td>
<td>1</td>
<td>55153.07</td>
<td>11.38</td>
<td>.002</td>
</tr>
<tr>
<td>Transfer by time</td>
<td>36526.59</td>
<td>1</td>
<td>36526.59</td>
<td>7.54</td>
<td>.011</td>
</tr>
</tbody>
</table>
Table 21

Results of Repeated Measures Analysis of Variance to Test Effects of Relaxation and Imagery and Diagnosis Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>437.41</td>
<td>1</td>
<td>437.41</td>
<td>.36</td>
<td>.556</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>5846.63</td>
<td>2</td>
<td>2923.31</td>
<td>2.38</td>
<td>.115</td>
</tr>
<tr>
<td>Group by diagnosis</td>
<td>9582.80</td>
<td>2</td>
<td>4791.40</td>
<td>3.90</td>
<td>.035</td>
</tr>
<tr>
<td>Time</td>
<td>20621.45</td>
<td>1</td>
<td>20621.45</td>
<td>3.43</td>
<td>.077</td>
</tr>
<tr>
<td>Group by time</td>
<td>547.27</td>
<td>1</td>
<td>547.27</td>
<td>.09</td>
<td>.766</td>
</tr>
<tr>
<td>Diagnosis by time</td>
<td>198.34</td>
<td>2</td>
<td>99.17</td>
<td>.02</td>
<td>.984</td>
</tr>
<tr>
<td>Group by diagnosis by time</td>
<td>25221.66</td>
<td>2</td>
<td>12610.83</td>
<td>2.10</td>
<td>.146</td>
</tr>
</tbody>
</table>

Table 22

Results of Repeated Measures Analysis of Variance to Test Effects of Relaxation and Imagery and Gender Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1016.68</td>
<td>1</td>
<td>1016.68</td>
<td>.60</td>
<td>.445</td>
</tr>
<tr>
<td>Gender</td>
<td>29.59</td>
<td>1</td>
<td>29.59</td>
<td>.02</td>
<td>.896</td>
</tr>
<tr>
<td>Group by gender</td>
<td>85.38</td>
<td>1</td>
<td>85.38</td>
<td>.05</td>
<td>.824</td>
</tr>
<tr>
<td>Time</td>
<td>39494.05</td>
<td>1</td>
<td>39494.05</td>
<td>8.69</td>
<td>.007</td>
</tr>
<tr>
<td>Group by time</td>
<td>461.13</td>
<td>1</td>
<td>461.13</td>
<td>.10</td>
<td>.753</td>
</tr>
<tr>
<td>Gender by time</td>
<td>12696.64</td>
<td>1</td>
<td>12696.64</td>
<td>2.80</td>
<td>.107</td>
</tr>
<tr>
<td>Group by gender by time</td>
<td>47294.05</td>
<td>1</td>
<td>47294.05</td>
<td>10.41</td>
<td>.003</td>
</tr>
</tbody>
</table>
The data were examined to explore the effect of unit and gender on sleep (Table 23). Sleep quantity and quality, again, depended on the unit ($p = .033$), and it improved over time for all subjects ($p = .001$). An interaction was found between unit and time ($p = .027$), with patterns of sleep improvement depending on the unit. An interaction also was found between unit, gender, and time, with sleep improving in different patterns over time depending on the unit and gender ($p = .019$).

Additional variables tested for their relationship to sleep scores for all subjects were date of admission, date of entry into study, age, medications received that might influence sleep, length of stay, number of devices to which the subject was attached, number of interruptions between 1900 and 0600, and number of interruptions between 0100 and 0600. Variables tested for their relationship to sleep scores for experimental group subjects were length of interaction; change in relaxation from preintervention to postintervention; change in image vividness from preintervention to postintervention; and changes in heart rate, respiratory rate, systolic blood pressure, and diastolic blood pressure from preintervention to postintervention. Because there would have been a significant loss of information had these variables been transformed into discreet or dichotomous variables, the contribution of these continuous or interval-level variables to sleep score variance was examined using repeated measures ANCOVA and multiple regression analysis. None of these independent variables made a significant contribution to the explained variance in sleep scores at any time.
Table 23

Results of Repeated Measures Analysis of Variance to Test Effects of Unit and Gender Over Time on Sleep in the Critically Ill Adult (n = 29)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>10985.79</td>
<td>2</td>
<td>5492.53</td>
<td>3.96</td>
<td>.033</td>
</tr>
<tr>
<td>Gender</td>
<td>611.17</td>
<td>1</td>
<td>611.17</td>
<td>.44</td>
<td>.514</td>
</tr>
<tr>
<td>Unit by gender</td>
<td>1263.48</td>
<td>2</td>
<td>631.74</td>
<td>.46</td>
<td>.640</td>
</tr>
<tr>
<td>Time</td>
<td>66132.78</td>
<td>1</td>
<td>66132.78</td>
<td>14.28</td>
<td>.001</td>
</tr>
<tr>
<td>Unit by time</td>
<td>39097.48</td>
<td>2</td>
<td>19548.74</td>
<td>4.22</td>
<td>.027</td>
</tr>
<tr>
<td>Gender by time</td>
<td>4702.38</td>
<td>1</td>
<td>4702.38</td>
<td>1.02</td>
<td>.324</td>
</tr>
<tr>
<td>Unit by gender by time</td>
<td>44040.58</td>
<td>2</td>
<td>22020.29</td>
<td>4.75</td>
<td>.019</td>
</tr>
</tbody>
</table>

Ordinal-level variables examined for their effect on the variance in sleep scores for the experimental group subjects were scores on protocol and environmental rating scales. These scores were treated as interval-level data and were even subjected to multiple regression analysis. None of these independent variables made a significant contribution to the explained variance in sleep scores at any time.

Responders versus nonresponders. Data from the experimental group, including qualitative data, were examined to determine if there was a subset of subjects who responded to the intervention. Response to the intervention was defined as (a) sleep scores on Time 3, which were greater than sleep scores on Time 1 and Time 2, or (b) qualitative evidence that perception of improved sleep
was attributed by the subject to the intervention. Subjects responded to the intervention with improved sleep, with qualitative data indicating that 4 subjects attributed their improved sleep to the intervention. However, no variable was found on which these responders differed from experimental subjects whose scores did not improve. For 2 subjects, quantitative and qualitative data were not in accordance. One subject who spoke strongly of the sleep benefits of the intervention had sleep scores that improved only slightly over time. Another subject, who fell asleep during the intervention and whose sleep scores improved markedly from Time 1 to Time 2, stated that he slept poorly and did not believe that the intervention could be effective for sleep in an environment so conducive to insomnia.

**Power analysis.** Repeated measures ANOVA offers calculations of partial eta squared (or effect size) and power for individual variables. Effect size is that part of a standard deviation in the dependent variable that can be expected to change on the basis of the independent variable. Power is a statement of the percentage of time a change in the dependent variable can be expected on the basis of the independent variable. Effect size and power for variables with significant effects on sleep scores were examined.

For analysis of the effects of unit on sleep over time, partial eta squared for unit was .23 and for time was .23 (Table 24). Power for unit was .64 and power for time was .75.
Table 24

Partial Eta Squared and Observed Power Analysis for Unit and Time (n = 29)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Partial eta squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>.23</td>
<td>.64</td>
</tr>
<tr>
<td>Time</td>
<td>.23</td>
<td>.75</td>
</tr>
</tbody>
</table>

For analysis of the effects of transfer on sleep over time, partial eta squared for time was .30 and for transfer by time was .22 (Table 25). The power for time was .90 and for transfer by time was .75.

Effect size and power calculations from the analysis of the effects of group and diagnosis on sleep over time can be seen in Table 26. Partial eta squared for group by diagnosis was .25 and for time was .13. Power for group by diagnosis was .64 and for time was .43.

Effect size and power calculation from the analysis of the effects of group and gender on sleep over time can be seen in Table 27. Partial eta squared for time was .26 and for the interaction of group by gender by time was .29. Power for time was .81 and for the interaction of group by gender by time was .87.

Effect size and power calculation from the analysis of the effects of unit, time, and gender were examined (Table 28). Partial eta squared for unit was .26; for time was .38; for interaction of unit by time was .27; and for interaction of unit, gender, and time was .29. Power for unit was .65; for time was .95; for interaction of unit and time was .68; and for the interaction of unit, gender, and
Table 25

**Partial Eta Squared and Observed Power Analysis for Time and Transfer by Time**  
(n = 29)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Partial eta squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.30</td>
<td>.90</td>
</tr>
<tr>
<td>Transfer by time</td>
<td>.22</td>
<td>.75</td>
</tr>
</tbody>
</table>

Table 26

**Partial Eta Squared and Observed Power Analysis for Group by Diagnosis and Time**  
(n = 29)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Partial eta squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group by diagnosis</td>
<td>.25</td>
<td>.64</td>
</tr>
<tr>
<td>Time</td>
<td>.13</td>
<td>.43</td>
</tr>
</tbody>
</table>

Table 27

**Partial Eta Squared and Observed Power Analysis for Time and Group by Gender by Time**  
(n = 29)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Partial eta squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.26</td>
<td>.81</td>
</tr>
<tr>
<td>Group by gender by time</td>
<td>.29</td>
<td>.87</td>
</tr>
</tbody>
</table>
Table 28

Partial Eta Squared and Observed Power Analysis for Unit, Time, Unit by Time, and Unit by Gender by Time (n = 29)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Partial eta squared</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>.26</td>
<td>.65</td>
</tr>
<tr>
<td>Time</td>
<td>.38</td>
<td>.95</td>
</tr>
<tr>
<td>Unit by time</td>
<td>.27</td>
<td>.68</td>
</tr>
<tr>
<td>Unit by gender by time</td>
<td>.29</td>
<td>.74</td>
</tr>
</tbody>
</table>

time was .74.

Post hoc examination of differences. Group means were graphed to determine where significant differences lay in sleep change for variables with significant F values. These graphed means also were examined for patterns of change or trends in mean sleep scores.

The unit effect can be attributed to a large difference in mean sleep scores for patients in one unit when compared to the other two units for Time 1, as well as differences between all three units for Time 2 (Table 29). Mean scores for subjects in MSICU (n = 11) were Time 1 = 44.6 (SD = 34.2), Time 2 = 69.7 (SD = 40.9), and Time 3 = 123.5 (SD = 54.2). Mean scores for subjects in CCU (n = 10) were Time 1 = 78.4 (SD = 38.3), Time 2 = 76.9 (SD = 35.1), and Time 3 = 107.3 (SD = 61.1). Mean scores for subjects in MICU (n = 8) were Time 1 = 86.5 (SD = 66.9), Time 2 = 44.3 (SD = 35.3), and Time 3 = 107.3 (SD = 61.1).
Table 29

**Mean Sleep Scores Over Time for Unit (n = 29)**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Time</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSICU</td>
<td>Time 1</td>
<td>44.6</td>
<td>34.2</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>69.7</td>
<td>40.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>123.5</td>
<td>54.2</td>
<td></td>
</tr>
<tr>
<td>CCU</td>
<td>Time 1</td>
<td>78.4</td>
<td>38.3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>76.9</td>
<td>35.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>107.8</td>
<td>53.1</td>
<td></td>
</tr>
<tr>
<td>MICU</td>
<td>Time 1</td>
<td>86.5</td>
<td>66.9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>44.3</td>
<td>35.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>107.3</td>
<td>61.1</td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td>Time 1</td>
<td>67.8</td>
<td>48.6</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>65.1</td>
<td>38.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>113.6</td>
<td>54.3</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Numbers for unit means are represented in Figure 2. When trends are examined, the main difference can be seen in the change in sleep scores between units, which occurs between Time 1 and Time 2 when the MICU is compared to the other two units. In MICU, the average subject experienced a sharply negative change, or worsening sleep, for the second night. In contrast, the average sleep of subjects in the CCU remained stable, and the average sleep of subjects in MSICU sharply improved from the first to the second night.

The transfer effect can be attributed to differences in mean scores for Time 1 and Time 3. Mean scores for subjects who did not transfer out of the unit by Time 3 (n = 18) were Time 1 = 51.2 (SD = 33.7), Time 2 = 68.9 (SD = 34.3), and Time 3 = 98.4 (SD = 53.9) (Table 30). Mean scores for subjects who transferred out of the unit by Time 3 (n = 11) were Time 1 = 95.0 (SD = 58.1), Time 2 = 59.1 (SD = 45.7), and Time 3 = 138.5 (SD = 47.2).

Scores for transfers are represented in Figure 3. The mean score for subjects who did not transfer is substantially lower than the transfer group's score on Time 1. Scores are approximately the same for Time 2. The mean score for subjects who transferred on Time 3 is much higher than for those who remained in the unit. Trends show that mean scores for the group who did not transfer improved over time. However, mean scores for the group who did transfer decreased significantly for Time 2 and increased to a high score for Time 3.
Figure 2. Analysis of Sleep Scores by Unit.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Table 30

Mean Sleep Scores Over Time for Transfer (n = 29)

<table>
<thead>
<tr>
<th>Transfer</th>
<th>Time</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>No transfer</td>
<td>Time 1</td>
<td>51.2</td>
<td>33.7</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>68.9</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>98.4</td>
<td>53.9</td>
<td></td>
</tr>
<tr>
<td>Transferred</td>
<td>Time 1</td>
<td>95.0</td>
<td>58.1</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>59.1</td>
<td>45.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>138.5</td>
<td>47.2</td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td>Time 1</td>
<td>67.8</td>
<td>48.6</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>65.2</td>
<td>38.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>113.6</td>
<td>54.3</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3. Analysis of Sleep Scores by Transfer and Time.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
The effect of group and diagnosis can be examined, even though the small numbers in each diagnostic group are small for this analysis. The effect of group and diagnosis can be attributed to a very large difference in scores on Time 3 for subjects with cardiac difficulties, in the opposite direction than was expected, and in very large differences in scores on Time 2 and Time 3 for subjects with pulmonary difficulties in the expected direction. Mean scores for subjects in the control group with cardiac difficulties \((n = 7)\) were Time 1 = 84.9 (SD = 49.8), Time 2 = 65.1 (SD = 49.6), and Time 3 = 133.4 (SD = 52.5) (Table 31). Mean scores for subjects in the experimental group with cardiac difficulties \((n = 2)\) were Time 1 = 97.5 (SD = 12.0), Time 2 = 86.0 (SD = 29.7), and Time 3 = 79.0 (SD = 97.6).

Group means by diagnosis for cardiac subjects are represented in Figure 4 in which the large difference in the change in scores between Time 2 and Time 3 (opposite direction from that expected) is apparent. An examination of trends shows that mean scores for the experimental cardiac group dropped slightly over time, whereas mean scores for the control group began high, decreased somewhat for Time 2, and increased to a very high score for Time 3. Scores for the two groups diverged on Time 3.

Mean scores for subjects in the control group with pulmonary difficulties \((n = 3)\) were Time 1 = 37.3 (SD = 49.4), Time 2 = 23.3 (SD = 14.7), and Time 3 = 76.3 (SD = 52.9) (Table 31). Mean scores for subjects in the experimental group with pulmonary difficulties \((n = 3)\) were Time 1 = 41.7
Table 31

Mean Sleep Scores Over Time by Group and Diagnosis (n = 29)

<table>
<thead>
<tr>
<th>Group</th>
<th>Diagnosis</th>
<th>Time</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Cardiac</td>
<td>Time 1</td>
<td>84.9</td>
<td>49.8</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>65.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>133.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>Cardiac</td>
<td>Time 1</td>
<td>97.5</td>
<td>12.0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>86.0</td>
<td>29.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>79.0</td>
<td>97.6</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Pulmonary</td>
<td>Time 1</td>
<td>37.3</td>
<td>49.4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>23.3</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>76.3</td>
<td>52.9</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>Pulmonary</td>
<td>Time 1</td>
<td>41.7</td>
<td>24.1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>95.7</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>155.7</td>
<td>49.0</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Other</td>
<td>Time 1</td>
<td>39.6</td>
<td>16.3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>74.0</td>
<td>35.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>102.6</td>
<td>48.0</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>Other</td>
<td>Time 1</td>
<td>94.9</td>
<td>63.3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>55.3</td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>112.6</td>
<td>52.8</td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td></td>
<td>Time 1</td>
<td>67.8</td>
<td>48.6</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>65.2</td>
<td>38.5</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>113.6</td>
<td>54.3</td>
<td></td>
</tr>
</tbody>
</table>
Figure 4. Analysis of Sleep Scores by Group and Diagnosis: Cardiac.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
These numbers for group by diagnosis for the pulmonary subjects are graphed in Figure 5 in which it can be seen that large differences are apparent in group scores for Time 2 and Time 3 in the expected directions. Trends show that for the control group (pulmonary), mean scores dropped between Time 1 and Time 2 and increased between Time 2 and Time 3, whereas mean scores for the experimental group (pulmonary) increased over time.

Mean scores for subjects in the control group with other difficulties than cardiac or pulmonary \((n = 7)\) were Time 1 = 39.6 \((SD = 16.3)\), Time 2 = 74.0 \((SD = 35.6)\), and Time 3 = 102.6 \((SD = 48.0)\) (Table 31). Mean scores for subjects in the experimental group with other difficulties \((n = 7)\) were Time 1 = 94.9 \((SD = 63.3)\), Time 2 = 55.3 \((SD = 32.0)\), and Time 3 = 112.6 \((SD = 52.8)\).

A visual examination of mean group scores by other diagnosis (Figure 6) shows that groups with a diagnosis other than cardiac or pulmonary differed appreciably in their sleep scores at Time 1, but not at Times 2 and 3. For the control group, sleep scores improved steadily over time; whereas for the experimental group, sleep scores decreased from Time 1 to Time 2 and increased between Time 2 and Time 3. The rate of improvement was faster for the experimental group compared to the control group.

The effect of group and gender on mean score differences was striking in males in which scores were different on Time 2 and Time 3 (Table 32).
Figure 5. Analysis of Sleep Scores by Group and Diagnosis: Pulmonary.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Figure 6. Analysis of Sleep Scores by Group and Diagnosis: Other.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Table 32

Mean Sleep Scores Over Time by Group and Gender (n = 29)

<table>
<thead>
<tr>
<th>Group</th>
<th>Gender</th>
<th>Time</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Male</td>
<td>Time 1</td>
<td>61.4</td>
<td>51.7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>49.6</td>
<td>30.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>113.1</td>
<td>43.4</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>Male</td>
<td>Time 1</td>
<td>50.7</td>
<td>49.4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>85.2</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>90.3</td>
<td>68.8</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Female</td>
<td>Time 1</td>
<td>54.7</td>
<td>37.3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>71.9</td>
<td>49.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>108.4</td>
<td>61.6</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>Female</td>
<td>Time 1</td>
<td>113.3</td>
<td>39.8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>55.8</td>
<td>30.1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>145.2</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td></td>
<td>Time 1</td>
<td>67.8</td>
<td>48.6</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>65.2</td>
<td>38.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>113.6</td>
<td>54.3</td>
<td></td>
</tr>
</tbody>
</table>
scores for males in the control group \((n = 8)\) were Time 1 = 61.4 \((SD = 51.7)\), Time 2 = 49.6 \((SD = 30.6)\), and Time 3 = 113.1 \((SD = 43.4)\). Mean scores for males in the experimental group \((n = 6)\) were Time 1 = 50.7 \((SD = 49.4)\), Time 2 = 85.2 \((SD = 33.3)\), and Time 3 = 90.3 \((SD = 68.8)\).

Figure 7 shows a difference in the pattern of change in sleep scores for males. When trends were examined, mean scores for the control group dropped slightly on Time 2 and increased on Time 3. Scores for experimental males show a change in the expected direction for Time 2 and Time 3.

Scores for the women show a difference on Time 1 and Time 3 (Table 32). Mean scores for females in the control group \((n = 9)\) were Time 1 = 54.7 \((SD = 37.3)\), Time 2 = 71.9 \((SD = 49.6)\), and Time 3 = 108.4 \((SD = 61.6)\). Mean scores for females in the experimental group females \((n = 6)\) were Time 1 = 113.3 \((SD = 39.8)\), Time 2 = 55.8 \((SD = 39.1)\), and Time 3 = 145.2 \((SD = 34.3)\).

A visual examination of scores by group by gender for females (Figure 8) shows that scores for the experimental group females were higher than for the control group females on Time 1, slightly lower on Time 2, and higher on Time 3. Mean scores for the control group females improved over time, whereas scores for the experimental females decreased dramatically on Time 2 and increased to very high levels on Time 3.

When all mean group scores by gender were compared, scores for the experimental males and females were seen to have moved nearly to the opposite.
Figure 7. Analysis of Sleep Scores by Group, Gender, and Time: Males.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Figure 8. Analysis of Sleep Scores by Group, Gender, and Time: Females.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Scores for males and females increased over time for the control group.

Mean scores for unit and gender are represented in Table 33. For MSICU males ($n = 6$), Time 1 = 23.5 ($SD = 25.6$), Time 2 = 73.5 ($SD = 44.0$), and Time 3 = 97.5 ($SD = 58.0$). For MSICU females ($n = 5$), Time 1 = 70.0 ($SD = 33.8$), Time 2 = 65.2 ($SD = 41.3$), and Time 3 = 154.6 ($SD = 30.2$). For CCU males ($n = 7$), Time 1 = 68.4 ($SD = 37.7$), Time 2 = 65.7 ($SD = 22.2$), and Time 3 = 101.6 ($SD = 56.8$). For CCU females ($n = 3$), Time 1 = 101.7 ($SD = 34.3$), Time 2 = 103.0 ($SD = 51.0$), and Time 3 = 122.3 ($SD = 50.6$). For MICU males ($n = 1$), Time 1 = 175.0, Time 2 = 7.0, and Time 3 = 151.0 (all $SD = 0.0$). For MICU females ($n = 7$), Time 1 = 73.9 ($SD = 61.1$), Time 2 = 49.6 ($SD = 34.5$), and Time 3 = 101.0 ($SD = 54.3$).

A visual examination of gender by unit shows the interactions of unit and gender with time (Figure 9). The small sample size for the MICU males ($n = 1$) does not allow for comparison with that subject’s sleep experience. However, when the MSICU and CCU males’ scores were compared, sleep scores were approximately equal for Times 2 and 3, but were not equal on pretest (Time 1). Sleep scores improved over time for both groups.

The pattern of change differed according to unit for the females. Sleep improved steadily for the females in CCU ($n = 3$), whose sleep, in general, was better than for the other two female groups for Times 1 and 2. For females in MSICU ($n = 5$), sleep worsened slightly between Times 1 and 2, then improved sharply, resulting in their sleep for Time 3 to be the best for the three groups. For
Table 33

**Mean Sleep Scores Over Time by Unit and Gender (n = 29)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Gender</th>
<th>Time</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSICU</td>
<td>Male</td>
<td>Time 1</td>
<td>23.5</td>
<td>25.6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>73.5</td>
<td>44.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>97.5</td>
<td>58.0</td>
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<td></td>
<td>Female</td>
<td>Time 1</td>
<td>70.0</td>
<td>33.8</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>65.2</td>
<td>41.3</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>154.6</td>
<td>30.2</td>
<td></td>
</tr>
<tr>
<td>CCU</td>
<td>Male</td>
<td>Time 1</td>
<td>68.4</td>
<td>37.7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>65.7</td>
<td>22.2</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>Time 3</td>
<td>101.6</td>
<td>56.8</td>
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<td></td>
<td>Female</td>
<td>Time 1</td>
<td>101.7</td>
<td>34.4</td>
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<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>103.0</td>
<td>51.0</td>
<td></td>
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<td></td>
<td></td>
<td>Time 3</td>
<td>122.3</td>
<td>50.6</td>
<td></td>
</tr>
<tr>
<td>MICU</td>
<td>Male</td>
<td>Time 1</td>
<td>175.0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 2</td>
<td>7.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 3</td>
<td>151.0</td>
<td>0.0</td>
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<tr>
<td></td>
<td>Female</td>
<td>Time 1</td>
<td>73.9</td>
<td>61.1</td>
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<td></td>
<td></td>
<td>Time 2</td>
<td>49.6</td>
<td>34.5</td>
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<td></td>
<td></td>
<td>Time 3</td>
<td>101.0</td>
<td>54.3</td>
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<tr>
<td>Total sample</td>
<td>Time 1</td>
<td>67.8</td>
<td>48.6</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>65.2</td>
<td>38.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 3</td>
<td>113.6</td>
<td>54.3</td>
<td></td>
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</tbody>
</table>

*Note.* MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Figure 9. Analysis of Sleep Scores by Unit, Gender, and Time: Males.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
the 7 females in MICU, sleep worsened between Times 1 and 2, then improved for Time 3; however, sleep scores for this group were the lowest of all three groups for Times 2 and 3 (Figure 10).

**Qualitative Findings**

Research Hypothesis 2 proposed that descriptions of the quality of sleep during nighttime from critically ill patients who use autogenic relaxation and guided imagery over time will differ from descriptions from those who do not use these interventions. The qualitative information about sleep confirmed that interruptions, noise, in-room alarms, devices, and pain contributed to insomnia in ICUs. No difference was found in the number of times these factors were mentioned or the way in which they were described between control and experimental subjects. These findings were expected, but the vivid descriptors reflect the real distress that these factors engender such as, “It was a parade”; “it was up and down, total chaos all night”; “they kept waking me up”; and “different interruptions every 10 minutes to one half hour.”

Urinary urgency was reported as a contributing factor on nine occasions, twice by control subjects and seven times by experimental subjects. For example, typical statements describing this problem were as follows: “Had to go potty: lasix®”; “they gave me a water pill too late”; “wake up to go to the bathroom”; and “I couldn’t urinate.” This factor had not been reported in any previous study.
Figure 10. Analysis of Sleep Scores by Unit, Gender, and Time: Females.

Note. MSICU = medical-surgical intensive care unit, CCU = critical care unit, MICU = medical intensive care unit.
Other descriptors of sleep in the ICU included the following: “The night from hell”; “chaos”; “hectic and messy”; and “a mess.” When subjects did not sleep well, time lengthened and clock-watching occurred. Subjects in both groups reported worry.

Men and women described physical symptoms and worry due to uncertainty in their lives at the moment; but men tended to relate physical symptoms of pain, urgency, thirst, and cold more than women. Conversely, the women spoke more of uncertainty and worry: “My thoughts now are troubling me”; “I was afraid to go to sleep because that last nurse was so bad”; “I didn’t know what was happening”; and “lotta things on my mind.” These quotations duplicate, in part, the findings of Signoret et al. (1994), who found that women evaluated general events related to sleep efficiency better than men and that men evaluated more circumstantial events related to sleep efficiency. Women, in particular, directed worry towards current physical complications such as bleeding, low blood glucose, and impending tests or test results. Women talked more about their sleep than the men.

Subjects in the experimental group described relaxing at night more than subjects in the control group, as well as shortened latency or delay for sleep onset. Five subjects directly attributed their improved sleep to the intervention: “The night before I needed medicine”; “I think the session with [the investigator] helped”; “[the investigator’s] the key to me having two good nights”; “it really works”; and “this has helped me out a great deal.”
Summary of Findings

Evidence was found that the RVSH2 Sleep Scale is a reliable and valid tool for measuring the perception of sleep and the diagnosis of insomnia in the critically ill adult. Questions remain about individual items and subscales in this tool.

No difference was found in sleep scores over time for the intervention. Sleep improved for all subjects over time. A difference also was found in sleep scores for the unit to which the subject was admitted. There was an interaction between transfer and time, with sleep scores improving with transfer. There was an interaction effect between the intervention and diagnosis, even though this analysis was conducted with very small cell sizes. There also was an interaction between the intervention and gender over time, with experimental males’ scores improving over time and experimental females’ scores first dropping then improving. There was an interaction between unit and time, with scores showing different patterns of improvement based on unit. There was an interaction between unit, gender, and time, with scores showing different patterns of improvement based on unit and gender, even though one cell of this analysis was extremely small. Qualitative data suggested that differences were apparent in the sleep patterns of the control and experimental groups and between the experience of sleep in ICU between men and women.
CHAPTER V

DISCUSSION

This chapter begins with a discussion of the findings relative to the RVSH Sleep Scale, and then it moves to an examination of the meaning of the findings for the sleep of the critically ill adult. The chapter also addresses limitations of the study and concludes with the implications of results for nursing theory, practice, and research.

The RVSH2 Sleep Scale

Factor analysis and reliability studies indicated that when the variance attributable to two items (naps and concern over disturbances) was removed from the RVSH Sleep Scale that the RVSH2 Sleep Scale was a reliable and valid measure of perceived sleep in the critically ill adult. Naps appeared not to be an important variable in sleep for these subjects possibly because they napped so little and so briefly. People who nap at home do so for a concentrated period of time, which decreases the amount of nighttime sleep needed. Naps, as an item, can be removed from the RVSH Sleep Scale for the critically ill adult.

The item concern over disturbances was not related to sleep in the critically ill adult. When marking this item, many subjects indicated that they were glad the staff were frequently entering the room and interacting with them. This feeling
was probably related to the fear and insecurity that accompanies a critical illness, the unfamiliarity of devices to which the patient is attached, and possibly the powerlessness attendant upon entry into the health-care system. Subjects also may not have registered concern over insomnia because it is likely to change. Concern over disturbances can be removed from the RVSH Sleep Scale for the critically ill adult.

Factor analysis of the RVSH2 Sleep Scale raised questions about other items. Several items loaded with moderate values on a second factor. The results of the factor analysis suggested that the items delay and concern over prodrome were measures of sleep, but were different from delay and concern over prodrome in the nonhospitalized adult. The onset of sleep for these patients occurred repeatedly during the night rather than once, which is relative to the healthy adult at home. Many patients seemed to expect multiple interruptions as natural and even desirable while in an ICU; therefore, they were not concerned that their sleep prodromes were multiple and prolonged. Other patients were so tired that their prodromes were extremely short; consequently, there was no concern over how long it was taking them to get to sleep. Even though it might be important to continue to measure delay in the critically ill adult, a case could be made for removing concern over prodrome from the RVSH2 Sleep Scale for this population.

The item enough measured sleep, but it also may have been contextually colored for this population. Specifically, these subjects did not get enough sleep while in the ICU, but many did not expect to get enough sleep while there. This
expectation was probably confirmed in the variance and low factor loading on the two concern items.

The item refreshed upon awakening also measured sleep, but not in the same way as for the healthy adult at home. Refreshed upon awakening reflects sleep for this population, with the mean and range being much lower than for the healthy adult at home. Refreshed upon awakening may have been clouded by the contributions of critical illness to their general fatigue state.

This contextual nature of the items for the critically ill adult may explain, in part, the lack of subscales on the RVSH Sleep Scale found by Snyder-Halpern and Verran (1987) and the difference in subscales on the RVSH2 Sleep Scale in this population. Sleep scores were likely so low and sleep was so disrupted that it was impossible for subscales to emerge.

This difference in subscales may not be a major objection to the validity of the tool for this population. When nursing research can show how to improve the sleep of the critically ill adult, subscales found in other populations might emerge with this group. Further, the subscales of disturbance and effectiveness are conceptually helpful ways to describe sleep, but they have not been demonstrated to be clinically important; that is, they are associated with certain health or illness states or outcome measures.

**Effect Size and Power Analysis**

The reported effect sizes were small but acceptable. Polit and Sherman (1990) reported the average effect size for nursing studies at .20. The effect sizes
for time in all significant tests of this study ranged from .13 to .38, with an average of .26.

The reported power was acceptable. For the interactions of the intervention with diagnosis and the intervention with gender and time, the power was .64 and .87, respectively. When combining mean effect size and power analysis, approximately 70% of the time the intervention is implemented in certain diagnostic and gender groups, a change in sleep scores over time of nearly three-tenths of a standard deviation will be detected.

Is the effect size clinically significant? How much of an improvement in sleep scores justifies the effort of the intervention or is detectable by the patient in terms of physical or mental improvement? How much of an improvement in sleep scores is related to beneficial changes in morbidity, mortality, stay in unit, or stay in hospital? For subjects who attributed their improved sleep to the intervention, qualitative information from this study indicated that the impact of the intervention was large—perhaps larger than their sleep scores indicated. This information suggests that, although the overall effects of the intervention may be small (no significant difference in sleep scores and small effect sizes for significant interactions) for those subjects who benefitted, the effect was significantly meaningful in a positive way. Further, for experimental subjects, in general, relaxation during the night was a recurrent theme; that is, a relaxed state is believed to be a desirable state associated with health and wellness.
Sleep Over Time

This study confirmed the high degree of insomnia found by researchers in hospitalized adults (Murphy et al., 1977; Pacini & Fitzpatrick, 1982) and in critically ill adults (Aurell & Elmqvist, 1985; Broughton & Baron, 1978; Dohno et al., 1979; Fontaine, 1989; Johns et al., 1974; Orr & Stahl, 1977; Richardson, 1986; Walker, 1972). However, the results of this study found that sleep improved over a period of 3 nights, contradicting the findings of Richards et al. They studied a very small number of men (n = 11) in one CCU, making it difficult to compare findings with the present study. However, subjects in CCU in this study did show improved sleep over time, but their improvement was less marked compared to MICU and MSICU subjects possibly because their sleep was not as disrupted overall.

The large number and pattern of interruptions found in this study confirmed the results of Woods (1972), Dlin et al. (1971), Hilton (1976), Edwards and Schuring (1993), and Richardson (1986). The contributions of noise, room alarms, physical symptoms, and emotional distress also agreed with the findings of these researchers.

Urinary urgency and worry/uncertainty were two unusual findings. The use of diuretics in the evening and night hours explains urinary urgency, whereas the latter is addressed because it may be related to the sleep patterns experienced by women in the study and the interaction effect of group with gender.
Effects of Unit

An examination of results for the analysis of the effects of unit on sleep over time (Table 19, Table 23, Table 24, Table 28, Figure 2, Figure 9, and Figure 10) shows a significant difference in the sleep score and changes in sleep score for the average subject over time. Men admitted to the MSICU experienced severe insomnia, but their sleep improved nearly linearly from the first to third nights. Women admitted to the MSICU showed a slight change in insomnia from the first to second nights, but a rapid improvement in sleep on the third night. In this unit, patients are treated fairly aggressively and then experience rapid improvement in status postoperatively and medically. Mindful of the morbidity associated with invasive monitoring and treatment technology on this unit, devices also are removed from the patient at the earliest opportunity. The combination of improvement and decreased number of devices may account for the rapid improvement in sleep scores for these subjects. Subjects admitted to the CCU, males and females, experienced moderate sleep disruption, with their sleep improving mildly over time. Routines and stressors may have been held fairly constant for these subjects. These CCU subjects also may not have felt as sick as other subjects, experiencing, for the most part, single-system disease (cardiac); whereas other subjects frequently were feeling the effects of multiple system failure.

The 8 subjects (7 females, 1 male) in the MICU presented a very different picture from other subjects. Their sleep scores were approximately those of CCU
subjects, but the drop in scores for Day 2 is difficult to explain, particularly when coupled with the subsequent dramatic rise on Day 3. The routine for MICU patients intensified on Day 2 after admission, leading to nighttime disruption from devices and monitoring. However, not all subjects in that unit were recruited on the same day following admission.

Inclusion in the study could have captured MICU patients in a downward trend for their sleep, regardless of admission date. Terrible insomnia is usually followed by a night of improved sleep; however, it is possible that these subjects slept so badly over time, particularly on Day 2, that they naturally slept very well on Day 3. This pattern might explain the rise on Day 2 for MSICU subjects as well, but then a flattening or even lowering scores for Day 3 would be expected for MSICU subjects.

Repeated measures ANOVA for the interaction effect of unit by transfer by time was nonsignificant. Transfer out of the MICU does not explain the change in scores for that unit because transferred subjects were distributed equally throughout the units; thus, the effects of transfer were accounted for in all three unit scores. Something may have been present in the pretransfer routine for the MICU subjects that disrupted their sleep. On that unit test results needed for transfer approval or physician orders for transfer are imparted or withheld in a manner that uncertainty over transfer leads to insomnia-producing anxiety.

Nurse awareness of subject inclusion in the study may account for the change in scores for that unit, particularly when the effects of transfer are included
in the discussion. Some resistance was encountered in that institution and at that unit, which was not experienced in the CCU and MSICU or on the units to which some subjects transferred. Resistance began at the committee level in the institution. Committee members who also were staff nurses or administrators in the unit carried that resistance to other staff nurses; that is, three staff nurses commented that they had heard negative comments about the study prior to recruitment. Therefore, nurses may have unconsciously changed their routine for subjects in the study; that is, those subjects declined sleep until transfer to the floor.

Effects of Transfer

When the effects of transfer were analyzed independent of the unit (Table 20, Table 30, and Figure 3), large differences in scores were seen. Experimental and control subjects who did not transfer had low sleep scores, which improved slightly over time. Subjects who transferred experienced significantly better sleep patterns than their counterparts on the first night, perhaps because subjects who did transfer were not as sick as other subjects initially.

The sleep scores of subjects who did transfer became the same on Day 2 as the sleep scores of subjects who stayed in the unit. This pattern may be due to similarities in unit intrusions and device attachment experienced at this point by all subjects. The drop in scores, again, may be due to pretransfer routine or worry; but if so, a drop in Day 2 scores should have occurred in subjects for all units, which was not observed.
Sleep scores improved dramatically following transfer. Routines on general units apparently are less intrusive at night. The number of devices attached to patients on the general unit also is small, but those devices are not so frightening. Finally, moving to the general unit indicates to everyone that the patient has improved, which is a source of relief to the patient; this activity may be associated with enough peace of mind that improvement of sleep naturally follows.

**Effects of the Intervention**

In this study, no relationship was found between the process variables and sleep scores, even though it duplicates similar findings of Rickard et al. (1989) and Gift et al. (1992). Warner and McNeill (1988) found that the vividness of the image reported after the imagery session was related to skill acquisition. Several explanations could be considered: (a) There may have been too much pharmacologic, pacemaker, or ventilator control over vital signs to detect changes; (b) the visual analogue scales used to measure relaxation and image vividness were not tested for validity or reliability; (c) the qualitative questions used to measure effects may not have been worded accurately enough to detect change; and (d) no tool has been devised to measure what may be the most important components of the intervention, namely, the exchange, receptivity, intent, and use of therapeutic self involved in a successful intervention.

**Effects of intervention by diagnosis.** Results of the analysis for intervention by diagnosis by time are discussed by diagnosis and then with all diagnoses, being mindful of the small cell sizes in this analysis. Differences were
found in scores and pattern of improvement by diagnosis that are informative, whereas others were found when all diagnoses were compared to one another.

The 9 subjects with cardiac diagnoses showed very different sleep scores and patterns from one another (Table 21, Table 31, and Figure 4). The control group experienced a worsening of sleep between Day 1 and Day 2, with a marked improvement on Day 3. This group showed the drop in sleep scores for Day 2 that appeared for transfer subjects and MICU subjects, although absolute scores did not compare with transfer and MICU subjects. Interaction effects for diagnosis by unit by time and diagnosis by unit by transfer were not testable because several cells had an \( n \) of 1.

If there was something particular for the Day 2 routine for cardiac patients related to insomnia, a drop in scores would have been expected for CCU subjects when data were analyzed by unit. CCU subjects were admitted for cardiac treatment. Scores for that group did not drop as had scores for the cardiac control subjects. Finally, the rise in scores for control cardiac subjects for Day 3 may have been due to general improvement in condition.

The cardiac experimental group consisted of 2 subjects whose scores had dropped over time. This downward movement was opposite the expected direction. The intervention was associated with increased insomnia for these 2 subjects. When speculating about certain causes such as a change in nursing care and emotional factors for the significant difference in scores over time and particularly for Day 3 for these 2 subjects, only these 2 subjects did not respond to
the intervention. Small cell sizes for this analysis made their contribution to the analysis large and significant.

The pulmonary subjects' scores, when analyzed by groups, showed differences over time (Table 21, Table 31, and Figure 4). The experimental group experienced a steady improvement in sleep when compared to the control group. The control group experienced a worsening of sleep scores between the first and second nights, followed by an improvement in scores on the third night.

Because of small group membership, it was not statistically possible to explore interaction effects for this cadre further. Qualitative data were examined for confirmation of the differences in scores between groups. A registered nurse working with an experimental pulmonary subject reported that the subject had told his mother, "It's really weird, but it really works." He reported, "It was the best night's sleep I've had since I've been here," which at that point was 5 days in the ICU and 24 days in the hospital. A second experimental pulmonary subject reported better sleep over time in spite of increasing irritation with interruptions. A third experimental pulmonary subject reported, "it helped me relax and I was able to get out of there," referring to her transfer. For the control group, 1 subject complained of restlessness, whereas another described all 3 nights as "lonely, scary."

Being very sick in the ICU with a pulmonary illness appeared to be associated with severe insomnia that worsened over time. The intervention had very powerful effects on these subjects. Pulmonary patients do benefit through a
lowering of dyspnea and anxiety that follows relaxation and imagery in outpatient settings (Gift et al., 1992; Renfroe, 1988; Royle et al., 1996). A lowering of dyspnea and anxiety might allow one to sleep better. Relaxation of striated muscle could correspond with a relaxation of the smooth muscle surrounding the bronchial tree, and anxiety relief could lead to a corresponding decrease in epinephrine release and RAS activity—leading to better sleep patterns.

When subjects with diagnoses other than cardiac or pulmonary were compared, no difference was found in scores over time on the basis of group membership (Table 21, Table 31, and Figure 6). However, a difference was found in scores on the pretest. The differences on pretest, which random assignment to groups should have eliminated, raises a question about validity of the tool. That is, systematic error from tool nonvalidity may have caused measurement error reflected in nonequal group scores at pretest.

Qualitative data were examined to determine why there was no difference between groups in the “other” diagnostic category. In the experimental other group, subjects attributed their insomnia to interruptions, symptoms, or worry. A 36-year-old male, who was admitted with deep vein thrombosis, experienced poor pain control each night, which worried him. Another subject was a 55-year-old male who had been placed on a roto-bed following a ladder fall; his morning interruptions grew from 18 to 30. Process variables indicated that he fell asleep during each intervention; thus, it is questionable whether or not he received the entire intervention each time. A 67-year-old female admitted for a clotted graft
attributed her poor sleep on Time 2 to interruptions, "It was the worst night I ever had in the hospital because they were taking care of me every half-hour... It was like a parade." A 77-year-old female attributed her second night of insomnia to a rebreather mask and worry over episodes of nocturnal hypoglycemia and her third night of insomnia to interruptions, "I went to sleep about 8:00 p.m., then they kept waking me up." A 68-year-old female with renal failure attributed her second night of insomnia to the fact that her husband had been admitted that day with a stroke; on her third night she and her ill husband occupied the same room on the general unit. A 46-year-old female with sepsis, on a ventilator for 7 days, and whose sleep scores improved only mildly over time attributed the poor quality of her sleep on the second night to, "A lot of people in the room and at the nurses' station talking." On the third night, she complained of worry over her "lost teeth and glasses" that kept her awake more than she would have liked. This information indicated that the intervention was not strong enough to overcome the effects of the ICU environment on sleep.

Factors leading to disrupted sleep in these subjects may have been so pervasive, so consistently encountered, or so strong that the intervention was not powerful enough to overcome their effects. The effects of the intervention in physiologic terms also may not have been germane for these "other" patients. The intervention works best when physiologic stress is present (Coursey et al., 1980; Lehrer et al., 1979). Relieving stress is associated with decreased epinephrine output, increased endorphin levels, and smooth and striated muscle relaxation—all
of which would be directly beneficial for the pulmonary patient (Chlan, 1995), but would not necessarily directly improve physiology for any other diagnosis.

When the scores for all four diagnostic group subjects were compared, it was difficult to discern a pattern for sleep. Small cell sizes in the diagnostic analysis made it difficult to interpret results confidently. Unequal means on the pretest raised questions about the tool's validity. The variations in scores and changes in scores seen in this portion of the analysis reaffirmed the fragile and individual nature of sleep in the ICU environment found by other researchers (Aurell & Elmqvist, 1985; Broughton & Baron, 1978; Dohno et al., 1979; Fontaine, 1989; Johns et al., 1974; Orr & Stahl, 1977; Richardson, 1986; Walker, 1972). Persons with pulmonary illnesses benefitted from the intervention, which also duplicates others' findings (Gift et al., 1992; Renfroe, 1988; Royle et al., 1996). Persons with cardiac illnesses did not benefit from the intervention, which partially corroborates the findings of Richards (1992, 1995), even though Richards combined relaxation, imagery, and music—delivering the intervention once by a very short tape.

Effects of intervention by gender. Men and women responded very differently over time to the intervention. Sleep scores for experimental male subjects improved strongly after one exposure to the intervention when compared to control male subjects. After the second exposure, scores for experimental male subjects improved only slightly, whereas scores for control male subjects showed improvement. At this point, the question of repeated doses must be raised in an
attempt to explain why the first intervention was associated with such a strong effect, but the second intervention was associated with an average flattening of effect.

One of the theoretical constructs underlying the intervention is therapeutic use of self. This construct is an intimate intervention that requires a closeness and vulnerability on the part of the nurse and patient for efficacy. Some characteristics of the therapeutic use of self in the intervention were effective for males, but that blocked efficacy with a second intervention.

The chart and other data, including qualitative information, were reviewed for evidence of nonresponse or unusual response in the experimental males. A subgroup of nonresponders \((n = 2)\) was found in this group.

The ages of these 2 male nonresponders were 49 and 55 years. Nonsignificance in three other studies of relaxation and imagery was related to youth, not age (Flaherty & Fitzpatrick, 1978; Lehrer et al., 1979; Lorenzi, 1991). Bridge et al. (1988) reported that women 55+ years old benefitted most from intervention.

The 2 male nonresponders showed a marked increase in morning interruptions from 16 to 21 and from 18 to 30, respectively. Qualitative data indicated that they attributed their poor sleep patterns to interruptions and physical symptoms of chest pain and dry mouth. The intervention may not have been powerful enough to counteract the effects of these increased interruptions and symptoms on the sleep of these two men.
The scores of the experimental women were very high on pretest when compared to all males and control females (Table 22, 32, and Figure 8). It is not clear why experimental female subjects' pretest sleep scores were higher than other subjects' pretest sleep scores. This difference may have been significant by chance because an alpha set at .05 does not eliminate a Type I error, but limits its probability to 5%.

A postulated threat to the validity of scores on pretest is hypothesis guessing within experimental conditions (Burns & Grove, 1987). The experimental group of women may have unconsciously influenced their scores on pretest to help me, having guessed that I hoped sleep scores would show improvement over time. Why the men also did not participate in this threat to validity is unclear, unless one accepts that men and women responded to my personality strongly and differently on the basis of the recruitment process only.

The sleep patterns of the experimental female subjects may have been influenced by menses. The interaction between sleep and place in menstrual cycle or perimenopause was not measured in this study. A 24-year-old subject with congestive heart failure was postpartum; several subjects (by age) were considered to be undergoing menopause; and some (again, by age) were past it.

After one intervention, scores of the experimental females dropped. There may have been an interaction effect with therapeutic use of self during the first intervention opposite of what the experimental men had experienced. This negative interaction effect lasted for 1 night and was replaced with an extremely
positive experience during the second night for the females. This positive effect was so strong that sleep scores for the experimental females exceeded those of the control females.

The experimental females' scores and data were examined for nonresponders. Two subjects were found, aged 77 and 68. Unlike the male nonresponders, morning interruptions for these women declined slightly over the 3 nights. Qualitative data indicated that they attributed the worsening of their sleep to interruptions and worry. For example, the husband of 1 woman was admitted for stroke into the next bed.

The interaction effects of the intervention, CCU admission, and gender could be explored to explain the differences in scores for the experimental men and women (Table 13, Table 33, Figure 9, and Figure 10). Unit practices may have influenced how the subjects were able to respond (or not) to the intervention. All women slept better in the CCU than in any other unit. They may not have been as sick as subjects in other units, may have been undertreated when compared to men in CCU, or may have been given information or support differently than any other group. Conversely, men in MSICU slept most poorly on the first night in the study possibly because they were treated the most aggressively of all groups or were given information and support differently than any other group.

A review of the literature showed that the number of exposures to the relaxation or imagery ranged from once to five times in 1 day to multiple times over 6 weeks (Bailey, 1984; Coursey et al., 1980; Daake & Gueldner, 1989;
Johnson, 1991b; Leja, 1989; Maring, 1990; McClusky et al., 1991; Rickard et al., 1989). In studies with multiple exposures over days, the effects of the intervention on the dependent variables were reported to occur over time. McClusky et al. (1991) reported that relaxation effects began in healthy volunteers after the second week of exposure to the intervention. Johnson (1991b) reported improved sleep over 6 days in well elderly women. Males’ sleep scores improved immediately, given the lag time in change in dependent variable measures reported for some groups; whereas females’ scores improved after a second exposure. Sleep in both groups may continue to improve over time more than in the control group, given further exposures to the dose and an extension of the measurement points longitudinally.

Gender differences were based on the manner in which men and women view sleep. Women are sensitive to general events that influence sleep efficiency in ways that men are not influenced; in fact, men tend to focus on circumstantial events that influence sleep efficiency (Signoret et al., 1994).

Another credible explanation for the difference between men’s and women’s responses can be given to the intervention. The script for the intervention contained multiple suggestions for control, intimating that the subjects could control the amount of tension retained in their bodies and that it was a pleasure to have this tension. Men and women may have responded very differently on the basis of their gender-based uses of control.
One assumption underlying care in the CCU is that nursing and other staff are entitled, and even required, to take control of as many extraneous and potentially confounding variables in the environment as possible in order to obtain the maximum benefits predicted and desired of treatment. The effects of this routine and other depersonalizing and paternalistic practices inherent in contact with the health care system are believed to contribute to the generation of powerlessness in men and women (Kubsch & Wichowski, 1997).

When the suggestions and encouragement of control placed in the script of the intervention were combined with this penchant for loss of control in the critically ill adult, as well as the possibility that information giving and decisional control differed between units, genders may have responded very differently. Four explanations were given for the pattern of change in insomnia seen in the experimental males.

First, for men in industrialized countries, control over self and surrounding events is necessary for success and survival. Improvement of control via one intervention may have been a very welcome outcome, possibly decreasing anxiety over control to a point in which sleep improved.

Second, after 1 additional day in the ICU and including the effects of transfer for the men, external events may have decreased in actual number and threat as devices were removed, some were transferred, and general health improved. At that point of delicate balance, an external source of control (me) may not have been welcome or they may have been feeling well enough to
perceive that the quality of their sleep was not good.

Third, one intervention may have increased the internal stability of the men; for example, a second exposure to the intervention may have been unwelcome. They may have felt comfortable enough after one intervention that it would have been a perceived weakness to "need" the help of someone else to cope. This finding may have been particularly important for some because I (female) hold an advanced degree, and this combination may have been an unwelcome "threat" to ego and control.

Fourth, the second exposure to the intervention may have increased the males' internal sense of control to the point that they were more bothered by routine and interruptions that night than they had been the preceding night. This intervention, in particular, may explain the sleep scores for the male nonresponders, even though they were faced with an actual, not a perceived, increase in stimuli on the third night.

Fifth, the threat to validity of hypothesis guessing must be revisited. Experimental males' pretest sleep scores were very low. Scores for this group grew tremendously for the second night, flattening on the third night. This group may have been trying to please me by responding in the expected direction on the sleep scale, but scores of the 2 nonresponders may have been low enough to flatten the average score on the third measure.

Qualitative data indicated that the experimental males who slept poorly generally attributed the poor quality of their sleep to interruptions and physical
symptoms, whereas the experimental women who slept poorly attributed their insomnia to interruptions and worry. Control and worry are antithetical. Interruptions, therefore, were important influences on sleep for both genders. The interaction of control suggestions and the gender-based predilection for worry were important sleep variables for women, but not for men. When Coursey et al. (1980) used autogenic training on healthy volunteers, the lack of significant results was attributed to the fact that subjects had no anxiety or health disruption on which the intervention could act.

For females, the social history and position of women in industrialized countries may have influenced their response to the intervention. Women historically have not had much control over events surrounding and influencing them outside the domain of the home. The control suggestions in the script may have been difficult for them to incorporate after only one exposure to the intervention because they may have been inexperienced in control.

Another explanation for the changes in scores for the females is related to women’s relative inexperience with control. Expectations that they control their response to uncontrollable events may, in actuality, been stressful for them, which would contribute to, not alleviate, insomnia.

A third explanation for women’s scores is related to the scripted suggestions that they enjoy this feeling of control over their body’s relaxation. Suggestions to enjoy the control they had may have raised an expectation that they control uncontrollable stimuli, namely, interruptions, the staff losing their dentures, and
admission of their sick husband to the next bed.

A fourth explanation is that female subjects were frustrated at their relative inability to control their surroundings. For example, women are treated less aggressively for cardiac disease, and information is given differently to men than to women. Perhaps these women were not being given enough information to make decisions or to feel secure in their surroundings. Suggestions to control their relaxation and to enjoy feeling in control of their bodies were, in light of how they were being treated, frustrating.

These explanations for the drop in the experimental females’ scores on the second measure must be reexamined and “explained away” when the steep rise in scores on the third measure is considered. After a second exposure to the intervention, ideas about control of their physical responses and enjoyment of control may have felt more natural and possible to these women, thus explaining the steep rise in sleep scores on Day 3. Incorporating the idea of control may have allowed the women to relinquish their worry, except for the 2 nonresponders.

Additional studies on other populations have not reported script content. Therefore, it would be helpful to repeat this study using two different scripts for men and women. The script for males would contain many control suggestions, whereas the script for females would not.

The process of the intervention could be an intimate exchange between the nurse and the patient. Such an exchange requires trust on the part of both parties. In relationship to this trust, there may have been a personal interaction between the
women and myself, a career female. I may have been perceived by the experimental females as a strong woman who was difficult to access in interpersonal terms. Following one intervention, the women may have been able to trust my goodwill enough to incorporate the intervention and benefit from it.

Limitations

The RVSH has not been tested against EEG recordings of sleep in healthy adults, but it has shown good reliability and validity when tested against the St. Mary’s Sleep Questionnaire and the Baekeland and Hoy Sleep Log—both of which show good reliability and validity when compared to EEG data on healthy adults. However, none of these tools has been tested against EEG measures of sleep in the critically ill. I elected not to use EEG measures of sleep in this study because of its intrusive, expensive nature and because there is sufficient evidence that subjective reports of sleep approximate EEG sleep measures of sleep in adults in laboratories, in residential care, and in institutionalized adults (Closs, 1988c). The institutionalized adult is not the same population as is the critically ill adult, but they do share characteristics. Further, researchers agree that for most parameters of sleep that subjective reports of sleep are reliable and valid measures in many populations, including the hospitalized adult (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Carskadon et al., 1976; Closs, 1988c; Ellis et al., 1981; Johns, 1971; Topf, 1992). The tool also provides information about the subjective nature of sleep that EEG recordings do not provide. However, this lack of demonstrated convergent validity with EEG measures in the present study must be acknowledged.
as a possible limitation.

Because the sample was drawn from Salt Lake City hospitals, it did not contain minorities in proportions found in the U.S. population in general. The population to which results can be generalized is limited primarily to Whites.

Because the sample was drawn from three selective ICUs in one city, generalizability of results was limited in terms of the types of units and patients found. Predicting similar results in small units with private rooms that have walls on all four sides, central nursing stations, and a population that does not include thoracic surgery or neurosurgery patients may be plausible.

There may be other beneficial effects of the intervention that were not measured. Variables such as pain, uncertainty, peacefulness, frustration, and anxiety (which were examined for the intervention of progressive relaxation alone) were not included in this study.

I am an expert in intervention. A similar expertise may be required for practicing nurses to achieve the same results. Similar effects would be achieved only if the nurses were similarly trained and confident in the intervention. Similar results also would depend on the gender of the nurse.

There may have been an attention effect that was not measured, which is particularly meaningful in light of the discussion about the use of therapeutic self, an exchange of therapeutic effects, and the intent and receptivities of the participants that this study engendered.
To know from this study if the significant group effects were due to the intervention as a whole or to the two parts of the intervention is not possible. Because the research question for the study came from my nursing practice in which relaxation and imagery appeared to be effective together and no other study on this combination's effect on sleep in the critically ill adult had been published, the study was designed as an exploration of the intervention as a whole.

An ethical limitation must be acknowledged. This study, in effect, asked patients to fortify themselves internally against intrusions and interruptions to sleep. Nursing was primarily responsible for the quantity and quality of these intrusions through acts of commission and omission. Placing the onus for sleep on the ability of a patient to internalize an intervention seems less right or ethically sound than changing nursing practice relative to the intrusions in which one participates.

Implications for Nursing

Critically ill adults may respond to relaxation and imagery differently based on diagnosis and gender. Additional research is necessary to build a body of knowledge about the effects of the intervention in this population, but the differences in subject response that this study detected have implications for nursing theory, practice, and research. A discussion of these implications draws upon the literature related to the conceptual framework of the study, nursing practice, and other nursing research.
Nursing Theory

The conceptual framework for this study was drawn from the writings of Nightingale (1859/1980), including the concepts of person, nursing, health/disease, and environment. Environment included physical, psychological, and social. The results of this study encourage a reexamination of all concepts.

Person. As stated in Chapter II, Nightingale (1859/1980) wrote that, if placed in an optimum state, patients have within themselves the ability to recover and to heal themselves. Relaxation and imagery are unlikely to heal the critically ill patient, but the intervention likely will promote sleep in selected critically ill individuals. For patients with pulmonary diagnoses and for women after two doses and men after one dose, the intervention may work by placing the patient in an optimum state so that sleep can occur. Healing was not measured in this study, but sleep was. Sleep, in general, is accepted as important to healing (Benor, 1996; Evans & French, 1995).

Nursing theory can explore the definition or conceptual clarification of “optimum state.” Adequate sleep is one component of optimum state, but nursing theory might address the point in which “adequate” slides into “inadequate.”

Nursing theory can examine the ethic of creating an environment in which the optimum state is abandoned in favor of medical interruptions. Unfortunately, the study highlighted the possible effects of interruptions on the sleep of the critically ill patient. The medically ordered and standard-of-care interventions that serve to cure or ameliorate disease are important, but the method of delivery of
these interventions has ethical implications. Nurses are responsible for most of the interruptions these people experience, thus creating an environment counteractive to the patient's optimum state.

The intervention placed the responsibility for optimum state on patients to modify their psychological environment so that the unfortunate circumstances around them could be ignored. The intervention may have allowed patients to reduce the perception of, or arousal response to, environmental stimuli. The ethics of where this responsibility for creating and maintaining the patients' optimum state is need to be addressed in nursing theory.

Nursing. Nightingale's (1859/1980) nursing included the idea of removing some of the "doing to" that was destructive and placing the person and benign nature in contact with each other; then healing could occur. For some subjects, the intervention may have reduced the perception of, or arousal response to, being "done to."

However, nursing as a theoretical construct is not limited to the idea of "doing to." Nursing also includes the processes of "being with" and "interacting with." Being with and interacting with require an exchange. My impression was that open participation on the part of the patient occurred during a successful session of the intervention; this open participation included an undefined exchange or mutuality. Nursing theory has yet to explain the exchange that may occur during a successful relaxation and imagery session.
Use of therapeutic self in nursing implies receptivity to the self being offered. The intervention requires the use of therapeutic self on the part of the nurse and the reception of the self that is being offered on the part of the patient. Prior to the study, I was selectively offering relaxation and imagery to my patients. An unidentified set of eligibility criteria had been developed and implemented that seemed to screen for receptivity to, and the ability to participate in, relaxation and imagery with me. During the study, my impression was that during successful sessions a mutual affinity for each other developed.

Six individuals were recruited to the experimental group that I would never have proposed participate in relaxation and imagery in my practice, which may be evidence of investigator bias that did or did not affect results. Ideas about the generation of a relationship conducive to the use of therapeutic self can be gained from an examination of these 4 subjects.

One man in the pilot study and 1 woman in the main sample completed both sessions and all three measurements, but they seemed resistive to the intervention during sessions. No sense of exchange was made with these 2 individuals, and no affinity for each other existed or developed. These individuals were resistive to the relative intimacy of the exchange necessary for the success of the intervention or they were resistive to my use of therapeutic self during the intervention. The resistance may have occurred entirely on my part or was mutual in nature. Nursing theorists could seek to explain the ideas of exchange of self and use of therapeutic self that occur during the intervention.
An intriguing idea that came from these notes is that use of therapeutic self traditionally has been described as unilateral, that is, coming from the nurse. Many nurses report gaining at least as much from their relationship and interaction with patients as it is presumed the patients' gain. Nursing theory could revisit the idea of therapeutic self to explore the role of patient as a therapist in the interchange between patient and nurse.

Two women in the main sample participated in one session and requested imagery with strong religious metaphors. For example, 1 woman wanted to be in a room with her spiritual mentor, whereas the other wanted to walk down her life’s path. Both declined to participate the next morning, fearing the intervention was frowned upon by their religious leaders (Jehovah’s Witness and Pentecostal Christian). The spiritual nature of nursing, in general, and the intervention, in particular, could be revisited to explain the spiritual stirrings and doubts that the intervention prompted in these 2 women.

Finally, 2 women were recruited to the experimental group that, in my opinion, could not benefit from the intervention. This opinion may have been biased or the result of clinical judgment or both. At any rate, 1 woman was very hard of hearing, making it difficult to use the voice as a musical instrument during relaxation. The other woman was intubated, writing her qualitative evidence with errors in grammar and spelling; consequently, I questioned her intellectual ability to engage in the intervention. Happily, both women were extremely receptive to the intervention, showing great changes in their process variables, as well as great
improvement in their sleep scores over time. Clarifying work on receptivity, willingness to exchange, and use of self in nurse and patient would be beneficial.

Some investigators have chosen to deliver relaxation or imagery, or both, by tape to decrease error variance due to method of delivery of the intervention (Crowther, 1983; Munro et al., 1988; Rickard et al., 1989). Combining taped with in-person delivery is more common (Daake & Gueldner, 1989; Gift et al., 1992; Lerman et al., 1990; Miller & Perry, 1990; Renfroe, 1988). Studies using tape only or a combination of tape and in-person delivery do demonstrate significant results associated with the intervention, but it has been shown that taped interventions are less likely to be effective than in-person interventions (Borkovec & Sides, 1979; Lehrer & Woolfolk, 1982; Paul & Trimble, 1970; Warner & McNeill, 1988). Taped delivery sterilizes, to some degree, the intervention of the “therapeutic intent” of the nurse. Therapeutic intent can be described as the healing purpose for which the intervention is delivered such as relaxation, increased peripheral blood flow, pain control, and decreased isolation. The definition of massage has included the idea of intent of the masseuse (Snyder, 1992), but intent is not contained in the definitions of relaxation and imagery. Theory might help explain the role of intent of the practitioner, if any, in these interventions. Therapeutic intent may be bound with the use of therapeutic self. Theory could help explain this relationship in the context of relaxation and imagery.
**Health/disease.** Theory about sleep and the effects of sleep on health and disease include restitution theory. Sleep is healing within this theory. Theory about sleep also includes the idea of energy conservation. During sleep, energy is conserved and is used in the more active periods of the day. In this study, the item refreshed upon awakening in the RVSH Sleep Scale was one measure of the amount of energy the subject felt in the morning. No evidence was found that the intervention or improved sleep regardless of group membership improved restitution or conserved energy in this population, as measured by the item refreshed upon awakening.

Returning to restitution theory and conservation theory about sleep would be helpful to examine these theories’ truth or usefulness in explaining the purpose or function of sleep. Relating fatigue theory to mechanisms of energy conservation and sleep theory also would be helpful. The role of relaxation in energy conservation and restitution could be reexamined. Finally, theories about the nature of healing in the critically ill adult could be combined with theories about sleep, relaxation, and imagery.

**Environment.** In previous studies, sleep was found to have two components: (a) sleep disturbance and (b) sleep effectiveness (Snyder-Halpern & Verran, 1987). In the critically ill subjects of this study, these subscales were not found. The subscales may have been lost in the depth of disruption of these people’s sleep scores or in the lack of independence in their unit of analysis.

Theories about sleep and sleep deprivation have been formed from studies
on the well young male adult in the sleep laboratory. The present study included
dmales, the aged, the very ill, and a different environment. Environment, in
particular, appeared to be very closely related to insomnia. A sleep theory that
accounts for the effects of environment, age, gender, and illness needs to be
created.

Control and the physical environment may have been intimately related in
this study. In the ICU, personal control over the physical environment is nearly
absent. In previous studies, the effects of giving patients control over hospital
noise and other environmental factors have been uneven (Johnson et al., 1985;

In this study, the item concern over disturbances did not measure sleep, but
measured, in part, affective responses to multiple interruptions and environmental
disturbances. Qualitative data gave information about irritation over environmental
disturbances. Some subjects were irritated, whereas others welcomed the
disturbances. One subject experienced a contextual component to a disturbance,
"Terrible awakening—guy next door coded." The effects of disturbances in the
physical environment and the subjects' response to disturbances possibly account
for the significant results for sleep over time and unit, as well as sleep over time
and transfer.

The women in the present study worried about their future, whereas the
men expressed concern over the effects of physical symptoms on their sleep
(psychological environment). The presence of symptoms appeared to disturb sleep
for some. Certainly, insomnia intensifies the fear and anxiety that accompanies such symptoms (Lichstein & Rosenthal, 1980). The fear of symptoms and the fear of loss of control over symptoms also may have impacted sleep. For most people, insomnia also leads to fear of the effects of the insomnia on their health or performance the following day. Insomnia also leads people to fear that they will sleep badly, that is, worrying about how little sleep one is getting leads to more insomnia. Nursing theory might help explain the recursive nature of this relationship between fear of symptoms, fear of loss of control over symptoms, fear of insomnia, and sleep.

The social environment also may have contributed to the effects of the unit on sleep, as well as the intervention by gender interaction effects on sleep. Theories about gender have identified the social forces and biases that lead people to treat women differently. In one unit, people, in general, may have been underinformed or given other causes to worry about. In all units, some women may have been singled out for treatment or nontreatment such as withholding information or interventions that led to insomnia directly and indirectly. Theories about gender differences, paternalism, and oppression could be revisited and combined to view them in the context of intensive care.

The current social ethic that values life at any cost is operative in ICUs. This ethic's direct effects are in the scheduling of interruptions regardless of the interruptions' effects on the patient, including sleep, comfort, sense of control, and personal space. This social ethic could be revisited to examine the areas in which
the value for life at any cost collides with values for wellness, comfort, personhood, and empowerment.

Theory about locus of control and loss of control could be examined for evidence that control affects sleep. Theory about relaxation and imagery could be revisited and reworked to include personal control concepts. Finally, theory about sleep, relaxation and imagery, locus of control, and loss of control over the environment could be combined in an effort to explain the relationship of control to the intervention and to sleep.

Sufficient theoretical work should be conducted to occupy many nurses for a long period of time. While theorists are busy, people are continuing to fall ill or working to maintain their health or wellness. These people could use the assistance of a clinical nurse providing direct patient care to ensure that sleep was contributing to healing and health.

Nursing Practice

Because nurses accept the idea that sleep is important for health, insomnia is no longer paid much attention in terms of assessing, documenting, and evaluating. After reviewing the 46 patient records used in the pilot and main studies, sleep was mentioned in nurses' charting approximately seven times. Respiratory therapists charted sleep or wakefulness approximately 50% of the time. Nurses in ICUs do not attend to sleep much because interventions are not available that will improve sleep, even though respiratory therapists are not responsible for promoting sleep. Routines and interruptions seem obvious to impact sleep for ICU
patients; consequently, changing nursing practice is very difficult. For a staff nurse to oppose an entire unit or system to change how nurses work in order to improve sleep for patients would be extraordinary.

When assessing, documenting, and evaluating sleep (arming nurses with effective interventions and changing practices), the outcome of decreased insomnia in ICU patients seems attainable. In this section, three issues are addressed in light of the findings of the present study.

Assessing, Documenting, and Evaluating Sleep

Assessing sleep. When I or the research assistant asked subjects, “How was last night for you?,” a great deal of information was obtained. Nurses should ask patients one question about their sleep, that is, unless too much information results from the asking. Few practicing nurses have been trained to analyze qualitative data, but many are good listeners. Occasionally, empathetic listening is sufficient to ameliorate a problem or at least make patients feel that they are not alone in their problem. Assessing sleep through one open-ended question is a sensible action for nurses providing care in clinical settings.

Results of the study also indicate that critically ill adults can self-report sleep using the RVSH2 Sleep Scale; however, there are caveats. Instructions for marking a visual analogue scale need to be standardized, even though the majority of subjects understood how to score intuitively. When they did not understand, however, it was necessary to explain the scoring in more detail; these detailed instructions can be involved and overwhelming.
Detailed instructions should be gender-specific (P. Meeks, personal communication, October 12, 1996). For men, the line of a visual analogue scale can be compared to a speedometer. The automobile at rest would show a mark at the far end of the scale; as speed increased, the mark would move further along the line. When the vehicle's maximum speed was reached, the mark would be placed at the other end of the line. This analogy does not work well for women. For women, the line can be compared to a thermometer. A state without fever would compare to a mark at the far end of the line. As fever appeared and increased, the mark would move further along the line until maximum fever was reached.

Scoring the RVSH2 Sleep Scale is not complex, even though some items need to be reversed. The sleep score for the critically ill adult is the sum of all items on a scale of 0 to 900. However, the meaning of a numerical score has not been established in clinical or ethical terms. With use over time practicing nurses might begin to “get a feel” for numerical scores that accompany clinical evidence of extreme, moderate, and mild insomnia. Unfortunately, insomnia is like pain in terms of subjectivity. If there is no relationship between clinical indicators and RVSH2 Sleep Scale scores, insomnia will need to be similar to pain, “Whatever the patient says it is.” If so, insomnia in the critically ill adult likely will continue to be underassessed and undertreated.

This lack of assessment of insomnia leads to the question of how much insomnia is ethically tolerable. The expectation that patients will not sleep well in
ICU is operative. A discussion of the ethics of this assumption would be healthy for critical care nursing practice. Such a discussion could give rise to numerical cutoffs for RVSH2 Sleep Scale scores beyond which nursing interventions to promote sleep would be the standard of care to which nurses are held legally accountable.

Sleep and insomnia in CCUs appear relatively easy to provide. Short descriptors of sleep (approximately two words) can be placed in assessments such as descriptions of mucus. A numerical score (possibly from the RVSH2 Sleep Scale) would fit practically and philosophically even more nicely with other numerical data recorded on flow sheets in ICUs.

**Arming Nurses With Effective Interventions**

The combination of relaxation and imagery was an effective intervention to promote sleep in the critically ill adult for 4 men/women in the experimental group (25%) based on qualitative data. Training and encouraging staff nurses in CCUs to deliver this intervention could improve sleep for many people. Modifications to the intervention in this study could help nurses use this intervention most effectively.

First, consider using the intervention on all pulmonary patients each day. With evidence that the intervention helps pulmonary patients in several ways in other settings, this study built evidence that helps pulmonary patients to sleep in ICUs.
Second, use with caution for sleep in cardiac patients. Even though evidence from this study was not conclusive that the intervention actually worsened sleep, sufficient evidence was not presented to use the intervention confidently in this population.

Third, give males one dose of the intervention and proceed cautiously with other exposures. Flattening of the effect of the intervention on sleep is not detrimental unless one considers that, left alone, the average male's sleep improves over time in ICUs. Other studies do not report a pattern for the male response to the intervention.

Fourth, give women repeated doses of the intervention and evaluate its effects over time. The effects of the intervention on the sleep of women were not seen until after the second dose. In other studies of the intervention, particularly Johnson's (1991b), women's sleep improved gradually over time.

Fifth, the nurse might consider modification of the control language in the script used for autogenic training, particularly for women. Suggestions for control and enjoyment of control may have been responsible for the decrease in sleep seen in women after one exposure to the intervention. Other studies do not include the script used; that is, it is difficult to know if other investigators used control suggestions in their studies.

Other interventions for improving the sleep of the critically ill adult came from this study. These interventions grew from the differences in scores based on transfer and gender.
Nurses must push to transfer patients out of CCUs at the earliest possible time. Patients may be responding to interruptions in the unit; devices to which it is customary or necessary for them to be attached in the unit; routines, noises, and light patterns in the unit; or the idea that they are critically ill. Moving the patient from the ICU to the general unit has immediate beneficial effects on sleep.

Critical care nurses could attend more aggressively to symptoms of discomfort in male patients. This concern over physical symptoms was a theme found in males' descriptors of their nights. Pharmacological interventions and comfort measures such as cleanliness, positioning, moistening lips, massage, and the application of heat and cold are common nursing interventions in which the average ICU nurse needs no further training, but perhaps encouragement. In particular, a sensitivity to the toileting needs and effects of the timing of diuretic medications on sleep might decrease the role of urgency in interrupting sleep.

Worry was a theme for female patients. For children, sensation preparation and "rooming-in" by a family member are common pediatric nursing interventions aimed at lessening the consequences of anxiety and fear in patients. If the effects of the social environment are considered, it would be ethical, as well as effective, to standardize information given to patients across genders regarding all aspects of their stay. Some ICU nurses believe that family members are an occasional hindrance to their work, but there is no documentation that rooming-in for an adult patient is detrimental or beneficial. For children, rooming-in is nearly universally beneficial. I found rooming-in to be routinely helpful in caring for the critically ill.
adult to have a trusted family member present for lengthy periods of time. An objection to rooming-in is that ICU rooms are quite small, but it is interesting that accommodation is always made for more equipment.

**Changing Nursing Practices**

The severely disturbed sleep pattern of the critically ill adult is related, in part, to nurse-initiated interruptions (Aurell & Elmqvist, 1985; Broughton & Baron, 1978; Dohno et al., 1979; Fontaine, 1989; Johns et al., 1974; Orr & Stahl, 1977; Richardson, 1986; Walker, 1972). Recommending nurses should begin to change the number and pattern of interruptions that ICU patients experience during the night.

The first impediment to this change is the necessity of close monitoring for the safety and healing of these patients. Some equipment and devices are so invasive that the standard of care requires at least an hourly reading or safety check from a nurse 24 hours a day. An example is the recording of vital signs from an arterial line every 15 minutes as the standard of care for a patient on vasopressors, including a hands-on check for validity of line values ("flush and ring checks" of oscilloscope data). The line also has an in-room alarm for high and low values, which is duplicated at the nursing station. The intrusive nature of these readings and checks could be modified by using readouts and alarms at the nursing station rather than at the patient's bedside.

Some of the intrusions believed to be necessary may not be as important to safety and healing. Such interruptions could be eliminated or modified. For
example, pulse oximetry equipment with a wire attached to a bedside readout with
an alarm that is never silenced is commonly placed on the index finger of all
patients. This placement could be a safe intermittent monitoring action for many
patients.

A second barrier to changing the number and pattern of nursing
disturbances is how routine and ingrained is the tradition of interruptions, including
work at the bedside, patterns of lighting, noise in the unit, and movement
throughout the unit. Each unit has a culture. Most ICUs have a culture that
values the active nurse over the passive nurse, the nurse who closely monitors
patients, the nurse who is a “hard worker” (as evidenced by physical activity), and
the nurse who fills up flow sheets and documentation records with personally
obtained data. Further, many nurses believe that intrusive interventions take
precedence over sleep while the patient is in the ICU and that sleep is an
occasional benefit in ICU, not a requirement. Therefore, interventions take place
at all hours without having undergone a critical scrutiny for their necessity, at least
at that time of night. Examples of traditional nighttime practices that could be
changed are early morning (0500) laboratory draws and patient weights, which are
done at that time for physician convenience, and bed baths on the night shift,
which lightens the workload of the day shift. Changing nursing routines is very
difficult, but influential nurses could be recruited to model the elimination of
unnecessary intrusions; the grouping of necessary cares; and the modification of
unit noise, light, and activity patterns.
A third obstacle to change is the practical and understandable use of “busy work” to keep the nurse awake during a long night shift. As circadian creatures, nurses should be honored for their ethic of staying alert throughout the night for the safety and healing of patients; however, there should be some way to do this without using the patient’s room as the location for the activity/light/noise.

Earlier in this section it was recommended that nurses push to transfer patients out of CCUs at the earliest possible time if they wish to improve sleep. Failing this occurrence, the experience of the patient in an ICU should be made as much like the experience of the patient on a general unit as possible. One way to accomplish this experience might be to cross-train nurses to work in both places, which carries the risk of transforming the general unit into one more like the CCU. Another way involves changing physical characteristics, as well as routines, for the ICU. When ICUs and general units are compared, architecture, furnishings, and lighting are very different. Dispersion of nursing stations into several small locations on general units reduces station noise. The number of in-room alarms is minimal. Rooms have doors that are closed. Patients on general units are “tucked in” with a routine. Many of these characteristics and routines could be used in ICUs without compromising nursing care.

The clinical experiences of nurses who are using the intervention and challenging routines will raise even more questions for investigation. Nurse researchers can use these clinical experiences to guide research priorities.
Nursing Research

Answering one research question often leads to the genesis of even more questions. The results of this study have implications for future nursing research.

Development of the RVSH Sleep Scale

Shorter measurement tools for research with the critically ill appear to improve recruitment, retention, validity, and reliability. Shortening the RVSH Sleep Scale may improve the scale. This study produced evidence that the 11-item RVSH Sleep Scale has two items that may not be germane to the critically ill adult. The 9-item RVSH2 Sleep Scale could be further modified by eliminating two additional items. The item concern over prodrome may be less related to sleep than to feelings about being kept awake. The item good night is really dichotomous; thus, it is inappropriate for a VAS scored from 0 to 100. If the item good night is removed, the overall impression of the night’s sleep can be obtained from a summation of the remaining 7 items. This 7-item tool needs to be tested using ICU patients as subjects.

Polysomnography using EEG measures is widely believed to be the gold standard for measuring length and depth of sleep. The validity of any form of the RVSH Sleep Scale should be established through a concurrent measure that compares the tool to EEG data. This work could begin on healthy volunteers in a sleep laboratory, but it should be carried into the CCU for testing on that population. Recruitment and retention will be issues when including polysomnography as a measurement on the critically ill adult.
Wrist actigraphy gives information about sleep efficiency, awakenings, and time awake that compares favorably to EEG when used in the sleep laboratory. A study could compare the RVSH Sleep Scale with wrist actigraphy in the ICU.

Test-retest reliability for the tool needs to be established in the critically ill adult, which might best be accomplished by administering the tool twice (in the morning to a group of ICU patients and for several days). Staggered administration intervals of 1 hour, 2 hours, and 3 hours could be randomly assigned to each patient. These subjects could be followed as they transfer to a general unit to determine if transfer had an effect on test-retest interval reliability. A sleep history from hospitalized subjects, even if obtained retrospectively, could give some sense of baseline sleep for each subject and could contribute to measures of reliability and validity for this tool.

**Exploration of Significant Effects**

The significant effects of unit and transfer on sleep scores should be further explored. An exploratory descriptive field study conducted at multiple sites would begin to answer questions raised by the results of this study. Potentially important variables such as noise, light, and personnel room entry and exit could be monitored with a decibel meter, a light meter, and an infrared beam at the doorway. These devices could give continuous ratio-level data about conditions in a patient’s room.

The problem of monitoring information given to, or withheld from, a patient is more difficult to address. Any attempt to have nurses track their
comments and instructions could lead to hypothesis guessing; that is, participating nurses would change their practices. For critically ill patients to remember what they were told might become too difficult because it is unlikely that patients' charts would reliably contain this information. Perhaps the only reliable method of obtaining information about the culture of a nursing unit is to place a participant-observer on the unit who would observe and record unit practices.

The interaction effect of the intervention and diagnosis could be confirmed through replication of this study. A larger sample size would give more confidence to the reported results of the present study. Another way to explore the diagnosis effect would be to replicate the study, limiting the population to patients with cardiac or pulmonary diagnoses or by including pulmonary and cardiac diagnoses, but not other diagnostic categories. Persons who are hard of hearing should be excluded from future studies. This type of study should be expanded to include the potentially contributing variables of locus of control and personality type.

The interaction effect of the intervention and gender could be confirmed by replication of this study with a larger sample size and multiple sites. Non-White subjects should be included because race and gender may interact to influence the effects of the intervention on sleep. Measures of locus of control and anxiety states/traits are possible contributing variables and should be included. The difficulty with increasing subjective measures in this population is the stress they represent to the critically ill patient. Too many questions and forms will threaten
recruitment and retention, with test fatigue becoming a confounding variable.

Exploring the effects on sleep of changing the pattern of interruptions to the patient would involve modification of how nurses conduct business. A training program would need to be designed and implemented, with its effects on the sleep of patients measured. Nurses of both genders should be recruited into this study to consider questions about gender and investigator interaction. Recruiting nurses willing to change their practice may be as challenging as the process of recruiting the critically ill adult. However, the ethics of imposing insomnia-producing nursing activities on patients must be addressed in research.

Investigation of the Intervention

This study presented evidence that the intervention is effective for certain critically ill adults. More research would help to explore exactly what part of the process (e.g., intervention, investigator, and time) was responsible for the observed differences in sleep.

A study should be conducted with an experimental, repeated-measures design that separates the intervention into two parts: (a) autogenic training and (b) guided imagery. This type of study could have groups that experience autogenic training alone, guided imagery alone, a combination of autogenic training and guided imagery, and an attention control process. This training would help nurses know if the intervention could be simplified or must be combined in order to have an effect on sleep.
Another question raised by the present study was the effect of the investigator. An experimental study that compares the effects of the intervention when delivered by a male/female and a tape recording could provide answers. A tape recording made by a person whose voice was not recognizable as belonging to either gender would be interesting.

A study that incorporates data from a hypnosis susceptibility scale could be very helpful in determining who might benefit from the intervention. These data could identify potential responders versus nonresponders to the intervention.

No consensus was found in the literature about the number of exposures to relaxation and imagery needed for effect. Furthermore, no consistent information was found about the relationship between length of the intervention and effect or time of day the intervention is delivered. A series of longitudinal studies with multiple groups that explore the effects of different exposures, different intervention lengths, and different times of administration of the intervention would be very helpful. The difficulty with these studies, if conducted on the critically ill adult, is the effects of the variable of location; that is, these subjects are in ICU for varying and usually a few days. Large sample sizes would be needed to account for this variable statistically. A meta-analysis of several small studies might help speed this work.

A study that attempted to explore questions about intent of the nurse, exchanges of intangibles between nurse/patient during the intervention, and use of therapeutic self by patient/nurse would be very difficult to design and conduct, but
Measurement questions abound in considering such concepts. In order to resolve such questions, the debate over quantitative versus qualitative must be entered. If the “debate” was engaged as a conversation, this process would help to decrease the hierarchical and polar nature of the question.

**Scrutiny of Other Issues**

Nursing research tends to dichotomize qualitative and quantitative designs, processes, and results. Many researchers, including myself, have decided to address this polarity in their design. Designing quantitative studies is an accepted practice that includes qualitative measures; in fact, it is less common to design qualitative studies that include one or two quantitative measures. Rather than addressing duality issues in the design, perhaps it is time to resolve the dichotomy by eliminating it entirely in teaching, research, and use of information. In terms of exploring the nature of nurse/patient interactions, particularly in the use of traditional interventions, dissolving the oppositional nature of designs could be extremely helpful in discovering new knowledge.

In addition, the issue of control in field studies will need to be addressed further, particularly in intervention studies by researchers willing to grapple with this problem. Field studies tend to be messy in terms of controlling extraneous variables. Including confounding variables in the measurement process and then in the analysis of results is one way to account for their effects on the dependent variable. However, additional variables in analysis require large sample sizes for
confidence in accepting or rejecting hypotheses.

Large sample sizes bring their own problems. In field studies, recruitment and retention issues work against large sample sizes, lengthening the time it can take to complete a study. Long studies lead to concerns about (a) the effect of history on results, (b) the effect on career trajectories, and (c) the effect on researcher effectiveness and enthusiasm. These issues are compounded if the field study is longitudinal.

Another issue for experimental field studies is the difference in the relationship between nurse/client and investigator/subject. If the experiment includes an intervention that requires the therapeutic use of self, the relationship that makes use of self effective may not exist between the investigator/subject. A notable difference was found in delivery of the intervention based on the episodic and intentional nature of contact with subjects as opposed to the protracted and multilayered (mutual) relationship with patients.

One answer to the problem of “relationship and contact with patients in a nursing practice versus a nursing research context” is to study the effects of relaxation and imagery using clinical nurses to provide the intervention. Although controlling variables that other nurses as participants would become an issue, this type of study makes sense for practice utility upon completion of the research.

Another answer is to resist the tendency towards individuals working alone in nursing research. Major institutions of nursing education should expect their faculty members to function as researchers in groups. These groups would form
around common interests, uncommon abilities, and backgrounds. Studies, publications, grants, application of results to practice and theory, and recruitment should be expected to occur in work teams; for example, the lone researcher would be an anomaly at such institutions. In institutions at the baccalaureate level, nursing students should be included in the work of research teams. Theses, as opposed to projects, should be the expectation for the master’s degree in nursing; these theses should be undertaken in the context of an established research group. Dissertations could naturally spring from the efforts of such alliances. In this way, nursing could capitalize on and develop one of my strengths: the tendency of caring to inform community.

Many implications for nursing theory, practice, and research were explored in this section. For theory, the study held implications for the concepts of person, nursing, health/disease, and environment in Nightingale’s theory of nursing. For practice, the study provided information that could help nurses deliver the intervention, as well as other nursing cares, to promote sleep. For research, the study represents a beginning work that raised interesting questions amenable to further study, as well as questions about how such research might best be undertaken.

**Conclusion**

In summary, evidence was found for the reliability and validity of the RVSH2 Sleep Scale as a tool for the documentation of the perception of sleep and insomnia in the critically ill adult. Further, autogenic relaxation and guided
imagery were found to have a positive effect on the sleep of patients with pulmonary disease, on men following one exposure, and on women following two exposures. Sleep in the critically ill adult improved over time for patients in CCU and MSICU, but varied according to night in MICU. Sleep in the critically ill adult also improved following transfer out of the ICU to a general nursing unit.
APPENDIX A

SCRIPT OF AUTOGENIC RELAXATION

AND GUIDED IMAGERY
"Take a deep, deep breath from your belly, inhaling as deeply as you can. Hold it, hold it for as long as you can, and then exhale slowly. Pay special attention to how your body feels as you exhale. Take another deep, deep breath, hold it, and as you exhale slowly this time, let some of your tension float away from you on your slow breath. [Slight pause]

"Take another deep breath. As you exhale, relax your toes. Let the tension in your toes float away on your slow breath. Take your time. Take a deep, slow breath. This time, as you exhale, relax your feet. They will begin to feel warm and very relaxed. Notice how they feel. Slowly take a deep breath, and as you exhale, relax your calves. Let them relax, and the tension that was there can float away on your breath. Your calves will feel comfortably warm, a little heavy, and relaxed. They feel wonderful! With your next breath, as you exhale, relax your thighs. Let your upper legs relax, become warm, and pleasantly heavy. Take a moment to focus on how relaxed, comfortable, and warm your entire legs feel. They are a little heavy, and very relaxed. This is a wonderful feeling. Focus on how good this feels. [Pause] If you get distracted, let the distraction go, take a deep breath, and refocus on my voice. Relax.

"Take another deep breath. As you exhale, relax your hips. Let the tension in your hips float away on your slow breath. With your next breath, as you exhale, relax your belly, just let it relax completely. Enjoy that deep relaxation, and notice how content and comfortable you feel. You are relaxed, in control, and very comfortable. With your next deep breath, relax your lower back. The tension that was there can float away on your breath. Your lower back will feel comfortably warm, a little heavy, and relaxed. From your waist down, you feel wonderful, very relaxed and warm. If there is any tension left below your waist, let it float away from you as you exhale your next deep breath. Enjoy this feeling of relaxation, control, and contentment. [Pause]

"Focus on my voice. With your next breath, let your chest relax completely. As you exhale, let it relax and become comfortable and warm. Let the relaxation move slowly with each breath up into your upper back, and let the tension between your shoulder blades float away from you as you exhale. You are in control, you are enjoying how relaxed you are, and you use your breaths to relax your back. [Slight pause] Take a deep breath, very deep this time, and as you exhale, let your shoulders drop and become completely relaxed. If you need to use another breath to fully relax your shoulders, go ahead and do that, just take your time and enjoy how wonderful this deep relaxation feels. Your shoulders become loose, warm, and comfortable, and any tension in them floats away from you as you exhale. Enjoy this. [Slight pause]

"With your next breaths, let the relaxation spread slowly down your upper arms to your forearms. Your arms feel relaxed, comfortable, warm, heavy. It is a wonderful feeling. Take a deep breath, and relax your hands. Any tension that was in your hands will float away on your next breath. Your hands feel heavy, warm, and wonderful. Focus on how good this feels, how comfortable and in control you are. Enjoy this feeling. [Pause]
"With your next breath, let the relaxation move into your neck, the front of your neck and the back of your neck. Let it relax as you exhale. With each breath, let the relaxation move comfortably up into the back of your head, through your scalp, to the top of your head. Let your whole scalp relax. Enjoy how warm and comfortable your scalp feels. Let the relaxation move into your forehead, and any tension that was in your forehead floats away on a breath. Your forehead becomes smooth and comfortable and warm. [Slight pause]

"Let the relaxation move into the muscles around your eyes and into your jaws. As you exhale, let your jaws go loose. Focus on how relaxed they feel. Take a deep slow breath, and as you exhale, let your mouth, tongue, and lips go loose and become completely relaxed. [Slight pause]

"Enjoy this feeling of being completely relaxed, from toe to head. If there is any tension left in your body, notice it now, and use a deep breath to float it away from your body as you exhale. As you exhale, notice how comfortable, in control, and warm you feel, completely relaxed and comfortable. Focus on my voice.

"Take a deep breath, very deep, and as you exhale, the image of your favorite place will begin to form in your mind. With each breath, it becomes more vivid. You are very relaxed, and enjoy how the meadow becomes real to you. "

"Notice what you see. With your next breath, you can see the trees, the sunshine, and green grass very vividly. The trees are moving a little in the breeze. The flowers are yellow and purple. You see birds, bees, and wildlife. How beautiful it is, how clear, and how relaxing! Enjoy all that you see. You are relaxed and in control. [Slight pause]

"Take another breath, and notice that you can now hear in your image. You can hear birds and the wind in the leaves of the trees. It is quiet, except for these sounds of life. You are right there, relaxed and happy, hearing very clearly. Take a moment to listen and enjoy. [Slight pause]

"Take another breath, and notice that you can now smell the clean air, the plants, and the earth and flowers. The smells are wonderful and make you feel relaxed and happy. Focus on what you see, and hear, and smell—how lovely! [Slight pause]

"With your next breath, you feel the sun on your arms, the perfect temperature of the breeze. You feel your body walking along the trail as you move easily through the meadow, past the trees. You are comfortable, relaxed, and happy. Use your deep breaths to stay there and stay completely relaxed. If you become distracted, with a deep breath you will be able to experience the meadow vividly again.

"Stay there while I am quiet for a while. [Long pause]

"Focus on my voice. You will stay completely relaxed and very comfortable tonight. You will feel wonderful. You will be able to relax tonight by breathing deeply and exhaling any tension from your body, and focusing on your meadow. As I count backwards, follow my instructions. Five: Wiggle your toes. The image of the meadow fades a little. Four: Move your legs gently.
You are very relaxed, but are aware of the room you are in. Three: Wiggle your fingers. You can feel your bed and hear the sounds in your room. Two: Gently shrug your shoulders. You are relaxed, comfortable, and completely aware of where you are. One: Open your eyes, look around you, and take a deep breath. The exercise is finished. Enjoy how wonderful you feel."
APPENDIX B

THE VERRAN AND SNYDER-HALPERN
SLEEP SCALE
1. Didn't Wake ---------- Awake Off and On
2. Didn’t Move ---------- Tossed All Night
3. No Sleep ---------- Ten Hours Sleep
4. Fell Asleep Immediately ---------- Didn’t Sleep At All
5. Slept Lightly ---------- Sleep Deeply
6. Awoke Exhausted ---------- Awoke Refreshed
7. Awoke Abruptly ---------- Awoke Spontaneously
8. Bad Night ---------- Good Night

APPENDIX C

THE REVISED VERRAN AND SNYDER-HALPERN SLEEP SCALE
For each item, make a mark on the line at the place that best reflects how you feel.

<table>
<thead>
<tr>
<th>Didn’t wake</th>
<th>Many awakenings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slept through the night</td>
<td>Awake ten hours</td>
</tr>
<tr>
<td>No sleep</td>
<td>Ten hours sleep</td>
</tr>
<tr>
<td>No concern with interruptions</td>
<td>Totally dissatisfied with interruptions</td>
</tr>
<tr>
<td>Fell asleep immediately</td>
<td>Never fell asleep</td>
</tr>
<tr>
<td>No concern with time it took to fall asleep</td>
<td>Totally dissatisfied with time it took to fall asleep</td>
</tr>
</tbody>
</table>
Slept lightly  -  Slept deeply

Didn't get enough sleep  -  Got as much sleep as I needed

Awoke exhausted  -  Awoke refreshed

No naps yesterday  -  Napped 10 hours yesterday

Bad night  -  Good night
APPENDIX D

PROCESS VARIABLES
<table>
<thead>
<tr>
<th>Process variables</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Post</td>
<td></td>
</tr>
<tr>
<td>Start time</td>
<td></td>
</tr>
<tr>
<td>Stop time</td>
<td></td>
</tr>
<tr>
<td>Intervener</td>
<td></td>
</tr>
<tr>
<td>Session 1 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Core Ear Oral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td>Radial Apical Monitor Oximeter</td>
</tr>
<tr>
<td>Heart rate</td>
<td>Cuff Line R L</td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

I am completely relaxed  I am not relaxed at all

My special place seems very vivid  My special place is not vivid at all
APPENDIX E

RATING SCALE FOR DEGREE OF

PROTOCOL IMPLEMENTATION
Rate the degree to which you were able to carry out protocol established for the intervention.

1 = Unable to do intervention.

2 = Minimal elements of intervention done or for short time or had many interruptions.

3 = Some deviations from protocol or able to do intervention for about half of the time or a few interruptions.

4 = Minimal deviations from protocol or few interruptions.

5 = Complete protocol carried out.

APPENDIX F

RATING SCALE FOR ENVIRONMENT IN WHICH PROTOCOL WAS IMPLEMENTED
1 = Many additional disruptive variables (patient toileted just before beginning protocol, restrained, hyperactivity on unit) present.

2 = Some additional disruptive variables present.

3 = No identified disruptive variables present.

Code: __________
Date: __________

APPENDIX G

CONSENT FORMS
Information

**Background:** You consent to take part in this study involving research about sleep. The purpose of the study is to discover information about how people respond to an intervention for sleep in a critical care unit.

**Study procedure:** You will be a part of the study for about two nights. The researcher will ask you to mark a form about your sleep patterns on 3 mornings and will take your vital signs twice each night. The researcher also will look in your chart and talk to your nurse to obtain your age, diagnosis, length of stay, and similar information. The researcher also will spend about 30 minutes with you on two nights.

**Risks:** Possible risks to you include a loss of your time (about 90 minutes total). No drugs will be given, and nothing invasive will be done to you.

**Benefits:** Benefits to you include the possibility that you may get more sleep while in the critical care unit and that you will have contributed to the discovery of information about the sleep that people get in a critical care unit and the way people respond to an intervention for sleep in a critical care unit.

**Confidentiality:** You will be contacted by a principle investigator, who is an experienced critical care nurse finishing doctoral (PhD) studies in nursing, and by one research assistant. Confidentiality of your records is guaranteed by having the information regarding you identified by a number that cannot be linked to you by anyone but the principle investigator, and that link to you will be destroyed when the study is finished.

**Person to contact:** For questions concerning the research and rights as a subject, contact the researcher, Stephanie Richardson, at 581-8272 (office) or 363-2206 (home). If you have questions or a problem that you cannot talk to the researcher about, you can call the Institutional Review Board Office at the University of Utah at 581-3655.

**Medical treatment or compensation for injury:** In the event you sustain injury resulting from your participation in the research project, the University of Utah can provide to you, without charge, emergency and temporary medical treatment not otherwise covered by your own insurance. If you believe that you have sustained an injury as a result of your participation in this research program, please contact the Office of the Vice President for Research at 581-7236.

**Consent**

I understand that my participation is voluntary and that my refusal to participate will involve no penalty or loss of benefits to which I would otherwise be entitled and that I may discontinue participation at any time without penalty or loss of benefits to which I would otherwise be entitled.
I understand that my participation in this study may be terminated by the investigator without regard to my consent under the following condition: if my condition changes so I am ineligible for the study. I understand that if I decide to withdraw from this study, arrangements will be made for an orderly termination and I will be informed of any consequences which may occur upon my decision to withdraw. I understand that new findings which develop during the course of the research which may relate to my willingness to continue participation will be provided to me.

Records will be held in confidence by the investigator, the sponsor of the research, and the Institutional Review Board. They may be inspected by the Food and Drug Administration. Any release of information derived from these records to scientific organizations, medical journals, etc., will be done only without identification of the subjects.

I have read the foregoing and my questions have been answered. I desire to participate in this study and accept the benefits and risks. I give permission for information gathered in this study to be released to scientific organizations and medical journals. My participation in this study has been explained to me, and my questions have been answered. I understand that a copy of this consent form has been given to me.

__________________________  _______________________
Signature of Subject         Date

__________________________  _______________________
Signature of Witness         Date
The Effects of Autogenic Relaxation and Guided Imagery on Insomnia in the Critically Ill: Experimental Group

Information

**Background:** You consent to take part in this study involving research about sleep. The purpose of the study is to discover information about how people respond to an intervention for sleep in a critical care unit.

**Study procedure:** You will be a part of the study for about two nights. The researcher will ask you to mark a form about your sleep patterns on 3 mornings and will take your vital signs twice each night. The researcher also will look in your chart and talk to your nurse to obtain your age, diagnosis, length of stay, and similar information.

**Risks:** Possible risks to you include a loss of your time (about 20 minutes each morning). No drugs will be given, and nothing invasive will be done to you.

**Benefits:** Benefits to you include the possibility that you will have contributed to the discovery of information about the sleep that people get in a critical care unit and the way people respond to an intervention for sleep in a critical care unit.

**Confidentiality:** You will be contacted by a principle investigator, who is an experienced critical care nurse finishing doctoral (PhD) studies in nursing, and by one research assistant. Confidentiality of your records is guaranteed by having the information regarding you identified by a number that cannot be linked to you by anyone but the principle investigator, and that link to you will be destroyed when the study is finished.

**Person to contact:** For questions concerning the research and rights as a subject, contact the researcher, Stephanie Richardson, at 581-8272 (office) or 363-2206 (home). If you have questions or a problem that you cannot talk to the researcher about, you can call the Institutional Review Board Office at the University of Utah at 581-3655.

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I have read the foregoing and my questions have been answered. I desire to participate in this study and accept the benefits and risks. I give permission for information gathered in this study to be released to scientific organizations and medical journals. My participation in this study has been explained to me, and my questions have been answered. I understand that a copy of this consent form has been given to me.

_________________________  _______________________
Signature of Subject       Date

_________________________  _______________________
Signature of Witness       Date
REFERENCES


Wallace, C. J. (1993). Problem analysis and an integrative literature review related to sleep pattern disturbances. Master’s project, University of Utah, Salt Lake City, UT.


