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Comparison of the effects of relaxation and music on postoperative pain

Good, Marion Patricia Long, Ph.D.
Case Western Reserve University (Health Sciences), 1992

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COMPARISON OF THE EFFECTS OF
RELAXATION AND MUSIC ON POSTOPERATIVE PAIN

by

MARION PATRICIA LONG GOOD

Submitted in partial fulfillment of the requirements
for the Degree of Doctor of Philosophy

Dissertation Advisor: Beverly L. Roberts, Ph.D., R.N.C.

Frances Payne Bolton School of Nursing
CASE WESTERN RESERVE UNIVERSITY
January 1992
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GRADUATE STUDIES

We hereby approve the thesis of

Marion Good

candidate for the PhD

degree.

Signed: Beverly L. Roberts
(Chairman)

John Knauer

Kathleen Ross-Aladjemolki

Date December 4, 1991

*We also certify that written approval has been obtained for any proprietary material contained therein.*
COMPARISON OF THE EFFECTS OF
RELAXATION AND MUSIC ON POSTOPERATIVE PAIN

Abstract

by

MARION PATRICIA LONG GOOD

Postoperative pain constitutes a major problem for patients who undergo abdominal surgery: 40 to 70 percent experience severe pain that is often not controlled by medication. Pain contributes to muscle tension, inactivity, and complications. Using Orem’s model of nursing and the gate control theory of pain, the purpose of this study was to compare the effect of three self-care actions, relaxation, music, and a combination of both on sensory and affective components of postoperative pain. Also, this study extends work of Flaherty and Fitzpatrick who found that the jaw relaxation technique decreased postoperative sensation and distress of pain among adults with abdominal surgery.

Using a completely randomized experimental design, a total sample of 84 patients scheduled for abdominal surgery (M age = 46 years, 70% female) were randomly assigned to four groups: relaxation, music, a combination of both, and control. With tape recorded instructions, these treatments were taught prior to surgery. Postoperatively, according to group assignment, subjects
listened to tapes of the jaw relaxation technique, choice of sedative music or both. Pain was measured before, during, and after the first postoperative ambulation. Measures obtained were sensation and distress of pain, state anxiety and 24 hour narcotic intake.

Using age, body mass, and pretest measures of sensation, distress, anxiety, and narcotic intake as covariates, orthogonal \textit{a priori} contrasts with analysis of variance and covariance were used to compare the groups. No significant differences were found in sensation and distress of pain, and narcotic intake between the 1) relaxation and music groups 2) the relaxation and music groups together versus the combination group and 3) the relaxation, music and combination groups together versus the control group. These nonsignificant findings may be related to high and variable levels of postambulatory pain or confounding factors. Anxiety was significantly lower in the relaxation, music and combination groups considered together than in the control group which suggests future directions for research. During the next two postoperative days, 90\% of patients reported that the interventions were helpful for alleviating the sensation and distress of pain.
Acknowledgements

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Most importantly, my husband Lowell, has patiently supported me and my research through five years of commuting for doctoral education. This research might not have been done without his assistance. My children, Kathryn, William, and Amy, have encouraged me by phone. While I have been occupied with my studies, they have matured into productive, contributing adults. Thanks also to my son-in-law, Dr. Jawad Naciri, for his assistance with my computer, and to my daughter-in-law, Stephanie Dreyfuss, for her enthusiasm for my work.

I appreciate my data collectors, Dr. Diana French, Dr. Frances Wimbush, Patricia Gray, Bonnie Billnitzer and Virginia Young, who helped me greatly in obtaining a total sample of abdominal surgical patients.

Finally, I am grateful to Sigma Theta Tau International and the Frances Payne Bolton School of Nursing Alumni Association for grant support, and to my committee for teaching me grantsmanship. It has been wonderful to be a student at FPB again and to share in the scholarship and collegiality of this fine institution.
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COMPARISON OF THE EFFECTS OF
RELAXATION AND MUSIC ON POSTOPERATIVE PAIN

Chapter One

Significance and Background

Postoperative patients have pain that is not always controlled by analgesic medication. Further reduction of pain can occur with self-care techniques such as relaxation and music (Flaherty & Fitzpatrick, 1978; Locsin, 1981). Although a few investigators have shown that relaxation and music reduce postoperative pain, others have not. This discrepancy may be due to methodological inadequacies in these initial studies and suggests that more controlled investigations among postoperative patients is needed to determine the support for these interventions. In addition, the effect of a third intervention that combines relaxation and music has not been studied in relation to pain, nor compared with either relaxation or music alone.

Facilitation of patient regulation of pain in acute illness has been declared an important priority for nursing investigation (Donaldson & Crowley, 1978; Gortner, 1983). Using the self-care perspective of patient participation, the purpose of this experimental study was to compare the effects of three nursing interventions, relaxation, music, and the combination of 1
both on the sensory and affective components of pain among patients with abdominal surgery (Figure 1).

**Problem**

Pain constitutes a major problem for patients who undergo abdominal surgery. Approximately 23 million people have surgical operations in the United States each year, and many report experiencing postoperative pain (Chapman, 1985). Abdominal surgery, due to the proximity of the diaphragm, is associated with the greatest pain (Bonica, 1954; 1983; Bruegel, 1971; Keats, 1956; Sweeney, 1977). Forty to 70 percent of individuals who have surgery in this area experience steady severe pain, while 25 to 40 percent have steady moderate pain, and 85 to 100 percent have severe pain on movement (Bonica, 1983).

In the early postoperative period, the sensation of pain is primarily a result of the incision of the skin and the abdominal wall (Bonica, 1954; Johnson, Christman, & Sitt, 1985; Sweeney, 1977) and is accompanied by muscular tension and affective elements (Bonica, 1954; 1982; Flaherty & Fitzpatrick, 1978; Johnson, 1971; Sweeney, 1977). This postoperative pain is not always controlled with analgesic medication. Investigators found that many patients who have been medicated after surgery still experience moderate to severe pain (Beecher, 1959a; Cohen, 1980; Keeri-Szanto & Heaman,
Figure 1. Model
1972; Marks & Sacher, 1973; Weis, Sriwatanakul, Alloza, Weintraub & Lazagna, 1983). They may not know appropriate and effective ways to decrease their pain (Geach, 1987; Quimby, 1968).

Undermedication may occur because the physician prescribes an insufficient dosage of the drug, and the nurse may give even less. In either case, there may be inadequate assessment, insufficient knowledge of the pharmacology of the prescribed drug, unnecessary concern about respiratory depression or an unwarranted fear of addiction (Beyer, De Good, Ashley, & Russell, 1983; Cohen, 1980; NIH Consensus Development Conference, 1987; Mc Caffery & Hart, 1976). There are times when the medication is not in effect due to preparation time, delayed onset, and brief duration of action. For example, Demerol is known to be effective in some people for about one to two hours (Bonica, 1982; Donovan, 1980; Jaffe & Martin, 1985). Yet, it is often prescribed at three to four hour intervals and the patient may experience unrelieved pain during one to three hours in every four hour period (Bonica, 1982; Hester, 1988; Vaterlaus, 1979). Self-care action can be mobilized for further relief.

Postoperative pain following abdominal surgery can contribute to pulmonary, cardiovascular, gastrointestinal
and urinary tract complications, thereby, prolonging hospitalization and recovery (Quimby, 1964; Wolfer & Davis, 1970). These complications are prevented by postoperative exercises and ambulation that involve abdominal muscles and also increase pain (Elton, Stanley, Burrows, 1983) that may continue after the activity has ended (Keats, 1956; Sweeney, 1977). It is therefore essential that the patient learn strategies to decrease pain.

Nurses have important and pivotal roles in the assessment and management of pain because they are the first to encounter the pain of postoperative patients at the bedside. Nurses need to be skilled in assessment pain, in the pharmacological properties and administration of analgesic medication, as well as in non-pharmaceutical interventions (Anderson, 1982; NIH Consensus Development Group, 1987).

Investigators found, however, that nurses view medication as the only method of pain management (Gaffam, 1970; 1981), are often satisfied with inadequate pain relief (Rankin, & Snider, 1984) and do not appreciate their potential as contributors of the regulation of pain (Hunt, Stollar, Littlejohns, Twycross & Vere, 1977). These views persist even though nursing interventions for pain have been shown to be effective (Ceccio, 1984;

The experience of pain is comprised of both sensory and affective components. Investigators in other disciplines have studied pain unidimensionally either as a sensation or without differentiating the components of pain (Egbert, Battit, Welch & Bartlett, 1964; Madden, Singer, Peck & Nayman, 1978; Wilson, 1981). However, pain has both a sensory component and an affective component (Bonica, 1954; Meares, 1967; & Casey, 1968; Sweeney, 1977). Because of this perspective, nurses have studied postoperative pain as being two dimensional (Bafford, 1977; Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Horowitz, Flaherty & Fitzpatrick, 1978; Johnson, 1971; 1973; Johnson, Fuller, Endress & Rice, 1978; Johnson, Rice, Fuller, & Endress, 1978; Johnson, Christman, & Stitt, 1985; Wells, 1982; Voshall, 1980; Zeimer, 1983).

Pain was defined in this study as an unpleasant sensory and affective experience ( & Casey, 1968; & Wall, 1965) associated with actual or potential tissue
damage (Mersky, 1974). The sensory and affective components of the experience of pain are concurrent and distinguishable by the patient (Johnsr, 1971; 1973; & Casey, 1968). The sensory component of pain was defined as the unpleasant, localized physical perception of hurt associated with tissue damage following a surgical operation (adapted from Flaherty & Fitzpatrick, 1978).

The affective component of acute postoperative pain was defined as the presence of emotions (Johnson, 1971) and general bodily feelings (Flaherty and Fitzpatrick, 1978) that accompany the sensory component. The affective component is part of the pain experience and not a reaction to the sensation of pain ( & Casey, 1968). Typical affective experiences include anxiety characterized by apprehension (Chapman, 1985; Spielberger, 1966), and bodily distress, or the amount the sensations bother the person and the rest of the body (Flaherty & Fitzpatrick, 1978; Ceccio, 1984).

There is a reciprocal relationship between the sensory and affective components of pain and tension that involves numerous body systems (Flaherty, 1976; Gellhorn & Kiely, 1972; Jacobsen, 1938; Rathbone, 1943; Sternbach, 1984a; Wilmore, Long, Mason & Pruitt, 1976). Patients may be unaware of the increasing degree of tension in the
body and the effect it has on pain (Brown, 1977; Donovan 1980; Flaherty & Fitzpatrick, 1978).

**Interventions**

The self-care strategies of relaxation and music were the focus of this study. Because of the reciprocal relationship between the sensory and affective components of pain, interventions to decrease pain after surgery have been found to be more effective if they utilize both body and mind (Flaherty & Fitzpatrick, 1978; NIH Consensus Development Conference, 1987; Wall, 1984b). According to the gate control theory, this is due to interactions between physical and psychological input in the central nervous system.

Relaxation lowers muscle tension and also distracts thoughts. It has been shown to reduce pain related to muscular tension, to slow breathing, to distract attention, and to reduce anxious thoughts, thereby increasing pain tolerance (Cunningham, 1974; Flaherty & Fitzpatrick, 1978; Grzisiak, 1977; Madden, Singer, Peck & Nayman, 1978; Meares, 1967; Turner & Chapman, 1982; Vaterlaus, 1979). The jaw relaxation technique used in this study consists of letting the lower jaw drop slightly, keeping the tongue quiet and lips soft, reducing thoughts and verbalizations and breathing slowly and rhythmically.
Music also provides input into the central nervous system that closes the gate to the perception of the sensory and affective components of pain. Music acts to relax muscles and/or distract thoughts. Because of a relationship between the nature of music and the individual, it can evoke an affective experience (Meyer, 1956). Music has been studied in relation to the thalamus and limbic systems, the immune system (Henry, 1987; Lane, 1991), the release of endorphins (Goldstein, 1985; Melnechuck, cited in Harvey, 1987) and neurotransmitters (Tanioka, Takazawa, Kamata, Kudo, Matzuki & Oyama, 1985). There are reports that soothing music calms the mind and has an impact on the sensations and autonomic functions of the body (Cook, 1981; Harvey, 1987; Standley, 1986).

Investigators suggest that when single treatment modalities are insufficient, multimodal therapies can be more effective (Beck & Siegel, 1980; Edelman, 1970; Hanser, 1985; Hathaway, 1986; Johnson, 1984; McCaffery & Hart, 1976; Mulcahy & Janz, 1973; NIH Consensus Development Conference Group, 1987; Peric-Knowlton, 1984; Scott & Barber, 1977; Tan, 1982; Weisenberg, 1977).

When using a relaxation technique, music can be a stimulus for the relaxation response, an attention focusing device, and a facilitator of breathing. It can
add increased interest and a happier atmosphere to the relaxation exercise (Livingston, 1979). The combination is thought to be useful for managing postoperative pain before it becomes too severe (Vaterlaus, 1980).

Relaxation and music as self-care measures were chosen because their individual ability to regulate human functioning has been supported by research. In addition, relaxation and music activities are brief, easily learned, efficient, safe, convenient to use (Gaffam & Johnson 1987), and may enhance the effect of analgesics (, 1982). There is empirical support for the use of these interventions to reduce pain and distress while moving and ambulating after surgery (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Herth, 1978; Horowitz, Fitzpatrick & Flaherty, 1984).

Relaxation, music, and multimodal approaches are useful adjuvants to medical management, and research on nonpharmaceutical approaches to pain management have increased during the past decade (NIH Consensus Development Conference, 1987; Wall, 1984b). Self-care interventions are in the domain of the profession and discipline of nursing, involve the body and mind, counteract a person’s feelings of helplessness, and shape the somatic outcome (Chapman, 1985; Dossey, 1981; Lazarus, 1974; NIH Consensus Development Conference,
1987; Vaterlaus, 1979). Examples of other interventions are splinting the incision, asking for medication before pain peaks, using a step-wise method of getting out of bed, and diversion.

Because initial research demonstrated the effectiveness of relaxation and music in reducing surgical pain, a controlled study using a broader range of abdominal surgeries than used before is needed to provide more insight into the place of these therapies in reducing pain. The purpose of this research was to compare the effectiveness of three self-care actions, relaxation, music, and combined relaxation/music, that enable patients to regulate the sensory and affective aspects of surgical pain.

**Conceptual Framework**

The conceptual framework for this study incorporated the Self-Care Deficit Theory of Nursing (Orem, 1985), and the gate control theory (, 1982; Wall, 1978; 1979a). Nurses assist postoperative patients to use self-care actions, such as relaxation and music, that regulate human functioning and thereby reduce the sensory and affective experiences of pain (Figure 2). Self-care actions for alleviation of pain are congruent with the gate control theory that conceptualizes pain as an interactive and unified sensory-behavioral system in
Figure 2. Conceptual and Empirical Structure
which the experience of pain results in action to relieve it. Use of relaxation and music may affect the experience of pain through changes in the autonomic, somatic and central nervous system influences on the "gates" or the areas that modulate noxious impulses as they ascend through the central nervous system.

Self-Care Deficit Theory of Nursing

The nursing conceptual model that will guided this study was the Self-Care Deficit Theory of Nursing (Orem, 1985). This model proposes that nurses assist patients in using self-care action that regulates human functioning, and is based on the relationship between a patient's need for action and his ability to act. The general model is made up of three theoretical constructs: self-care, self-care deficit, and nursing systems. It is modeled after action theory (Nagel, cited in Johnston, 1983, 1989; Nursing Development Conference Group, 1979) and describes knowledge of the practice discipline of nursing at a behavioral level of self-care action as it affects physiological and emotional functioning (Johnston, 1983, 1989; Orem, 1985).

Self-care is the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health and well-being. Listening to music or relaxing to enhance comfort after surgery are
activities that may contribute to the reduction of the
sensation and distress of postoperative pain.

The use of music and relaxation to reduce the
sensory and affective components of pain in postoperative
patients is related to two universal self-care requisites
described by Orem (1975): a) the prevention of hazards to
life, functioning, and well being, and b) the promotion
of normalcy. Although postoperative pain is beneficial
to the patient as a reminder to use caution because of
the incision, it is also a hazard because it is very
uncomfortable, and the resulting inactivity can
contribute to physical and affective complications of
surgery. Further, pain interferes with the promotion of
normalcy: it is a deviation from normal experience,
affects normal functioning, and conflicts with the human
desire to be normal and pain free.

The five health deviation self-care requisites
described by Orem (1985) are general purposes for people
who are ill and under medical treatment. One of these
requisites served as a purpose for the self-care
activities of this study, and it is being aware of and
regulating the discomforting or deleterious effects of
medical care measures. Surgery is a medical
intervention, and pain is a discomforting and deleterious
effect of it. The use of music and relaxation to reduce
the sensory and affective components of postoperative pain involves patient awareness and regulative action directed toward the requisite.

**Gate Control Theory**

Two of the physiological theories of pain that have been proposed are the specificity theory (Craig, 1984; & Wall, 1965) and the pattern theory (Meinhart & Mc Caffery, 1983; & Wall, 1965; 1977; Peric-Knowlton, 1984). These theories describe sensory neural pathways but do not encompass the affective dimension of pain. Theories addressing the affective aspects of pain are the affect theory and the gate control theory. The affect theory suggests that anxiety, culture, the meaning of pain, and feelings such as depression, guilt, shame, and anger affect the amount and quality of pain (Peric-Knowlton, 1984). The gate control theory ( & Wall 1965) unites the physiological, the psychological, and behavioral mechanisms of pain into one theory and is, therefore, more congruent with this study of self-care actions for alleviation of sensory and affective components of pain than either physiological or psychological theories alone.

The gate control theory posits that pain is the result of an integrated neural system that modulates input. Originally, the "gate" was hypothesized to be
located in the substantia gelatinosa in the dorsal horns of the spinal cord (Casey & Melzak, 1967; & Wall, 1964). Recently, the concept of "gate" was broadened to refer to repeated modulation, filtering and abstraction of input in many areas of the central nervous system (, 1982; & Wall, 1965 1977; Noordenbos, 1984; Wall & Melzak, 1984). The gates are numerous and diverse. Noxious messages are modified by physical and psychological interactions in the cortex, spinal cord, and other body systems, thereby closing the gate to the transmission of noxious impulses toward sensory and affective centers in the brain.

Increasing support from biochemical research reveals that endogenous opiates in the brain, in the substancia gelatinosa, and at the nociceptive site, as well as variability in neuropeptide receptors, are operative in the experience of pain (Bullingham, 1985). Therefore, the transmission of the noxious impulse can be modified in numerous ways. Some of these modifications may be a result of self-care action and affective functions.

In addition to physiological factors, the experience of pain is affected psychologically by expectation, suggestion, emotion, anxiety, attention, past experiences, cognitive factors, and motivation to act to protect oneself (, 1982; & Chapman, 1973; & Wall, 1965). The psychological dimension of pain has been
investigated in relation to alleviation of pain (Orne & Dinges, 1984; Sternbach, 1984; Weisenberg, 1984). This dimension of the gate control theory has not been well developed and has not provided strong operational, empirical nor pragmatic adequacy for nursing practice and research (Kim, 1980), but has helped to explain the body and mind interactions that are believed to be operative in the experience of pain.

Behavioral activities to reduce pain are the third dimension of the gate control theory and are congruent with Orem’s nursing model which proposes that self-care actions regulate human functioning. Wall (1984a) has recently conceptualized pain as a unified sensory behavioral system. Wall suggests that pain is an output rather than an input: a need-state associated as much with imperative action as with the stimulus. By this he means that as a thirsty person seeks water, the person in pain will also disrupt his usual activity and substitute activity to seek relief and prevent further damage. Wall posits that although the causal linkage between the stimulus and pain is variable, pain always results in an increase in activity to stop the pain, prevent harm and to recover (Melzak, 1982; & Wall, 1965; Sternbach, 1984a; Wall, 1979a, 1979b, 1984a, 1985).
Self-care actions to relieve pain that employ
distraction and relaxation are activities undertaken to
reduce pain as described in the unified sensory
behavioral system. Self-care actions are behaviors aimed
at closing the gate, thereby diminishing the sensory and
affective elements of pain (Wall, 1965; Wall, 1984).
Because of this interactive nature, the gate control
theory has been used by researchers for studying the
effects of relaxation and music individually on
postoperative pain (Ceccio, 1984; Flaherty & Fitzpatrick,
all of the linkages are known, the gate control theory
provides a general explanation for testing these
interventions in a more controlled study that includes
combined effects.

Some of the linkages between the concepts of the
sensory and affective components of pain and mental and
muscular tension have been established. The
postoperative patient reacts to incisional pain by
reflexively splinting, guarding or tensing his muscles
(Bonica, 1982; Rathbone, 1943; Sweeney, 1977). Mental
tension, or thoughts and feelings about the pain also
result in muscular tension (Brown, 1977; Flaherty &
Fitzpatrick, 1978). Tension of the body and mind
increases sympathetic outflow (Benson et al. 1978;
Borkovec & Sides, 1979; Donovan, 1980; Edelman, 1970; Jacobson 1938) that maintains and intensifies muscular and mental tension (Brown, 1977; Snyder, 1984) and influences centers that affect the sensory and affective components of pain which in turn affect each other and amplify the total discomfort (Casey & Melzak, 1967; Melzak, 1982).

In addition to the cyclical relationship between pain and mental and muscular tension, a reciprocal relationship has been established between the sensory and affective components of pain (Chapman, 1985; Johnson, 1971). In postoperative patients, the relationships between the two dimensions of both pain and tension are affected by preoperative tension and anxiety (Flaherty & Fitzpatrick, 1978).

When patients manage their pain with relaxation or music, they reduce muscle tension and anxiety (Borkovec & Sides, 1979; Hanser, Larson & O‘Connell, 1983; Rider, 1985; Scartelli, 1982, 1984; Wolpe, 1958). Relaxation and music have been found to reduce pain (Ceccio, 1974; Cunningham, 1977; Flaherty & Fitzpatrick, 1978; Hanser, 1987; Rathbone, 1943). This raises the question of how reduced tension and anxiety affect the "gate." It is thought to take place, in part, through the decreased sympathetic and increased endogenous opiate effects on
the central nervous system response to nociception. (Brown, 1977; Gellhown & Kiely, 1972; Stoyva, 1976). Changes in sympathetic, central and somatic input into the synaptic areas for pain transmission in the brain and spinal cord decreases propagation of pain impulses (Melzak, 1982).

The behavioral aspect of the gate control theory encompasses the human ability to learn to modify pain (Wall, 1984a) and is congruent with Orem's model that states that self-care can be learned for health-related purposes. Self-care interventions for pain relief are congruent with the gate control theory because they are behavioral activities undertaken to modulate the sensory and affective components of pain.

Summary of Literature

Combinations of more than one therapy have demonstrated varying effects on pain (Clark, McCorkle, & Williams, 1981; Gaffam & Johnson, 1989; Hanser, Larson & O'Connell, 1983; Swineford, 1987; Siegel, 1983). What is unknown in a study that tests only a combination of therapies is a) whether combination is necessary for the effect, b) what each modality contributes to the relief of pain, and c) whether either of the modalities alone would provide more effective pain relief than the
combination. The current study is designed to explore this problem.

Although there are no known studies that compared the effects of the three techniques, relaxation, music, and the combination of relaxation and music on pain, results of studies of relaxation and music individually have often revealed reduced sensory and affective components of pain. The sections that follow will give an overview of studies of the effect of relaxation, music, on the sensory and affective components of pain. Methodological issues in the review will be raised along with how this study resolved them. Gaps in knowledge will be identified along with how this study filled the gaps.

**Effect of Relaxation on Pain** There is conflicting evidence as to the effect of a relaxation technique on the sensory and affective components of pain. Relaxation, using a variety of different techniques, reduced experimental self-reported sensation of pain in a few laboratory studies (Bobey & Davidson, 1970; Geden, Beck, Brouder, Glaister & Pohlman, 1985; Mulchay & Janz, 1973) and in a few clinical postoperative studies (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Madden, Singer, Peck, & Nayman, 1978). However, relaxation was not effective in other laboratory (Geden, Beck, Anderson, Kennish & Mueller-Heinze, 1986; Geden, Beck,

Conflicting reports have also been found in studies of the effect of relaxation on narcotic intake as well as the affective component of pain. Narcotic intake has been used widely as an objective measure of the sensory component of pain. Relaxation reduced narcotic intake in some studies (Egbert, Battit, Welch & Bartlett, 1964; Ceccio 1984; Flaherty & Fitzpatrick, 1978; Voshall, 1981; Wilson, 1981), while it did not in others (Horowitz et al. 1984; Wells, 1982; Zeimer, 1983). One problem with the affective component of pain is that it has been inconsistently conceptualized and has been measured with differing indices. Relaxation reduced the affective component of pain in some surgical studies (Aiken, 1972; Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Johnson, 1966; Field, 1974; Egbert et al, 1964), but had no effect in the laboratory (Geden, Beck, Brouder, Glaister & Pohlman, 1983), or in two clinical studies (Voshall, 1980; Horowitz et al., 1984).

A number of methodological problems in previous studies may have bearing on the inconsistent results. First, most investigations did not hold constant such variables as age, experience with surgery, type and
complications of surgery, emotional factors in illness, methods of medication administration, and nursing measures for pain. In the present study age, type of surgery, and methods of medication administration were held constant using methods of experimental control.

Other methodological problems with most of the surgical studies included failure to control for amount of pretest analgesic medication, body mass, preoperative anxiety, and pain and distress just prior to use of the relaxation procedure. The lack of control for these factors may have contributed to inconsistent results. In the present study, these were controlled statistically.

Finally, the problem of inconsistent conceptualization and operationalization of the affective component of pain is a problem of construct validity that may have affected the conclusions. Originally, distress of pain was not clearly conceptualized but was generally specified as being emotional in nature (Johnson, 1971; 1973). The same conceptual term and instrument have also been used to measure a somewhat different concept of bodily distress of pain (Ceccio, 1984; Flaherty & Fitzpatrick, 1978).

To clarify the affective component of pain in the present study, the affective component was measured within both bodily and emotional contexts. The Distress
of Pain Scale measured bodily distress as operationalized in two previous studies (Ceccio, 1984; Flaherty & Fitzpatrick, 1978) and the state anxiety scale measured anxiety. Anxiety has been associated with pain (Chapman & Cox, 1975b), Johnson, 1971; Kim, 1978; Martinez-Urrutia, 1975), although, none of the studies of relaxation have examined the anxiety of pain. The present study has provided this initial information about the effect of relaxation on anxiety of pain and has compared it to the other two interventions. Furthermore, no previous investigators examined the effect of relaxation on the anxiety of pain or studied more than one indicator of the affective component of pain. The present study strengthened the evaluation of the affective component of pain by measuring it with two indicators.

A major gap in knowledge is the scarcity of studies that replicate and extend research on the same relaxation technique. The jaw relaxation technique reduced reports of the sensation of pain, bodily distress of pain, and narcotic intake among patients with cholecystectomy and herniorrhaphy (Flaherty & Fitzpatrick, 1978), and hip surgery (Ceccio, 1984), but not with cardiac surgery (Horowitz, Flaherty & Fitzpatrick, 1984). The results of these replications indicated that the technique should be
tested again, broadening the generalization, but increasing methodological control. The increased control was necessary because of the conflicting results found in studies of the jaw relaxation technique as well as other studies of relaxation. Therefore, the present study was a controlled test of the jaw relaxation technique among patients undergoing a variety of abdominal surgeries.

Effect of Music on Pain In an experimental study of postoperative patients, Locsin (1981) used preferred music as compared to non-preferred music and found that preferred music decreased overt muscular and verbal reactions to pain during the first 24 hours after surgery but had no effect on narcotic intake. He measured pain using a newly developed behavioral instrument, which did not include any self-report measures. Self-report is considered the most valid indicator of pain, and use of only behavioral measures leads to a problem of the validity of the construct, because other patient states may have resulted in the same behaviors. The present study, however, investigated two components of pain using three self-report instruments and one behavioral indicant. Other methodological problems with the Locsin (1981) study were absence of random selection and random assignment to groups, inadequate sample size, and lack of controls. These problems may have contributed to the
lack of effect on narcotic intake. These concerns were resolved in the current study.

In regard to the affective component of pain, Updyke (1990) found that music diminished the emotional as well as physical experience of pain among a small group of critical care patients. No studies have been found which measured the effect of music on bodily distress or anxiety associated with pain. Anxiety, however, has been empirically related to postoperative pain (Chapman & Cox, 1975; Johnson, 1971; Kim, 1978; Martinez-Urrutia, 1975), and music has reduced general anxiety in undergraduates (Davis & Thaut 1989; Stoudemire 1975), and in some patient populations (Chetta, 1981; Jellison, 1975; Hanser, Martin & Bradstreet 1982; Levine-Gross & Swartz 1982; O’Connell 1984; Liebman & MacLaren, 1991). However, in other studies, music had no effect on anxiety among student (Rhoner & Miller 1980) and patient populations (Zimmerman, Pierson & Marker 1988). Because there is moderate support that music reduced anxiety and because anxiety has been empirically related to pain, it is logical that music may result in less anxiety of pain. Whether music decreases the anxiety related to pain is a gap in knowledge that was addressed in this study.

Music has been combined with a number of other techniques for alleviation of pain, and often tested as
one intervention. Music has been added to the traditional use of relaxation, distraction and breathing exercises prenatally, and in labor and delivery, resulting in reduced prenatal anxiety or pain during childbirth (Clark, McCorkle & Williams, 1981; Hanser, Larson & O’Connell, 1983; Liebman & MacLaren, 1991). Music and relaxation combined with imagery reduced postoperative pain on some measures of pain (Gaffan & Johnson, 1989; Swineford, 1987; Siegel, 1983). It is not possible to determine which technique was effective or whether the combination of techniques was required to decrease pain. This would require studies in which relaxation and music were compared separately and in combination, but no such studies were found. Thus, the current study compared music and relaxation individually and also in combination.
Assumptions
2. Nurses teach people ways to care for themselves.
3. The underlying mechanism of the response to music and relaxation is holistic.
4. Pain medication is necessary, but not sufficient to reduce pain in most patients after major surgery.

Research Questions
1. Is there a difference in sensation of pain and bodily distress during and after initial postoperative ambulation, between postoperative patients who use relaxation and those who use music?
2. Is there a difference in anxiety of pain after initial postoperative ambulation, and narcotic intake during the first 24 hours after ambulation between postoperative patients who use relaxation and those who use music?
3. Is there a difference in sensation of pain and bodily distress during and after initial postoperative ambulation, between postoperative patients who use the combination of relaxation and music, and those who use either relaxation or music?
4. Is there a difference in anxiety of pain after initial postoperative ambulation, and narcotic intake during the first 24 hours after ambulation, between
postoperative patients who use the combination of relaxation and music, and those who use either relaxation or music?

5. Is there a difference in sensation of pain and bodily distress during and after initial postoperative ambulation, between those who use either relaxation, music or a combination of relaxation and music and those who use none of these techniques?

6. Is there a difference in anxiety of pain after initial postoperative ambulation, and narcotic intake during the first 24 hours after ambulation between those who use either relaxation, music or a combination of relaxation and music and those who use none of these techniques?

7. While controlling for preoperative anxiety, and Quetelet Index of body mass, time since last medication and preambulatory pain and bodily distress, is there a difference in the sensation of pain, bodily distress, anxiety of pain and 24 hour narcotic intake between those who use relaxation and those who use music?

8. While controlling for preoperative anxiety, Quetelet Index of body mass, time since last medication, and preambulatory pain and bodily distress, is there a difference in the sensation of pain, bodily distress, anxiety of pain and 24 hour narcotic intake between those
who use a combination of relaxation and music and those who use either relaxation or music?

9. While controlling for preoperative anxiety, Quetelet Index of body mass, time since last medication and preambulatory pain and bodily distress, is there a difference in sensation of pain and bodily distress during and after initial postoperative ambulation, anxiety of pain after initial postoperative ambulation and 24 hour narcotic intake between those who use either relaxation, music or a combination of relaxation and music and those who use none of these techniques?

Hypotheses

**Hypothesis #1** There will be no difference in sensation of pain and bodily distress during and after initial postoperative ambulation, anxiety of pain after initial postoperative ambulation, and narcotic intake during the first 24 hours after ambulation between postoperative patients who use relaxation and those who use music.

**Hypothesis #2** There will be no difference in sensation of pain and bodily distress during and after initial postoperative ambulation, anxiety of pain after initial postoperative ambulation, and narcotic intake during the first 24 hours after ambulation between postoperative patients who use the combination of
relaxation and music, and those who use either relaxation or music.

**Hypothesis #3** There will be no difference in sensation of pain and bodily distress during and after initial postoperative ambulation, anxiety of pain after initial postoperative ambulation and narcotic intake during the first 24 hours after ambulation between those who use either relaxation, music or a combination of relaxation and music versus those who use none of these techniques.

**Hypothesis #4** While controlling for preoperative anxiety, Quetelet Index of body mass, time since last medication and preambulatory pain and bodily distress, there is no difference in sensation of pain, bodily distress, anxiety of pain and 24 hour narcotic intake between those who use relaxation and those who use music.

**Hypothesis #5** While controlling for preoperative anxiety, Quetelet Index of body mass, time since last medication, and preambulatory pain and bodily distress, there will be no difference in sensation of pain, bodily distress, anxiety of pain and 24 hour narcotic intake between those who use the combination of relaxation and music and those who use either relaxation or music.

**Hypothesis #6** While controlling for preoperative anxiety, Quetelet Index of body mass, time since last
medication and preambulatory pain and bodily distress, there will be no difference in sensation of pain and bodily distress during and after initial postoperative ambulation, anxiety of pain after initial postoperative ambulation and 24 hour narcotic intake between those who use either relaxation, music or a combination of relaxation and music and those who use none of these techniques.
Chapter Two

Review of Literature

The literature review begins with a discussion of the manifestations of pain. In this section, two dependent variables, the sensory component of pain and the affective component of pain, are conceptually clarified. Second, the literature is reviewed in relation to the effects of the three interventions, relaxation, music, and a combination of relaxation and music in the relief of surgical pain. Theoretical and methodological issues are addressed.

Manifestations of Pain

The Sensory Component of Pain The sensation of pain has been discussed variously in the literature. Acute superficial pain has been described as pain associated with the incision of the skin that has a bright, burning, prickling quality, and deep somatic pain associated with muscles, tendons and arteries is described as diffuse, dull, aching, and poorly localized (Bonica, 1954).

However, postoperative patients have described their incisional pain differently in nursing studies. They describe it as tenderness, sensitivity, pressure, pulling, smarting and burning that hurts the most on the first day, and becomes less sensitive each day. When the patient moves, a sharp sensation seems to travel along

Unrelieved sensations of pain were found to increase the affective discomfort of pain: patients who experienced the sensation of pain for longer time periods reported more symptoms of affective distress (Johnson, 1971). Conversely, the greater the distress, the more the sensation increases (Chapman, 1985). This reciprocal and escalating relationship between the two components of pain may produce perceptions of unbearable and uncontrollable pain and feelings of helplessness, anxiety, and anger (Bonica, 1982). These responses may contribute to sleep disturbances, decreased natural defenses and reduced motivation to engage in postoperative exercises that prevent complications (Meinhart & McCaffery, 1983; Quimby, 1964). Interventions, such as alpha feedback, hypnotic suggestion, and relaxation, which produce interactive effects, help to decrease both the sensory and affective components of pain and may thereby reduce the interplay
between them (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Melzak & Perry, 1975).

Although various qualitative descriptions of pain are important when preparing a patient for surgery, the primary concern of the postoperative patient is in diminishing the magnitude of pain. Therefore, relief of its sensory and affective components are best measured by self-report on a scale of intensity rather than on a measure of the quality of pain. Furthermore, behavioral and physiological measures of pain are not always reliable in the postoperative patient because of individual ways of expressing pain and the effects of the surgery and medications on these measures (Sweeney, 1977).

Theories of the mechanism of pain describe how it occurs, but theories of the alleviation of pain are prescriptive of how it may be relieved. From the discipline of psychology, theories of the alleviation of pain include behavioral learning theory (Fardyce, 1976; Sternbach, 1984b), cognitive theory (Weisenberg, 1984), theories of hypnosis (Chaves & Barber, 1976; Hilgard & Hilgard, 1975; Orne & Dinges, 1984; Turner & Chapman, 1982; Yapka, 1984), cognitive-behavioral theory (Goldfried, 1977; Turk & Meichenbaum, 1984; Turner & Chapman, 1982), systematic desensitization (Wolpe, 1958),
acupuncture (Melzak, 1984), and stress innoculation (Meichenbaum & Turk, 1976). The gate control theory encompasses how pain occurs, the interactive nature of the experience of pain, and human actions to control it.

Although nurses have used theories from other disciplines as a basis for pain relief, a theory of the alleviation of pain that reflects the nursing perspective does not exist. Based on Johnson's use of sensory information to decrease the distress of postoperative pain, Kim (1978) developed and tested a contingency model of pain care, positing that the effect of sensory information on measures of postoperative pain was contingent on preoperative anxiety. She suggested that nursing theory of pain delineate the types of personality, pain, and situation in which nursing interventions are effective (Kim, 1980).

Kim's model does not differentiate the affective component of pain from the sensory component and does not consider that state anxiety may be associated with pain. In addition, the patient was not taught to help himself and, therefore, a valuable resource in the relief of pain may have been excluded. Taylor (1988) states that patient participation that is directed toward goals is important to therapeutic success. The present study reflects the self-care perspective of patient
participation, differentiates the affective and sensory components of pain, and measures state anxiety as a variable of the affective component.

Jacox (1974), suggested a theory of the alleviation of pain that would prescribe when a supportive approach or when an explanation to the patient of the cause of the pain would be most effective with or without medication. Researchers have found that nursing activities that aid in the relief of the sensation of pain include spending time with the patient, communicating, assessing the meaning of pain, giving information on pain management, and developing a trusting caring relationship aid in relief of sensory pain (Diers, et al., 1972; McBride, 1964; McCaffery, 1979; Moss & Meyers, 1966; Peric-Knowlton, 1984).

Reviews of the effects of age on pain indicate that there is great disagreement in regard to how age is related to the threshold and tolerance of pain (Ghose, 1987; Jacox, 1977), but there is agreement that older patients have an increased analgesic response to narcotic medications (American Pain Society, 1987; Ghose, 1987; Kaiko, Wallenstein, Rogers, Grabinski, & Houde, 1982). The effects of older age on pain were controlled in this study by including only patients from ages 21 to 65.
In reviews of literature, others also show that it is difficult to draw definite conclusions about the effect of gender on pain (Jacox, 1977; Weisenberg, 1977) because of the differences between the studies. Differences in painful stimuli, conditions of testing, and differences in dependent measures need to be taken into consideration (Weisenberg, 1977), as well as the medical diagnosis (Jacox & Stewart, 1973 cited in Kim, 1980). Thus, gender was not controlled in the current study.

A patient's request for pain medication indicates the presence of pain. Investigators have found that patient's report of incisional pain was positively and significantly related to narcotic intake (Flaherty & Fitzpatrick, 1978; Kim, 1978). Narcotic analgesics are routinely ordered and administered for postoperative pain. Thus, narcotic use was measured in this study by recording from the patient record the milligrams of narcotic used in the 24 hours following ambulation and converting them to milligrams of morphine equivalent.

**The Affective Component of Pain** The affective component of pain is theoretically defined as 1) the emotions (Johnson, 1971) and 2) the general bodily feelings (Flaherty and Fitzpatrick, 1978) associated with the sensation of pain. The general feeling of bodily distress is conceptualized in this study somewhat
differently than from the original definition of the distress of pain as it was developed by Johnson (1971; 1973). At that time, the distress of pain was defined as emotional and was operationalized by asking how much the sensation of pain bothered the patient (Johnson, 1971 1973; Johnson, Christman & Sitt, 1985; Johnson, Fuller et al., 1978; Johnson & Rice, 1974; Johnson, Rice, et al., 1978). The two concepts, bodily distress and emotional distress, have been measured on similar scales. The present study used the Flaherty and Fitzpatrick, (1978) conceptualization of bodily distress and asked subjects "how much the sensations bother you and the rest of your body".

**Bodily Distress.** The idea that distress of pain may be experienced throughout the body was developed by Flaherty and Fitzpatrick (1978) and was based on the reports of patients and on findings indicating that not all patients express pain emotionally (Zbrowski, 1969). Flaherty used the relaxation technique in her practice with lower middle-class caucasian patients who were not normally inclined to express psychological emotions. When asked about the distress that they experienced, they described it as a bodily sensation of just not feeling good all over; that they could not relieve the pain in the incision, but with the jaw relaxation technique they

In their instructions to subjects, Flaherty and Fitzpatrick asked subjects how much the pain bothered them and the rest of their body. To help patients to make a distinction between the two components of pain they suggested that subjects think of surgical pain as they would a light. They could explain how bright a light is separately from how much it bothers them, just as they could describe the intensity of sensation separately from how much it bothers them.

Bodily distress was also used in instructions to subjects in the Ceccio (1984) study, but without the analogy to the light bulb, which may have affected responses because clear communication to this age group was also important. Horowitz et al. (1984) conceptualized distress as an emotion, anxiety, and the instructions to patients neither referred to the body, nor to the analogy of the light bulb. Although all three studies used the same distress scale, differences in instructions to patients constituted a measurement artifact that is a threat to the validity of substantive comparisons with other studies (Blalock, 1982). The two studies in which the jaw relaxation technique was successful in decreasing sensation of pain, bodily
distress, and narcotic use elicited patient reports of bodily distress by asking how much the pain bothered them and the rest of their body (Ceccio, 1984; Flaherty & Fitzpatrick, 1978). Only one of these added the analogy to the light bulb (Flaherty & Fitzpatrick, 1978).

Emotional distress as conceptualized by Johnson, (1971, 1983) was not the focus of this study, but needs to be conceptually differentiated from the study variables, bodily distress and anxiety. When developing the concept of distress, Johnson conceptualized it to be the emotional component of the sensation of pain and related to the meaning the sensation had for the patient. Johnson found that patients varied in the magnitude of reported distress independently of the intensity of the sensation.

Johnson studied distress of experimental and surgical pain with mixed results on self-report measures (Johnson, 1971, 1973; Johnson & Christman, 1985; Johnson, Fuller et al., 1978; Johnson & Rice, 1974; Johnson, Rice et al., 1978). She also measured the distress of nonpainful threatening events by observing patient behavior (Fuller, Endress, & Johnson, 1978; Johnson, Kirchoff, & Endress, 1975; Johnson & Leventhal, 1974). Distress has not been defined and operationalized consistently in Johnson’s studies because it has been related to emotions
associated with pain as well as behaviors associated with threatening medical procedures. Studies of relaxation have varied in their conceptualization of the distress of pain but have used similar scales to measure it (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Horowitz et al, 1984; Voshall, 1980; Wilson, 1981; Ziemer, 1983). This study provided some consistency by conceptualizing and operationalizing distress similar to that of Flaherty and Fitzpatrick (1978).

The emotions associated with the distress of pain have varied and need to be clarified (Taylor, 1988). Johnson studied distress of pain as well as postoperative moods such as fear, anxiety, helplessness, anger and depression but did not relate these moods to the sensation or distress of pain (Johnson, 1971, 1973; Johnson, Leventhal & Dabbs, 1971). Other investigators measured the affective component of pain with indicators of fear, irrational fear, anxiety, defensiveness, irritability, anger, aggression, guilt, resentfulness, and subservience (Craig, 1984).

Because of the lack of clarity in the meaning of emotional distress, the emotional component of pain, and the relationship of postoperative emotion to pain, a specific emotion, anxiety, was chosen for the study because it is commonly associated with pain (Chapman,
1967; Craig, 1984; Kim, 1978; Mears, 1967; Meinhart & McCaffery, 1973; Melzak & Chapman, 1973; Wall, 1979a, 1979b). Anxiety was studied along with bodily distress to identify and differentiate indicators of the affective component of pain.

Anxiety. Anxiety is an emotion that is commonly associated with surgical pain (Bonica, 1982; Kim, 1978). It is an unpleasant emotional response that is characterized by feelings of apprehension and tension and is accompanied by increased sympathetic physiological arousal such as increases in blood pressure, and pulse rate (Chapman, 1985; Spielberger, 1966).

Anxiety is considered to be of two types, trait and state. Trait anxiety is a personal disposition that remains relatively stable over time and is usually related to feelings of personal adequacy (Martinez-Urrutia, 1975). State anxiety is a transitional emotional state that varies in intensity and fluctuates over time. It is induced by physical danger and by physical and psychological stress (Martinez-Urrutia, 1975; Paul, 1969).

Some investigators describe emotions as separate phenomena from the pain experience: as either concurrent, antecedent or consequential to pain (Craig, 1984; Kim, 1978; Meinhart & McCaffery, 1973). Others describe
anxiety and sensation of pain as two concomitant aspects of the same phenomenon; that the emotional component neither precedes nor follows the sensory component but that they are present together (Meares, 1967; Wall 1979a, 1979b). Chapman and Cox (1979b) supported concomitant components of the phenomenon of pain with their finding that although preoperative state anxiety was lower in kidney donors than recipients, it became much higher on the first postoperative day, when anxiety concomitant with surgical pain could be expected. Frequently associated with acute pain, state anxiety has been positively related to the severity of the sensation (Chapman & Cox, 1977a; Kim, 1978; Meinhart & McCaffery, 1983; Scott, Clum & Peoples, 1983). In this study, state anxiety was measured because of its association with the concomitant sensory and affective aspects of postoperative pain.

The anxiety associated with postoperative pain occurs in a context of preoperative and postoperative state anxiety related to the illness and the surgical situation. State anxiety has been found to be higher preoperatively than postoperatively (Auerbach, 1971; Dabbs & Leventhal, 1970; De Long, 1970; Haselhorst, 1970; Martinez-Urrutia, 1975; Spielberger, Aurbach, Wadsworth, Dunn, & Taulbee, 1973; Wolfer & Davis, 1970). Those who
had high preoperative fear and anxiety also reported
greater pain and more postoperative emotionality
(Johnson, Leventhal, & Dabbs, 1971), fear and
helplessness on the Mood Adjective Check List (Johnson,
Rice et al., 1978). Anxiety of pain will be measured in
this study, and preoperative anxiety that may affect the
sensory and affective components of pain and escalate the
patient's discomfort will be controlled statistically.

Most studies of interventions to reduce postoperative
affective reactions to surgery did not measure anxiety in
relation to the sensation of pain (Carnevelli, 1966;
Felson, Huss, Payne & Srsic, 1976; Hathaway, 1986;
Horowitz et al, 1984; Johnson, Rice et al. 1978; Pickett
& Clum, 1982; Sime, 1966). Furthermore, current methods
for assessing anxiety are not sufficiently developed to
distinguish between the anxiety component of pain and
anxiety in relation to the surgical situation (Chapman,
1985). In the present study, there was statistical
control for the effect of preoperative anxiety on the
postoperative anxiety of pain.

Summary of the Manifestations of Pain

Nurses have used theories from other disciplines and
do not have any established nursing theories of the
alleviation of pain. However, investigators frequently
conceptualized pain as having both a sensory and an
affective component. Findings in laboratory settings suggest self-report of emotional distress varies in magnitude independently of the intensity of sensation, and also hypnosis, alpha feedback and relaxation decreased both the sensory and affective experience of pain. An escalating interactive relationship between the two components of pain, sensory and affective, affects other human functions.

The affective component of pain has not been consistently conceptualized, and instructions to patients prior to administering the Distress of Pain Scale have varied. Distress of pain has been described as emotional in nature (Johnson, 1971, 1973), but the same instrument was also used to measure the somewhat different concept of bodily distress of pain (Ceccio, 1984; Flaherty & Fitzpatrick, 1978). This problem of construct validity may have affected conclusions. In the present study, conceptualizations of bodily distress and instructions consistent with established studies of jaw relaxation were used. To clarify the affective component of pain further, it was also measured with an emotional indicator, anxiety. Only one of the investigators of relaxation's effect on pain examined the anxiety of pain, and none used more than one indicator of its affective component.
Anxiety in the clinical area also occurs preoperatively and is higher than after surgery. Preoperative anxiety has been positively related to the postoperative sensation of pain and emotional state. Therefore, preoperative state anxiety was controlled statistically in this study.

Relaxation

Relaxation is the first intervention that was tested in this study. The review of the literature on relaxation will begin by identifying techniques and the underlying physiological mechanisms. Next, the range of health problems in which nurses and others have found relaxation helpful will be described, followed by the methodological issues. The effect of relaxation on the affective and sensory components of pain will be reviewed.

Techniques  Jacobson (1938) found that progressive relaxation, a lengthy method of contracting and relaxing individual muscle groups, quieted the muscular system and thereby calmed the nervous system including the mind. Other researchers have developed shorter relaxation techniques such as systematic desensitization (Wolpe, 1958), a shorter program of progressive relaxation (Bernstein & Borkovec, 1973), autogenic training (Luthe,
1953, Schultz & Luthe, 1969), and progressive muscular relaxation (Benson, 1975).

Modifications have been made for use with surgical patients to conserve time and energy and to maximize clinical effectiveness. Voshall (1980) and Ziemer (1983) tested very brief techniques combined with other preoperative instructions. Wells (1982) combined three relaxation techniques into one intervention. Flaherty and Fitzpatrick (1978) developed and tested a single, brief adaptation of the Jacobsen technique known as the jaw relaxation technique. This technique has been effective in reducing sensation of pain and bodily distress in persons with surgery of the abdomen (Flaherty & Fitzpatrick 1978) and hip (Ceccio, 1984).

**Physiological Mechanisms** The jaw relaxation technique reduced pain and distress in postoperative patients who have undergone surgery of the upper and lower abdomen (Flaherty & Fitzpatrick, 1978) and of the hip (Ceccio, 1984). It has only been effective in reducing the distress of pain in those who have undergone rectal surgery for hemorrhoids (Flaherty & Fitzpatrick, 1978) and has not reduced either component of pain in persons undergoing open heart surgery (Horowitz et al., 1984).

How does relaxation of the jaw affect incisional pain in another part of the body? Relaxation techniques,
in general, result in an integrated physiological response and an altered state of consciousness known as the relaxation response. The physiological changes are consistent with a wakeful hypometabolism or trophotropic state (Stoyva 1976) that is characterized by a decrease in sympathetic nervous system activity (Benson 1975; Benson, Beary & Carol 1974; Budzynski & Stoyva 1972; Gellhorn 1958; Gellhorn & Kiely 1972; Matthews & Gelder, 1969; Stoyva, 1976).

A similar mechanism for the jaw relaxation technique may be via reduction of anxiety and its effect on sensation. Some psychologists view the role of relaxation as one that produces a response inhibitory to anxiety in the presence of an anxiety-producing stimulus (Wolpe, 1958; Wolpe & Lazarus, 1966). Relaxation is most likely to produce decreased sympathetic activity in subjects who have high anxiety and physiological arousal (Borkovec & Sides, 1979; Kim, 1978; Zahourek, 1982).

In addition to sympathetic and psychological effects, decreased muscular tonus may spread by extension to other parts of the body. The jaw relaxation technique is thought to reduce tension in the organs of speech and spread to muscles of the neck, throat and the upper part of the abdominal wall (Flaherty, 1976; Flaherty & Fitzpatrick, 1978). This is supported by Henry, who
proposed in a personal communication to J. Johnson (April 26, 1978), that the relaxed state of the jaw and respiratory muscles may extend via muscle attachments to adjacent muscles closer to the abdominal wound. However, empirical studies of generalization of relaxation from the frontalis muscle to either the muscles of the upper body or to the autonomic nervous system have produced contradictory results (Budzynski & Stoyva, 1969; Jones & Evans, 1981; Madden, Singer, Peck & Nayman, 1978; Stoyva & Budzynski, 1974).

Little consensus exists about how the jaw relaxation technique reduces pain. It may be that more than one of these effects, accompanied by distraction, expectancy, suggestion, reduction of thoughts and verbalization, improved blood flow and respiratory gas exchange, or a sense of control closes the gates to pain (Flaherty & Fitzpatrick, 1978; Horowitz et al., 1984; Snyder, 1985).

That relaxation has multiple effects is demonstrated by its use with a broad range of health problems known to have both physical and affective causes. Jacobson (1938) found progressive relaxation to be helpful in reducing the effects of many illnesses such as peptic ulcer and hypertension. Others have found relaxation helpful in reduction of anxiety (Goldberg, 1982; Hillenberg & Collins, 1982), fear (Glaister, 1982), pain (Lawlis,
Selby, Hinnant & McCoy, 1985; Turner & Chapman, 1982; Wilson, 1981), in self-regulation of problems related to physiologic overactivation, in tension headaches (Steger & Harper, 1980), childhood asthma, hypertension, tension headache, phobias, sleep disturbances, drinking behavior, hyperactivity and control of anger (Hillenberg & Collins, 1982), in decreased substance abuse (Kljajner, Hartman & Sobell, 1984) and in diabetics there have been mixed effects on the regulation of blood sugar (Bailey, Good & McGrady, 1990; Bailey, McGrady & Good, 1990; Feinglos, Hastedt, & Surwit, 1987; Fowler, Budzynski, & Vandenberg, 1976; McGrady, Bailey, & Good, 1991; Surwit & Fierglos, 1983).

Relaxation has been taught by nurses to patients with diabetes (Bailey, Good et al., 1990; Bailey, McGrady et al., 1990; McGrady et al., 1991) cancer (Moore & Altmain, 1981), with nausea and vomiting after chemotherapy (Baker, 1984; Cotanch, 1983) psychiatric problems Sheer, 1980; Tamez, Moore & Brown, 1978), epilepsy (Snyder, 1983), chronic obstructive pulmonary disease (Broussard, 1979; Sitzman, Kamiya & Johnson, 1983), anxiety, (Pender, 1985), emotional reactions after open heart surgery (Aiken, 1972; Aiken & Henrichs, 1971; Bafford, 1977) hypertension, (McGrady, Utz, Woerner, Bernal & Higgins, 1986), Pender, (1984, 1985), cardiac
problems (Bohachick, 1984), postoperative pain (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Horwitz et al. 1984; Johnson et al., 1978a; Voshall, 1980; Wells, 1982; Ziemer, 1983), spinal cord injured patients (Grzeiak, 1977), myocardial infarction (Morris, 1979), and patients undergoing threatening diagnostic procedures (Rice, Caldwell, Butler, & Robinson 1986). Although there were differences in the technique and variation in sample size, all of the above studies, except four (Baker, 1984; Rice et al. 1986; Tamez et al. 1978; Ziemer, 1983), had positive results. Thus, the present study used a tape of the brief jaw relaxation technique.

**Methodological Issues** Variations in the types of relaxation procedures confound empirical outcomes. In a review article of research on relaxation, Hillenberg and Collins (1982) found twenty-six techniques and ten undescribed procedures used in eighty studies of relaxation. Procedural variability is evident in such factors as the length of the teaching session and number of sessions, the use of practice sessions, the use of live or taped instruction as well as types of illness problems and health settings. Studies have shown that taped instructions are not as effective as live instructions (Paul & Trimble, 1970; Snyder, 1985), but procedural variability between studies may have affected
the results (Snyder, 1988). There is also a lack of
description of the techniques and how they were modified
(Hillenberg & Collins, 1982) and lack of evidence of
mastery as determined by EMG, respirations, posture, and
self-report. To reduce the problem of procedural
variability between studies, the present investigation
replicated the use of the jaw relaxation technique used
in three other studies, along with similar length and
amount of teaching and practice. The instructions to
patients were taped to improve the reliability of
treatment implementation. The investigator coached the
patient until mastery was achieved. Evidence of use of
the technique was assessed using five criteria: face
relaxed, no frown or grimace, lips apart, slow breathing,
and not talking.

Most studies of patient relaxation have had positive
outcomes, but changes from pre to posttreatment were not
significant on all measures (Snyder, 1985; Taylor, 1987;
1988). This may have been because the illness or its
treatment may have confounded results or it may have been
that the intervention affects people differently, and
predictors of success need to be determined (Kim, 1978;
McGrady et al, 1986; Orem, personal communication,
October, 1988), or it may be that their efficacy depends
more on the particular nurse-patient interaction than on
the intervention (Taylor, 1988). In the present study, confounding due to this interaction was controlled by using a tape recorded intervention.

**Effect of Relaxation on Affective Component of Pain**

The review of the effect of relaxation on the affective component of postoperative pain will begin with studies of bodily distress, followed by those of emotional distress, and then studies of a variety of other measures of distress.

The bodily distress associated with surgical pain was reduced by the jaw relaxation technique in elderly persons following hip surgery (Ceccio, 1984) and in patients after cholecystectomy and herniorrhaphy but not following hemorrhoidectomy (Flaherty & Fitzpatrick, 1978). It was in the latter study that the Distress of Pain scale was first used to measure bodily distress because patients did not seem to understand what emotional distress meant (Personal communication, G.G. Flaherty, October 27, 1989).

Others conceptualized distress as emotional, but the operationalization varied. Using Johnson’s scales, Benson’s relaxation response decreased emotional distress in patients with open heart surgery while the jaw relaxation technique had no effect (Horowitz et al., 1984). In another study that used Johnson’s scale, a
combination relaxation technique was effective in reducing the psychological distress of pain of patients with abdominal surgery (Wells, 1982). On the other hand, a 27 minute taped systematic muscle relaxation technique reduced distress of pain, but the conceptualization and operationalization of distress were not reported (Wilson 1981). Relaxation was not effective in reducing the distress of pain in a study by Voshall (1980) in which Johnson's scales were used. Again, the conceptualization of whether distress was emotional or bodily distress was not stated. Nonsignificant results were also found by Ziemer (1983) using a four point distress scale, a variation of Johnson's eleven point measure, in which distress was conceptualized as a reaction to surgery rather than as a component of pain. Instructions to patients were not reported. In these studies, the conceptualization and operationalization of distress has varied or has not been described. However, the jaw relaxation technique was effective in studies in which the conceptualization of bodily distress developed by Flaherty and Fitzpatrick (1978) was used. Using other measures of distress in other health problems, relaxation was related to absence of nervousness in orthopedic surgical patients (Field, 1974); reduced the emotional distress of pain using a ten centimeter visual analogue
scale in oncology patients (Gaffam & Johnson 1987); and reduced psychological distress measured by the SCIR-90 Symptom Checklist in patients with tension headache (Steger & Harper 1980); and resulted in fewer postoperative psychological reactions measured by the presence of mental status disturbances in patients after open heart surgery (Aiken, 1972; Aiken & Hendricks 1971; Bafford, 1977). The affective component of pain in these studies was not consistently defined and operationalized.

Anxiety was empirically related to surgical pain (Chapman & Cox, 1975; Johnson, 1971; Kim, 1978; Martinez-Urrutia, 1975), but the use of relaxation to relieve it was only effective for state anxiety in the laboratory (Johnson & Spielberger, 1965). Although anxiety is a component of acute pain, investigators have focused on distress of pain, but have not defined it well. They did not differentiate it from anxiety, anger, irritability, resentfulness, guilt, fear or defensiveness. The present study used the bodily conceptualization of the distress of pain in consideration of those people who do not tend to express emotion easily, and in addition, measured one emotion that was empirically associated with pain, anxiety.

**Effect of Relaxation on the Sensory Component of Pain** In the laboratory, Bobey & Davidson (1970) found
that a taped relaxation technique was the most effective of four treatments to reduce induced sensation of pain. Others investigated the effects of LaMaze and cognitive-behavioral pain management strategies on a laboratory analogue of labor pain (Geden, Beck, Anderson, Kennish, & Mueller-Hleinze, 1986; Geden, Beck, Brouder, Glaister, & Pohlman, 1985; Geden, Beck, Hague, & Pohlman 1984; Geden, Lower et al., 1989). Only Geden et al. (1985) found that relaxation reduced the sensation of pain. Stevens (1977) found that combined treatments of relaxation, focusing, and biofeedback reduced experimental pain. In a randomized study, Mulcahy and Janz (1973) studied a combination of distraction techniques and found a pre to posttest increase in pain threshold in the experimental group and a difference between the experimental and control groups on the posttest. The results of these techniques tested in the laboratory setting have limited generalizability to the clinical area where it is impossible to measure pain threshold and where the distress of illness accompanies the pain (Beecher, 1959b).

In the clinical area, Johnson (1966) visited postoperative patients who reported increased comfort when instructed to take a deep breath and slowly let it out while concentrating on relaxing the abdominal
muscles. Studies of a variety of relaxation interventions on patients with spinal cord injuries, discolysis, phantom limb pain, tension headaches and cancer have had small samples (n = 3 to 20), but positive results. Indicants of improvement were less pain, muscle tension, and pain medication as well as improved mood, increased activity, and sustained pain relief (Cunningham, 1974; Gaffam & Johnson, 1987; Grzesiak, 1977; Sherman et al., 1979; Steger & Harper, 1980).

A frequently cited study of Egbert, Battit, Welch & Bartlett (1964) used preoperative abdominal surgical patients who were informed and reassured one or two times about the pain expected and were taught to use abdominal relaxation in addition to other self-help activities for pain relief. Patients in the study group requested less medication and appeared more comfortable to a blind observer. In this study, there may have been extraneous effects on the dependent variables. The active placebo technique of delivering instructions with enthusiasm and confidence was a confounding threat to external validity. Also, because the control group was not visited after surgery, attention to the study group may have confounded the effects of the intervention. In the present study placebo effects were controlled by taped interventions and instructions to data collectors were to follow the
written protocol when human interaction takes place. All three groups received similar amounts of attention in this study.

Zeimer (1983) studied the effects of three taped interventions on coping behavior, and pain. One hundred eleven preoperative patients undergoing gynecological and gastrointestinal surgery were randomly assigned to three groups: procedure, sensation, and coping information (including progressive muscle relaxation). Results showed that giving information did not affect reported frequency of coping behavior, but coping was related to reduced sensation of pain. It was difficult to determine the effectiveness of the relaxation technique because information to patients about the technique was given along with other instructions. The taped messages may not have aroused the attention of anxious preoperative patients with the result that inadequate learning occurred. In the present study, the patient practiced the technique with feedback from the investigator until mastery was achieved.

Miller and Perry (1990) using a sample of 29 cardiac surgery patients found that a slow, deep-breathing relaxation technique produced a significant group by time interaction for scores on a visual descriptor scale of pain, but no significant change in pre to post scores in
the experimental group and no significant difference on a visual analogue scale.

Other investigators who taught relaxation to abdominal surgical patients and measured muscle tension by electromyogram, found conflicting results. Biofeedback, along with simple instructions to relax abdominal muscles, lowered contralateral abdominal or frontalis muscle tension, reduced reports of pain, and decreased narcotic use (Madden et al, 1978). However, others found that a combination of three relaxation techniques did not alter rectus abdominis tension, sensation of pain, or analgesic use, but did reduce reports of distress (Wells, 1982). The effect of relaxation on abdominal muscle tension and pain in surgical patients is not clear.

Three investigators used the jaw relaxation technique in postoperative patients to increase comfort operationalized as decreased pain and distress as measured by Johnson’s dual scales. Flaherty and Fitzpatrick (1978) and Ceccio (1984) reported a significant reduction in pain, bodily distress, and narcotic use as a result of patients using the jaw relaxation method. Horowitz et. al. (1984), however, found no difference in sensation and narcotic use between three groups: a group taught the jaw relaxation
technique, a group taught Benson's relaxation response, and a control group. Only the group using Benson's method reported less emotional distress. These findings may have been because of increased use of medication. A fourth group of investigators found that a tape of Benson's Relaxation Technique reduced a combination of sensation and distress in comparison to an attention-distraction group but not compared to the standard control group (Levin, Malloy, & Hyman, 1987).

Flaherty and Fitzpatrick used the gate control theory for their conceptual basis. To avoid diffuson of treatments, the control group was completed first. The experimental group was taught the relaxation technique the night before surgery and was asked to use it while ambulating and while moving in bed. The control group was not taught the technique. Six to eight hours after surgery, patients were ambulated the length of the room and back to bed. Comfort, operationalized as vital signs, sensation of pain, and bodily distress, was measured. The results were a significant reduction in pain, bodily distress, and narcotic among patients using the jaw relaxation method.

However, Flaherty and Fitzpatrick (1978) did not use random sampling and did not control for pretest measures. The two groups were matched in age, sex, and type of
surgery rather than randomly assigned. There may have been selection, maturation or selection-maturation bias in the groups. Outcome measures of pain may have been confounded by pre-existing pain. Random assignment was done in the present study to insure that the four groups were probabilistically equivalent, and there was statistical control for pain existing prior to treatment.

Ceccio (1984) conceptualized her study in Orem's Self-Care Deficit Theory of Nursing as well as the gate control theory. Randomly assigned to two groups, only the experimental group was taught the jaw relaxation technique. Sensation of pain and bodily distress were measured within the first 24 hours after surgery when the patient was turned at least two hours after receiving an analgesic. Findings from this study included significant differences in sensation of pain, bodily distress and use of narcotic analgesics between the two groups.

Instructional methods to enhance older persons' self-care agency may have contributed to the findings of decreased sensation and bodily distress in Ceccio's study. These instructions included teaching done in a slow, low pitched voice, use of large print and orange paper for the scales, practice sessions, coaching during relaxation, and review before turning. The present study did not include older aged persons, but voice and
coaching were appropriate for adults and large print on orange paper was used to improve visibility of the scales for medicated patients.

Ceccio (1984) did not control for pretest measures of sensation and distress, preoperative anxiety or diffusion of treatments. Lack of random sampling as well as failure to use power analysis to determine sample size were other methodological problems. Horowitz et al. (1984) assigned patients scheduled for open heart surgery to a control group and two different relaxation treatment groups of 15 subjects each. All subjects were visited the evening before surgery and the relaxation groups were taught one of the techniques, the jaw relaxation method or Benson's relaxation response. On the evening they arrived in the intensive care step-down unit, they were ambulated. The jaw relaxation technique had no effect on pain or distress, but Benson's technique reduced distress of pain. The investigators thought the scores may have been equalized by the nurses' encouragement of pain medication every four to six hours rather than on a prernata (PRN) basis. Random sampling was not carried out, preexisting pain was not controlled, and there was no method of control for diffusion of treatments.

The retrospective measures of pain during ambulation in patients using the jaw relaxation technique were
significantly higher than the post ambulatory measures taken on return to bed, but there was no difference in the distress scores. The retrospective scores were not compared with those of the control group. Therefore, the effectiveness of the jaw relaxation treatment on the increased pain during ambulation is not known. The present study compared three techniques in their effect on the self-reported retrospective measures of pain and bodily distress during ambulation.

To summarize methodological problems in the three studies, power analysis was not done to compute sample size, and there was no reliability of the implementation of treatments. The effects of preambulatory pain and distress as well as body mass were not controlled. In two of the three studies that used the jaw relaxation technique, the amount of analgesic medication at the time of ambulation was not controlled (Flaherty & Fitzpatrick, 1978; Horowitz et. al., 1984). The present study did control for these variables.

Considering all of the surgical studies, a frequent indicator of the sensory component of pain was narcotic intake. Reduced narcotic use has been a somewhat more consistently positive indicator of the effect of relaxation on postoperative pain than have reports of sensation or distress. Relaxation reduced narcotic use
in some other surgical studies (Ceccio, 1984; Egbert et al., 1964; Flaherty & Fitzpatrick, 1978; Madden et al., 1978; Voshall, 1981; Wilson, 1981), but not others (Horowitz et al., 1984; Wells, 1982; Zeimer, 1983). Reasons given by the authors for lack of results were small sample size (Wells, 1982), inadequate learning of tape-recorded instructions (Ziener, 1983), and scheduled rather than pro re nata medication (Horowitz et al., 1984). These problems were corrected in the design of the current study.

**Summary of Relaxation Literature** Relaxation has been effective in a wide variety of health problems with some positive outcomes. Empirical support for the mechanism of the jaw relaxation technique is inconclusive, but it is probably interactive in its affect on human functioning. Investigators examining the effects of relaxation on sensory and affective pain used the gate control theory (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Horowitz et al., 1984; Levin, 1988, Wells, 1982). Because of the empirical support found, they can be considered the beginning of theoretical continuity in research on pain in the discipline of nursing (Fawcett, 1978). The present study added the self-care nursing model to the conceptualization. This
model is congruent with the gate control theory but adds the nursing perspective of patient participation.

Relaxation has reduced acute pain in about half of the laboratory and surgical studies, and not on all outcome measures (Snyder, 1985; Taylor, 1987, 1988). These inconsistencies may have been due to methodological problems which were corrected in the current study to improve the validity of the conclusions. To prevent the problem of inadequate sample size affecting statistical conclusion validity found in many studies, a power analysis was used for the decision to include 21 subjects in each of the four groups.

Music

The section on the effect of music on pain will begin with an overview of the clinical uses of music. Then the physiological effects of music will be discussed followed by psychological effects, and finally, the effect of music on pain.

During the past 50 years, music has been used to reduce pain and anxiety and to potentiate medications in patients during surgery, labor and delivery, after surgery and those with pain associated with cancer, chronic and spinal problems (Bailey, 1983; Beck, 1988; Cook, 1982; Herth, 1978; McClelland, 1979; Livingston, 1979; Rider, 1985; Wolfe 1978). Music therapists have
studied music as an intervention with persons having
spinal pain (Rider, 1985) and chronic pain (Wolfe, 1978).

**Physiological Effects of Music.** Although there is a
popular belief that music has the power to excite or calm
many physiological processes, support for the
physiological effects of music is inconclusive. The most
commonly studied effect of music has been on heart rate,
but the effect is meagerly supported. The effect on
respiratory rate and amplitude has been studied with
inconsistent results (Dainow, 1977; Hanser, 1985).

Music has been found to lower adrenocorticotrophic
hormone and raise the levels of endogenous opiod beta-
endorphins (Melnechuk, cited in Harvey, 1987). Scartelli
(1982, 1984) and Scartelli & Borling (1986) found that
music reduced muscle tension. These findings suggest
that music may reduce the perception of pain.

**Psychological effects of music.** Music has generally
been found to reduce anxiety, but treatments, subjects,
and measures of anxiety have varied from study to study.
Music reduced state but not trait anxiety among
undergraduate females, (n = 108) (Stoudenmire, 1975),
behavioral indications of anxiety in children prior to
surgery (n = 19) (Chetta, 1981), and state and trait
anxiety in chronically ill patients (n = 19) (Levine-
Gross & Swartz, 1982). Hanser (1985) cited three studies
in which physiological variables did not respond to music, but state anxiety was reduced. Among 321 students with high anxiety levels, ten minutes of music did not reduce anxiety (Rhoner & Miller, 1980). Lower anxiety and noradrenalin levels were found when music was used during surgery under epidural anesthesia (Tanioka et al., 1988). In a critical care unit, patients with suspected myocardial infarction had reduced state anxiety, blood pressure, heart rate and digital temperature with music, but these were also reduced with white noise and in the control group (Zimmerman, Pierson & Marker, 1988). Thirty minutes of listening to music resulted in a more calm and relaxed state in ten preoperative patients awaiting plastic surgery (Updyke, 1987).

Effects of Music on Pain In 1921, Gatewood theorized that two separate sensory stimuli such as pain and music tend to neutralize each other with only the stronger one entering the nervous system. Based on this theory, dentists have studied audioanalgesia, a combination of music and white noise, for the pain of dental procedures, and found that patients who had previously required an anesthetic needed none (Gardiner & Licklider 1959; Gardner, Licklider & Weiss, 1960). Audioanalgesia was also used for the pain of labor,
resulting in a decreased use of meperidine (Burt & Korn, 1964).

Standley (1986), in a meta-analysis, discussed probable analgesic mechanisms in the dental studies: 1) auditory suppression of pain, 2) masking the sound of the dental drill, 3) relaxing the patient, 4) distraction, 5) increased control, and 6) prior suggestion. All of these mechanisms, except masking sound, would be candidates for the mechanism of how music may have an analgesic effect in surgical patients.

Two laboratory studies of analouged labor pain used four kinds of music to test its effects: easy listening, rock music, self selected music, and classical music as well as combinations of music and imagery. Music had no effect on reported sensation of pain but did lower heart rate and blood pressure among healthy individuals between the pretest and posttest (Geden, Lower, Beattie, & Beck, 1989). Updyke (1990) found that 30 minutes of taped music diminished the report of physical and/or emotional experience of pain in fourteen patients in the cardiac and surgical intensive care unit.

In a study of the effect of music in relation on discomfort of injections and the distress of undergoing surgery (Kopp, 1988), patients were offered their choice of selections from a variety of types of music.
(classical, country-western, and popular). The music had a tempo of 60 to 70 beats per minute and was without lyrics as a means to minimize emotional responses. Music had a calming effect with a significant preoperative to postoperative differences where facial expression was more relaxed, blood pressure was lower and body movement was less.

Using the gate control theory, Locsin (1981) theorized that music acted as a distraction that broke the cycle of anxiety, fear, and pain. He examined the effect of preferred or not preferred music on the pain of twenty-four postoperative gynecological and obstetric patients, paired by age, type of surgery, education, and previous operative experience. Milder overt musculo-skeletal and verbal reactions to pain were found in the preferred music group during the first 24 hours. There was no difference in the use of analgesics. All experimental subjects recommended music for patients during the first two days after their operation.

Locsin's study had weaknesses that threaten the validity of this widely cited research. He included neither a no-music control group nor described psychometric properties of the Overt Pain Reaction Scale. Length of time that music was played and that subjects were observed were not specified. Preexisting pain was
not controlled. The study does appear to support using patients’ musical preferences to reduce musculoskeletal and verbal responses to pain.

Also using the gate control theory, Mullooly, Levin and Feldman (1988) found that ten minutes of easy listening music reduced anxiety on the first and second postoperative evenings and reduced pain on the second evening. Although this study controlled for pretreatment pain, the length of the music treatment was very short.

**Combined Relaxation and Music**

Music has been combined with a number of other self-care actions for alleviation of pain, and thus, is difficult to determine which technique was effective. Sedei-Godley (1987) described the use of music combined with a relaxation technique and ocean sounds, and volume modulation in a taped intervention with patients in a chronic pain clinic. Seventy-five percent of the patients decreased their use of pain medication, and 75 percent reported a decrease in sensation of pain or discomfort that was associated with a decrease in electromyogram levels.

Liebman and MacLaren (1990) studied the effects of progressive muscle relaxation and music composed by Steven Halpern on anxiety during the third trimester among thirty-nine pregnant adolescent girls and found a
significant main effect on state anxiety after ten weeks of treatment.

Music has been added to the traditional use of relaxation, distraction, and breathing exercises during prenatal classes, labor and delivery. Clark, McCorkle and Williams (1981) found that calming music, autogenic training, progressive relaxation and guided imagery, followed by home practice, lowered pain and discomfort during labor and delivery. Others used a within-subjects design and found that the pain of labor was reduced after music was added to relaxation and breathing techniques (Hanser, Larson & O'Connell, 1983).

Swineford (1987) combined relaxation and positive imagery on a tape with background music and nature sounds and found that it reduced the pain of postoperative abdominal surgical patients as measured by an intensity of pain scale but not the ranking and the number of words used to describe pain. Because 18 t-tests were used, the possibility of finding a positive result by chance was high.

Gaffam and Johnson (1989) also used music as a background for two taped interventions, relaxation and guided imagery, comparing their effect on pain of cancer and distress. Both interventions resulted in significant decreases in pain and distress, and there was no
difference between the amount of relief of pain or
distress between the two interventions, guided imagery
and relaxation. The background music, however, was a
part of both interventions, and not compared as a single
therapeutic factor as in the present study.

Postoperative pediatric patients undergoing spinal
fusion were given a taped treatment of music, relaxation,
and guided imagery made fewer requests for analgesics
than the control group, but there were no effects on
self-reported pain or nurses' observations of pain or
distress (Siegel, 1983). Again, multiple t-tests were
used, which increased the experimental alpha.

Most investigators used more than two intervention
modalities, and none compared the combination of
relaxation and music with either modality alone. Even
with interventions consisting of several modalities
thought to affect the relaxation response, only one
(Graffam & Johnson 1987) had significant results on all
measures. The present study compared individual
treatment components with each other and with the
combination of the two.
Summary of Studies Using Music

Investigations of its clinical uses of music in the discipline of nursing are recent, and the discipline of music therapy is young. No studies were found assessing the effect of music on the distress or anxiety of pain. There are many preliminary studies with small sample sizes, multimodal therapies, descriptive statistics, incomplete reports, and lack of theoretical explanation. However, results indicate that music reduced postoperative pain in some studies. To obtain more consistent and conclusive results in the present study, a number of methodologic improvements were made to control confounding variables and increase generalizability.

Comparison of Music and Relaxation

Music and biofeedback-assisted relaxation have been compared in their effectiveness on muscle tension and anxiety, but no studies have been found that compared the effects of music and relaxation on pain. In the first of a series of studies of muscle tension, Scartelli (1982) compared the effect of biofeedback-assisted relaxation training both alone and combined with a sedative instrumental music background on electromyographic measurement of muscle tension of the arm. After a five week period, those with the combination condition had a 65 percent decrease in muscle tension, compared to the
biofeedback condition, which had a 32 percent decrease. These results were similar to a second study where the biofeedback and music group and the music only group experienced significant decreases in electromyographic levels while the biofeedback only group merely approached significance (Scartelli, 1984).

A third study compared simultaneous versus sequential treatment components of relaxation and music. The sequential use of music followed by relaxation instructions was found to be a more effective technique in reducing frontalis muscle tension than either simultaneous music and relaxation instructions or sequential relaxation followed by music. In the simultaneous treatment group, subjects reported confusion in deciding to attend primarily to the music or the sound of the feedback click that indicated degree of frontalis relaxation (Scartelli, 1986).

Stoudenmire (1975) compared a relaxation technique with soft relaxing music and found that both interventions significantly decreased state anxiety in undergraduate females, but there were no significant differences between the two treatment groups.

Although none of these investigators compared treatments in regard to their effect on pain, the combination of music and relaxation was superior to
relaxation in reducing muscle tension, and a sequential combination of music followed by relaxation was most effective. The present study, however, used a simultaneous combination to insure that during brief ambulation, both modalities were heard.

Confounding Variables

People may have different amounts of pain in relation to age, experience with surgical pain, surgical procedure, location of incision, emotional meaning of their disease or surgery, and surgical complications. In this study, age, abdominal surgery and complications were controlled by inclusion and exclusion criteria for selection of subjects. Experience with surgical pain, location of incision (upper or lower abdominal or both), and the finding of cancer were noted. Reliability of treatment implementation was controlled by use of tape-recorded treatments. The effects of placebo and communication factors were minimized by using tape recorded interventions and by instructions to data collectors about these threats.

Medication administration practices were controlled by excluding subjects receiving medications other than on a pro re nata basis. Random assignment of subjects to treatment groups insured comparability of groups within known limits of sampling error and controlled for
history, maturation, testing, statistical regression, selection, selection-maturation, and mortality (Cook & Campbell, 1979).

Diffusion of treatments was controlled by instructions to patients, hospital nurses, physicians, and office nurses. Unit nurses were not told about the relaxation and music interventions, nor about the measurement of narcotic intake. The effect of diffusion of treatments was explained and they were asked not to discuss the interventions with patients or other nurses so that an honest opinion could be obtained. Subjects were also assigned to different rooms through requests to admitting departments in the hospitals.

Compensatory equalization of treatments or compensatory rivalry could occur if patients communicated with each other. Resentful demoralization was possible with a control group, but diminished because all subjects were told that they would receive a slight addition to usual care and were not told what intervention the other groups were receiving.

The quality of music in this study was controlled by using only sedative music at about 60 to 80 beats per minute. Stimulative music "enhances bodily action, stimulates the striped muscles, the emotions and subcortical reactions of man", while sedative music
"results in physical sedation and responses of an intellectual and contemplative nature" rather than physical (Gaston, cited in Taylor 1973). Precategorization by the researcher, however, may nevertheless result in different responses (Hanser, 1985). This was controlled by asking the subject to choose music that was either relaxing or distracting from the selections offered.

As appropriate to the treatment, brief interview data was collected postoperatively on the following variables which have been found to influence responses interventions: prior experience with relaxation, prior experience with music (Rhoner & Miller, 1980); and amount of liking for the music used (Barger, 1979; Miller & Bornstein, 1977; Stratton & Zelanowski, 1984; Vincent & Thompson, 1929). Data on location of incision was obtained from the medical records, as this has been shown to have differing effects on postoperative pain (Johnson & Johnson, 1970; Lindeman, 1972). In addition, subjects were asked in the postoperative interview about the amount they used the technique, their perception of its helpfulness, and other ways they coped with pain after surgery. Preoperative anxiety, narcotic intake during the two an one half hours prior to ambulation,
preambulatory sensation of pain and bodily distress were
controlled statistically.

Body mass was considered for control because
overweight patients may have more strain on their sutures
and more difficulty moving, therefore they may have more
pain than patients of normal body mass. Narcotic intake
within two and one half hours prior to surgery also
important because it may affect pain. In addition,
preambulatory pain and distress were used as covariates.

There are many confounding variables in a clinical
experimental intervention study. The purpose of these
controls was to decrease the variance in measures of pain
that was due to confounding variables and to increase
confidence in the results of this study of the comparison
of the effects of relaxation and music on postoperative
pain.
Chapter Three

Methods

An experimental, completely randomized design was used with four levels of self-care actions: relaxation, music, a combination of relaxation and music, and an attention/control group. Comparisons in the effects of the three interventions on postoperative pain were made. Using a total sample, every patient scheduled for surgery who had physician approval and who met the eligibility criteria for the study was selected. Those who consented to participate were randomly assigned to one of four treatment groups: relaxation, music, combination, or control.

Sample

The total sample consisted of 25 men and 59 women aged 23 to 64 who underwent major abdominal surgery performed by 28 surgeons at 4 hospitals in northwest Ohio. They were chosen from surgery and precertification lists provided by the hospitals. Three hospitals provided access to the surgery list and the fourth recommended the precertification list. The lists were reviewed daily, and all persons who met the study criteria were asked to participate, except one whom the data collector forgot to ask.
Three of the hospitals were located in a city with a population of 322,943, and one was in a smaller city of 35,703 located in a rural area. In the larger city, data were collected in two tertiary care medical centers with seven and nine surgeons and 630 and 319 beds respectively, and in one osteopathic hospital with only five surgeons and 130 beds, which had the largest number of subjects. Only one eligible subject was found in the hospital in the smaller city because the patient-controlled analgesia (PCA) pump was used.

The sampling frame consisted of all eligible subjects at each hospital. Originally every second eligible patient was to be selected and asked to participate, but because the numbers of eligible subjects was low, a total sample was chosen. Data collection began in one hospital, but because available subjects was low, sampling was initiated at three other hospitals.

The subjects underwent a wide variety of abdominal surgeries (Appendix A). Discussions with surgeons and nurses prior to collecting data, revealed that the number of available patients would be low because of the increasing prevalence of laparoscopic cholecystectomies, and patient-controlled analgesia, factors which had been excluded from the study.
Originally, to control for method of delivery of analgesic medication, only patients expected to receive intramuscular (IM) pro re nata (PRN) medication were to be asked to participate. Because of the numbers of surgeons who preferred intravenous (IV) PRN medication, the problem of analgesic equivalence was discussed with Russell Portnoy MD, a neurologist and director of pain research at the Sloan Kettering Institute in New York City (Personal communication, December 1990). He said that in his research, because there are no studies to the contrary, intravenous and intramuscular analgesics expressed in milligrams of morphine equivalent were considered equal over the duration of effect. Based on this, it was decided that in controlling for method of medication administration, patients receiving both IM and IV pro re nata (PRN) analgesics given by the nurse would be included and equated for the 24 hour narcotic measure.

It was originally planned to use minutes since last medication to control statistically for analgesic intake within 2.5 hours prior to ambulation. However, since linear time does not reflect if, and how much, the subject was medicated at the time of ambulation, the amount of analgesic intake within 2.5 hours prior to ambulation was used because the greatest effect of both IM and IV narcotic analgesics takes place within this
time frame (Personal communication C. Miaskowski, Ph.D., R.N., Robert Wood-Johnson Post-Doctoral Fellow, University of California, San Francisco, School of Nursing, December, 1990).

Analgesics administered by methods other than intermittent IM or IV injections differ in regard to the timing, control of administration, and maintenance of blood levels. Continuous intravenous drip, patient-controlled intravenous analgesia, or regularly scheduled intramuscular injections would have been likely to obscure differences between the treatment groups (Horowitz et al, 1984). If subjects were found to be receiving analgesic medication other than IM or IV pro re nata, their data was excluded from the analysis.

Inclusion criteria were persons: (a) aged 21 to 65, which controlled for age differences in response to analgesia (American Pain Society, 1987; Ghose, 1987; Kaiko et al., 1982); b) scheduled for major abdominal surgery, which controlled for the surgical and anesthetic effects on pain; (c) were expected to receive IM PRN or IV PRN medication; (d) were expected to be hospitalized two or more days postoperatively; (e) were able to ambulate after surgery; (f) spoke English; (g) agreed to be telephoned; and (h) had their physician's permission.
Originally, only patients receiving general anesthesia would be included. However, the fourth hospital to be included in the study was osteopathic, where anesthesiologists routinely used general anesthesia simultaneously with a subarachnoid block or spinal anesthesia. The anesthesiologists stated that they are particularly skilled in knowledge of the spine, and can, therefore, expose the patient to less general anesthesia when a subarachnoid block is also used. Thus including subjects with this type of anesthesia would not be confound measures of pain because normal sensation returns in four to six hours (Personal communication, Anesthesiology Department, Parkview Hospital, October 22, 1991), and patients were ambulated at least 8 to 9 hours after surgery in this hospital. Therefore, the inclusion criteria regarding general anesthesia was changed to include also the combination of general and subarachnoid block.

Exclusion criteria were: (a) patients undergoing new reduced-pain surgical techniques such as laparoscopic surgeries, and (b) patients with a diagnosis of psychosis, or c) who were mentally retarded. Because of the low number of available subjects, the sample included patients with conditions that were threatening to life, quality of life and body image, such as surgery for
cancer, patients having Cesarean sections, patients going to intensive care after surgery, and those whose ambulation was delayed. Data was kept on the frequency of these conditions in the sample.

To achieve a power of .80 at alpha .05, using a t-test, the size of each of the four groups was computed to be 21 (Cohen, 1988, p. 53, Formula 2.4.1). The effect size (.80) was calculated on the basis of means of the differences between scores on the Sensation of Pain scale in the Flaherty and Fitzpatrick (1978) study (clinically significant at 1.90 on a 0 to 10 scale) and the standard deviation from the present sample (2.4). The number of subjects in each group was 21 and the total sample numbered 84 subjects.

Experimental Interventions

The three experimental interventions were relaxation, music, and a combination of relaxation and music. To prevent extraneous variation in the three interventions, a similar amount of time was allotted for instruction, validation of effectiveness and experimenter contact. Taped instruction varied from 5 minutes in the relaxation group to 7 minutes in the music group to 9 minutes in the control group. The 2 minute differences were due to differences in the nature of the intervention, i.e. the relaxation group had only the relaxation technique to
learn; the music group had to choose from five 30 second excerpts of different types of music, and the combination group had to learn the relaxation technique as well as choose music.

**Relaxation**  Relaxation is the deliberate self-care use of a technique designed to reduce muscle and mental tension utilizing the following procedure: (a) let the lower jaw drop slightly as though starting a small yawn; (b) keep the tongue quiet and resting in the bottom of the mouth; (c) let the lips get soft; (d) breathe slowly and rhythmically with a three-rhythm pattern of inhale, exhale, and rest; (e) stop forming words; do not even think words (Flaherty and Fitzpatrick, 1978; Rathburn, 1943).

A tape was used preoperatively to explain the purpose and general physiological effects of relaxation. It then described the procedure for the jaw relaxation technique and repeated it slowly, so that practice and coaching on the steps of the procedure could take place until the performance was correct. Coaching by the data collector consisted of giving verbal feedback and positive reinforcement. To verify the effectiveness of the subject's use of relaxation, the following observations were made during preoperative practice and postoperative ambulation: face relaxed, no grimace or
frown, lips apart, not talking, and slow breathing. The degree of relaxation achieved was rated and recorded on a scale of 0 to 5 by the data collector. If the subject was unable to achieve relaxation preoperatively, as evidenced by a score of less than 4 on a 5 point scale, he was coached and observed again during the first postoperative ambulation. If the subject was not able to relax effectively at that time, scores were recorded as data.

**Music**  Music was the second experimental intervention and was defined as a deliberate self-care technique used to reduce pain through distraction and/or relaxation. Subjects chose one of five music types of taped music: piano, harp, synthesizer, orchestral and slow jazz music (Appendix G). The music was tape-recorded on 60 minute tapes according to type, and the patient listened to it using earphones. The selection of music on the five tapes was made by the investigator in consultation with Deforia Lane, PhD, Music Therapist.

The music was without lyrics, and generally sedative in nature. This was indicated by a sustained melodic quality, a rate of 60 to 80 beats per minute, and a general absence of strong rhythms or percussion (Gaston, 1951). The investigator rated selections on these criteria that were validated by Dr. Lane. Variations in
volume and pitch were controlled at the time of taping so that the tape could be heard comfortably. Subjects were instructed to adjust the volume to a soft, yet easily heard level.

Because the literature supports the effectiveness of music the patient prefers (Barger, 1979; Locsin, 1981; Miller & Bornstein, 1977; Stratton & Zalanowski, 1984; Vincent & Thompson, 1929), the music was pretested with 26 persons to understand more about its effect on different people. The purpose of the first pilot, using excerpts of the music with 20 people of different ages and cultural backgrounds, was to determine if the music was calming and liked by different people. It was discovered that young people, African-Americans and persons who grew up in foreign countries found the music less calming and likable than did the group as a whole. Thus, a fifth tape of slow modern jazz was developed to appeal to a wider group of people, and in addition, music was added to the other tapes so that they were more culturally sensitive.

The second pilot with three surgical patients demonstrated that the music type that they chose was helpful postoperatively. In the third pilot, three people listened to all of the tapes in their entirety and found them calming and likeable. In all three pilots,
people had no difficulty choosing one of the types of music. As a result of comments, compact discs were used as original sources for most of the music to insure quality of sound.

During the study, a tape was used at the first meeting with the subject to explain the purpose and general distracting and relaxing effects that music has in relation to pain. Five 30 second samples of music were presented and the subject choose one that was either relaxing or distracting.

The subject listened to one minute of the chosen music while the investigator coached him on letting the music distract or relax him and gave positive reinforcement. To verify the effectiveness of subjects' use of the music, the following observations were at the first visit and in the hospital during the first ambulation after surgery: face relaxed, no tension around the mouth, no grimace or frown; not talking, and slow respirations. The degree of relaxation achieved was rated and recorded on a scale of 0 to 5 by the data collector. If subjects were unable preoperatively to use this technique effectively, as evidenced by a score of less than 4 on a 5 point scale, they were observed again during the first postoperative ambulation. If they were
not able to use it effectively at that time, this was recorded.

Combination of Relaxation and Music  The third intervention was a combination of relaxation and music that was the simultaneous taped presentation of the jaw relaxation technique repeated throughout the tape with the chosen sedative music played in the background. At the first visit with subjects, those in the combination group followed the procedures of both the music and relaxation groups. Listening to an introductory tape, they choose music, learned the jaw relaxation technique, practiced, and received coaching on steps of the relaxation technique and on letting the music distract and relax them. To determine the effectiveness of subjects' use of the combination technique, observations similar to those used for each of the single techniques were made during practice and ambulation: face relaxed, no grimace or frown; lips apart, not talking, slow respirations. If subjects were unable to achieve relaxation preoperatively, as evidenced by a score of less than 4 on a 5 point scale, they were observed again during the first postoperative ambulation. If they did not achieve relaxation at that time, this was recorded.
Tape Recorder  The small tape recorder had a strap so that it could be hung from an IV pole during ambulation. It could also be held by the data collector or put it in her pocket so that the wires did not get tangled with the patient's IV lines and catheters. The tape recorder was designed with a clip attached to the strap so that it could be clipped to the sheet, for easy access of the control buttons by the patient while in bed. Patients also used it on their overbed table.

The tapes were 60 minutes in length with 30 minutes on each side. The jaw relaxation technique was repeated throughout the entire tape on both the relaxation tape and the combination tape. On the relaxation tape, it was repeated at one minute intervals, to remind, yet not irritate. On the combination tape, the relaxation technique was repeated ten times so that a reminder was given, but the music could also be listened to without constant interruption. Three repetitions of the relaxation technique were given within the first ten minutes of the tape so that reminders would be present during ambulation.

Instruments

Pain was measured in five ways. The sensory component was operationalized by: (a) the Sensation of Pain scale that measures the physical intensity of the
pain at the incision (Johnson, 1973), and (b) use of narcotics during the 24 hours after the first ambulation. The affective component of pain was operationalized by measures of (a) bodily distress measured by the Distress scale (Johnson, 1973), and (b) anxiety using the State Anxiety Inventory (STAI Form Y-1; Spielberger, 1983). The McGill Pain Questionnaire (MPQ; Melzak, 1983) was used after the subject returned to bed and was related to the other measures of pain to validate them.

Sensation and Distress of Pain The Sensation of Pain and Distress Scales were developed by Johnson (1971, 1973) in a study of reactions to painful events. They consist of a set of two 11-point scales that measure two components of pain: the intensity of the sensation at the incision and the overall distress associated with it. The scales each consist of a horizontal line that is intercepted at equidistant intervals numbered from 0 to 10. There are three verbal anchors written below the line, one at the beginning, middle and end. On the sensation scale, the verbal anchors are (a) no sensation, (b) medium sensation and (c) most sensation. On the distress scale, they are (a) no distress, (b) moderately distressing and (c) extremely distressing. The scales were printed on light orange paper with large dark
printing to be easily read by postoperative patients. Readability of colors was established by Ceccio (1984).

These patient-report scales separately assessed the sensory component and the affective component of pain. The subject was asked to indicate the physical feel of the pain at the area of the operation on the sensation scale and to indicate how much those sensations bothered him and the rest of his body on the distress scale.

The subject indicated the intensity of sensation and the amount of distress associated with the sensation by making a mark on the horizontal line of each respective scale. The number indicated on the scale was used as the score. If the patient made a mark in the interval between numbers, a decimal indicating the nearest 10% of that interval was added. The scales yield interval data that is useful in statistical analysis, yet provide the subject with three verbal anchor points to guide responses.

Validity of the scales was determined by Johnson (1971, 1973) who demonstrated that subjects could differentiate between localized pain and emotional distress during an induced painful experience. She found that sensory information reduced reported distress but not sensation of pain. She also showed that subjects varied their responses with the intensity of the
stimulus. Pain was induced by a blood pressure cuff attached to the arm and inflated to 250 millimeters of mercury for 18 minutes. During this time the subject was expected to feel tingling, aching and then numbness. Analysis of variance revealed that within subjects over the time the cuff was inflated, there were the expected curvilinear increases in sensation ($p < .001$) and distress of pain ($p < .01$) (Johnson, 1971, 1973). Originally numbered from 0 to 100, the scales were later simplified to 11-point scales in which reliability and validity were not reestablished. Using the distress scale to measure bodily distress, rather than emotional distress as originally conceptualized, may be a threat to its established validity, or it may not be, if the instructions to patients are clearer. In either case, validity of the scales is uncertain.

**Anxiety** Anxiety as a measure of the affective component of pain was measured using the State Anxiety Inventory (STAI, Form Y-1) that was administered at the first visit to measure preoperative anxiety and again postoperatively to measure the affective component of pain. The postoperative measure was administered after ambulation when pain was expected to be most intense. The instrument was administered by asking subjects to
indicate how they feel in relation to the situation of interest: anticipation of surgery or postoperative pain.

The State Anxiety Inventory is a self-report measure that takes about 5 to 10 minutes to complete. It consists of 20 statements on which subjects indicate how they feel, "right now" in relation to a particular stressful experience on a 4-point Likert scale with responses ranging from "not at all" to "very much so". It refers to a felt reaction or process taking place at a given time and level of intensity.

The State Anxiety Inventory (STAI Form Y-1) measures feelings of apprehension, tension, nervousness and worry. It has been used extensively to assess anxiety related to imminent surgery. Form Y is a major revision of Form X and replaces thirty percent of the inconsistent and weak items and has improved the factor structure. It was not practical to repeat all of the psychometric tests of Form X using Form Y. Only psychometric tests of Form Y reflect the reliability and validity of this form, with the convergent validity of Form Y being unknown. However, the two forms are highly correlated. Reliability and validity data are from Spielberger, (1983).

Construct validity of an instrument links the measure to the its theoretical meaning. The measure of
state anxiety has been linked to experiences that are known to arouse apprehension tension, nervousness and worry. Construct validity (STAI Form Y-1) was established by showing that scores of military recruits beginning a highly stressful training program were much higher than those of college and high school students tested under less stressful conditions. Further evidence, based on Form X, showed that scores of college students were significantly higher under examination conditions and significantly lower after relaxation training than during a normal class (Speilberger, 1973).

Convergent validity means that evidence from different sources measured with different instruments all indicate a similar meaning of the construct (Kerlinger, 1986). Convergent validity was demonstrated with patients in one neuropsychiatric hospital who had higher levels of acute anxiety as measured on both the State Anxiety Scale (Form X) and the Minnesota Multiphasic Personality Inventory (MMPI). Convergent validity for Form Y is unknown.

Divergent validity indicates differences between measures of related, but conceptually different concepts (Cook & Campbell, 1979). No relationship was found between state anxiety (Form Y-1) and the U.S. Army Beta
intelligence test indicating that the STAI is unrelated to measures of scholastic aptitude or intelligence.

Test-retest reliability data, established in female high school students (Form Y-1) tested in the classroom, was low as would be expected for a measure of situational anxiety (.35 over thirty days). Internal consistency was .93 using KR-20. Further evidence of internal consistency was found in item remainder correlations for working adults of .63 (Form X). These are higher when given under stressful conditions (Spielberger, 1983).

Items are short and worded simply, such as "I feel calm", "I feel tense". Each response item on the four point Likert scale is given a score of 1 (low level of anxiety) to 4 (high level of anxiety). Total scores are obtained by adding the individual scores for the 20 items taking into account the reverse scored items. Scores for the twenty items can vary from 20 to 80.

Narcotic intake A fourth measure of pain measured the sensory component and was the total number of milligrams of analgesic utilized during the 24 hours following ambulation when experimental subjects had a tape recorder at their bedside. Because morphine is the most potent opiate and the standard to which other narcotics are compared, milligrams of narcotic analgesic used in the 24 hour period were converted to milligrams
of Morphine Equivalent according to a table (Jaffe & Martin, 1985) for the purposes of data analysis. For example, 75 milligrams of Demerol is equal to 10 mg of morphine. To calculate the milligrams of morphine equivalent, the total number of milligrams of Demerol were divided by 75 and the quotient was multiplied by 10.

Validation To validate other measures of pain, the McGill Pain Questionnaire (MPQ) (Melzak, 1983) was administered following ambulation after the patient was settled in bed and had completed the Johnson scales. The MPQ is a one page self-report scale based on the gate control theory of pain and provides information about the sensory, affective and evaluative dimensions of pain. The MPQ took 10 to 12 minutes to complete with this population. It consists of major indexes: a Pain Rating Index (PRI) comprised of 78 one-word descriptors of pain in 20 subgroups of two to six words each, a Present Pain Intensity (PPI), which is a 6-point numerical-word scale, and the Number of Words Chosen (NWC) or total number of words that subjects identify as indicating pain. The seventy eight words on the PRI in twenty subgroups are categorized in six subscales as the a) sensory, b) affective, c) evaluative, d) miscellaneous sensory, e) miscellaneous affective-evaluative and f) miscellaneous total dimensions of pain.
Construct validity of the MPQ has been well supported (Kremer, & Atkinson 1981; Kremer, Atkinson, & Ignelzi 1982; Toomey, Gover & Jones, 1983; Turk, Rudy & Salovey, 1985). The results of several studies using factor analysis confirm a distinction between the sensory and affective categories but show less consistent differentiation of the evaluative category (Crockett, Prkachin, & Craig, 1977; Leavett, Garron, Whisler, & Sheinkop 1978; Prieto, Hopson, Bradley, Byrne, Geisinger, Midex & Marchisello 1980; Reading, 1979).

Concurrent validity is the relationship between an instrument and some current criterion. Correlations between the MPQ and a visual analogue scale were .50 and .65 for the PPI and the total score. (Taenzer, 1983). Lower correlations of .39 and .10 were found between total rank scores on the MPQ and verbal and visual analog rating scales (Reading, 1982). Discriminant validity was demonstrated by Reading (1982) who showed that patients with acute pain use more sensory word subgroups while patients with chronic pain used more affective words. Dubuisson and Melzak (1976) showed that 77% of patients could be correctly classified into diagnostic groups using the MPQ.

Test-retest reliability has been established (Graham, Bond, Gervovich & Cook, 1980; Hunter, Phillips & Rachman, 1979; Melzak, 1975), as has alternate forms
reliability (Graham et al., 1980; Klepac, Dowling, Rokke, Dodge & Schaefer, 1981b; Reading, Hand & Sledmere, 1983). Sensitivity to standardized stimuli has been established (Klepac, Dowling & Hague, 1981).

Recommendations that the MPQ be administered in interview form (Melzak, 1975), so that unfamiliar words could be explained, were followed in this study. As suggested, the subject was asked to select only one word from each of the sub-groups, and only if a word was descriptive of his present pain. For the Pain Rating Index, each of the words has been assigned a scale value within its sub-group and a rank value within the category, i.e., sensory, affective etc. The rank value is used more often than the scale values and was the scoring method used in this study. This subscale is known as the Pain Rating Index ( Ranked) or PRI(R).

Four types of scores may be obtained form the MPQ: (a) the PRI(S) is the Pain Rating Index (Scale) in which responses are weighted by the mean scale values established by Melzak & Torgerson, (1971) for each category, and for a total score of all categories; (b) the PRI (R) which is the Pain Rating Index based on the rank pain intensity values of the words in each sub-group; (c) the number of words chosen (NWC); and (d) the present pain intensity (PPI) which is a number-word
combination chosen to indicate overall pain intensity at that time (Melzak, 1975).

Total scores on the PRI(R) range from 0 to 78 with a range of 0 to 42 in the sensory, 0 to 14 in the affective, 0 to 5 in the evaluative, and 0 to 17 in the miscellaneous categories. Scores on the NWC can range from 0 to 10 and on the PPI from 0 to 5. For the PPI, the verbal descriptors have been given a 0 to 5 number in order of increasing severity of pain.

Correlations of the Pain Rating Index with the other measures of pain in the present study were positive: sensation before, during and after ambulation ($r = .48$, $.44$, $.42$ respectively), distress before, during and after ambulation, ($r = .52$, $.45$, $.53$, respectively) anxiety of pain, $r = .45$, and 24 hour narcotic intake, $r = .31$. The sensory, affective, evaluative, miscellaneous sensory (MS), miscellaneous affective evaluative (MAE), miscellaneous total (MT) subscales as well as the NWC and the PPI were significantly correlated with most measures of pain used in this study.

A meta-analysis of 51 studies has given normative estimates of scores for all categories and indexes across various painful conditions including acute/postoperative pain (Wilke, Savedra, Holzemier, Tesler, & Paul, 1990).

**Body Mass** Because overweight people may have more strain on their sutures and more difficulty moving, they
might have more pain than patients of normal weight. Body mass, an indication of weight in relation to height, was measured by the Quetelet Index. Height in centimeters and weight in kilograms were measured by the admitting nurse, and the Quetelet Index of body mass was calculated by dividing the weight by the height and squaring the quotient (Jequier, 1987).

Procedure

Surgeons were contacted by letter, telephone and a meeting with the investigator in their offices to explain the study, request access to patients and determine their use of pro rata nata analgesia. Office and clinic nurses and secretaries were taught to screen patients according to the criteria. The data collector also screened them for eligibility during the telephone call or initial visit to potential subjects.

Names of patients scheduled for major abdominal surgery were obtained by the investigator daily from lists provided by the hospitals. A telephone call to the nurse at the attending physician's office was made to establish eligibility according to the criteria. The office nurse approached patients about willingness to be telephoned by the investigator.

As circumstances were varied and often unpredictable, a variety of methods were used to gain access and permission prior to surgery. Patients were invited to
participate by telephone, in the nursing unit, in the surgical holding area and in the surgery clinic. Patients were informed that the first visit would take about twenty minutes of their time, and arrangements were made for it to take place in the hospital or home. Table 1 presents the data collection points.

Table 1  
Data Points

<table>
<thead>
<tr>
<th>Time</th>
<th>*Interview</th>
<th>Narrative</th>
<th>Anxious</th>
<th>Cotic</th>
<th>Sensation</th>
<th>Distress</th>
<th>MPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Surgery</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Ambulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During ambulation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(retrospective)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After Ambulation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 Hours after</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The interview at the first visit was to obtain demographic data. The interview 48 hours after the first ambulation was to determine intervention use and relief.

At the first visit, subjects were met by the data collector who described the study, informed them of the rights of human subjects and gave them the opportunity to sign the consent form. Subjects were randomly assigned to one of four groups: (a) relaxation, (b) music, (c) combined relaxation and music or (d) an attention/control group. A structured interview was conducted to obtain
demographic data, followed by administration of the State Anxiety Inventory. Height and weight were obtained from the medical record. Perceived tolerance of pain from past experience was rated on a 3-point scale from tolerate it well to very sensitive to pain. Next, the use of the pain and distress scales were explained. Activities of the assigned treatment groups were described to the subjects by audiotape, and all groups were instructed to use the technique whenever they wished to cope with discomfort and especially when moving, turning or getting out of bed. All subjects practiced the technique with the tape, and received feedback and reinforcement from the data collector, who ended by asking if there were any questions.

Subjects in the relaxation group were taught the jaw relaxation technique. Those assigned to the music group were asked to choose a kind of music that they found relaxing or distracting: piano, harp, synthesizer, orchestral, or jazz. The combination relaxation and music group chose the kind of music that they thought was most relaxing or distracting, and were also taught the jaw relaxation technique. The investigator spent a comparable amount of time in casual conversation with subjects in the attention/control group.

After surgery, the data collector contacted the recovery room or the postoperative unit to determine when
the patient was going to ambulate. The data collector visited all subjects just prior to the first ambulation. That was planned to occur 6 to 8 hours after surgery, however with the variety of hospitals, surgeons and surgeries, it was not possible to control for time since surgery. The time of ambulation provided a control in itself because patients were more alert and ready to answer questions reliably and to be involved in taped self-care activities by the time they were stabilized enough to ambulate. The data collector called the subject's nurse and asked when ambulation was planned. At that time the tape recorder, earphones and assigned tape were brought to the bedside.

Prior to ambulation, the data collector measured sensation of pain and bodily distress with the subject lying or sitting in bed and helped with putting on the earphones. The tape was played for 2 minutes before the subject was helped to get out of bed by the staff nurse. The investigator carried the tape recorder during ambulation, and a member of the hospital staff assisted the patient. In that way, patients were helped by the person who had been giving ongoing care, who had rapport, and knew how each one liked to be moved. The investigator asked the staff nurse to take the lead and offered to help in any way suggested. This permitted the investigator to be a participant-observer and insure that
the research protocol was followed. After returning to bed, in most cases, the tape continued to play while the patient completed measures of pain. A few patients took off the earphones, and to respect their wishes, they were left off.

The interventions were used at the time of ambulation to compare their effectiveness during an activity that increased pain. That the subject was relaxing during ambulation was verified in those who used relaxation. Verification that the subject was letting the music distract or relax him was made in those who used music. Subjects in the control group were assisted by the staff nurse to ambulate in the usual manner, and were accompanied by the investigator.

After the subject returned to bed, measures of sensation of pain, and bodily distress experienced at that time were obtained, as well as a retrospective report of how much sensation of pain and bodily distress were experienced during ambulation. These measures were followed by administration of the McGill Pain Questionnaire and the State Anxiety Inventory. Patients were then told to use the jaw relaxation technique whenever they wanted to cope with discomfort. It was suggested that they try it when ambulating, or to calm down after ambulating, or when they were waiting for medication.
Forty-eight hours after ambulation, all subjects were visited again, and structured interview data was collected on use of relaxation and music prior to the study, and other ways that were used to manage postoperative pain. Subjects in the treatment groups, were asked about frequency of use and helpfulness of the assigned technique during the first two postoperative days, and about the quality and quantity of relief they attributed to use of the techniques. Subjects in the music and combination groups were asked whether music was used for distraction or relaxation. Subjects in the relaxation and combination groups were asked about their use of the technique independently of the tape. At this final visit, tape recorders and tapes were returned to the data collector. The times and dosages of narcotic that were administered during the first and second 24 hours, as well as the 24 hours after ambulation were recorded from the hospital record along with the kind of surgery and the site of the incision.

To determine the amount that the tape was used during the 48 hours that it was left with the patient, the tape recorder was equipped with a device that recorded elapsed time while the play button was depressed. Although the devices each passed twelve reliability checks prior to the study, it was unfortunately discovered after the study was under way, that they were malfunctioning. A
small electronic board was added to each tape recorder. These also malfunctioned at times, but now the data collector could tell if the device had worked for each subject or if it had not. Reasonably reliable data on about two-thirds of the subjects was obtained. The name of the device was changed from the Relaxation Assessment Device (RAD, Hoelscher, 1988), to the Relaxation Timing Device (RTD, Good, 1991) to reflect changes from an electric to electronic mechanism. Elapsed time that the tape recorder was played was documented from the RTD on the final visit along with indications of its reliability. To obtain some subjective data on the amount of use, subjects were asked on the second postoperative day how often and how long at a time they used the tape.

Protection of Human Subjects

Subjects benefitted from participation in the study by investigator attention and by the opportunity to help future patients by contributing to nursing knowledge about postoperative pain. Those in the treatment groups benefitted further by receiving instruction in a self-care technique designed to make them more comfortable, and a tape to use for discomfort during the first two days after surgery.

There were no risks to the relaxation, music or combination interventions. To reduce the risk of
invasion of privacy in obtaining patient telephone numbers, a letter from the investigator given to patients in the surgeon's office or a similar phone call from the office staff were used to obtain permission for the investigator to telephone (Appendix B). To reduce the risk of patients feeling obligated to be telephoned by the investigator or to participate in the study, they were informed by the contact person, and again in the oral and written consent procedures, that participation was voluntary.

To reduce the risk of uninformed consent, patients were given oral and written descriptions of research procedures, experiences, risks, benefits, and assurance of confidentiality, anonymity and protection of privacy (Appendix C). They were informed that benefits from the study were not guaranteed. They were given the opportunity to ask questions and were given answers. Their right to refuse or withdraw was respected without prejudice and without it affecting their care. The informed consent form was signed at the first data collection visit, and the patient was given a copy to keep.

To maintain anonymity and confidentiality, names, phone numbers and hospital room numbers of potential subjects and subjects in process were kept in a private notebook in a locked briefcase, and when no longer
current were removed to a locked file. After the refusal and attrition rates were calculated, they were destroyed. Subjects' names were not linked with data. Subjects were identified by a number on the data collection form and their participation in the study and group membership were not and will not be disclosed to anyone. Permission to use information from the patient record was obtained by written consent from the patient and was kept confidential.

Data Analysis

Subjects and variables were described by measures of central tendency and dispersion appropriate for the level of measurement. To identify covariates, Pearson's product moment correlation was computed between the outcome variables and extraneous variables that were thought to be possible covariates: preoperative state anxiety, Quetelet Index of body mass, narcotic intake within 2.5 hours prior to ambulation, and preambulatory sensation of pain and bodily distress. Those variables that were significantly related to the dependent variables at the .05 level were used as covariates.

To determine whether there was a difference in sensation of pain, bodily distress, anxiety of pain, and 24 hour narcotic intake between those who used relaxation, those who used music, those who used the combination, and those who did not use any of these
techniques, orthogonal a priori contrasts were used (Table 2).

Table 2
Orthogonal a Priori Contrasts

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Relaxation</th>
<th>Music</th>
<th>Combination</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1</td>
<td>1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td># 2</td>
<td>1/2</td>
<td>1/2</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td># 3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>-1</td>
</tr>
</tbody>
</table>

First, the relaxation group and the music group was compared. Second, the combination group was compared to the relaxation group and music group considered together. Third, the control group was compared with the three treatment groups considered together. Univariate analysis of variance was used to assess significance. Since these are orthogonal a priori contrasts, the experimental alpha remained at .05 (Kirk, 1982, p. 105).

Controlling for the identified covariates, orthogonal a priori contrasts with analysis of covariance were used to determine differences between the effect of the treatments on each dependent variable. First the relaxation group and the music group were compared. Second, the combination group was compared to the relaxation group and music group considered together. Third, the control group was compared with the three treatment groups considered together. The error term was
smaller than the first set of analyses because the
effects of covariates were removed from this term.
Chapter Four

Results

This section summarizes the results of this study. First, the subjects and surgical experiences will be described. Second, results pertaining to the hypotheses will be presented. Third, factors in the self-management of postoperative pain will be discussed.

Sample

The sampling frame was composed of all eligible subjects at four participating hospitals. One hundred twenty-six persons scheduled for abdominal surgery were invited to take part in the study with 102 (81%) consenting and 23 (18%) declining. Only one potential subject was missed.

Of the 13 males and 10 females who refused, over half \( (n = 12) \) were scheduled for exploratory surgery for masses or metastasis, while only one-fourth of those who completed the study had similar surgeries. Of the 102 subjects who consented, 84 (82%) remained in the sample, 2 withdrew and 16 (16%) were excluded from the data analysis because of ineligibility after they had begun the study. Reasons for subsequent ineligibility included: surgery canceled \( (n = 1) \); major surgery changed to minor surgery \( (n = 3) \); did not ambulate after surgery \( (n = 2) \); received patient-controlled analgesia that was
unforeseen by the investigator \((n = 9)\); and erroneously received more than one intervention \((n = 1)\).

The demographic characteristics of the subjects are presented in Table 3. They ranged in age from 23 to 64 years with a mean of 46 \((SD = 12.54)\) years. The majority were female \((70\%)\), Caucasian \((83\%)\) and married \((64\%)\). Half were employed \((49\%)\), and the rest were fairly evenly distributed between being unemployed, full-time homemaker

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>41</td>
<td>49%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>14</td>
<td>17%</td>
</tr>
<tr>
<td>Retired</td>
<td>12</td>
<td>14%</td>
</tr>
<tr>
<td>Full-Time Homemaker</td>
<td>15</td>
<td>18%</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Ethnic Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>70</td>
<td>83%</td>
</tr>
<tr>
<td>African-American</td>
<td>9</td>
<td>11%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>54</td>
<td>64%</td>
</tr>
<tr>
<td>Divorced</td>
<td>18</td>
<td>21%</td>
</tr>
<tr>
<td>Never Married</td>
<td>10</td>
<td>12%</td>
</tr>
<tr>
<td>Widowed</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade School</td>
<td>9</td>
<td>11%</td>
</tr>
<tr>
<td>High School</td>
<td>52</td>
<td>62%</td>
</tr>
<tr>
<td>College</td>
<td>19</td>
<td>23%</td>
</tr>
<tr>
<td>Graduate School</td>
<td>4</td>
<td>5%</td>
</tr>
</tbody>
</table>
and retired. Most (73%), had a high school education or less.

The demographic characteristics of each of the four groups are summarized in Table 4. The groups were not significantly different in age, $F (3, 80) = .17, p > .05$, race, sex, education or marital status.

Table 4
Frequencies, Percentages of Demographic Characteristics by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Relaxation n = 21</th>
<th>Music n = 21</th>
<th>Combination n = 21</th>
<th>Control n = 21</th>
<th>Chi Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>17 (81)</td>
<td>15 (71)</td>
<td>13 (62)</td>
<td>14 (67)</td>
<td>1.99</td>
</tr>
<tr>
<td>White</td>
<td>18 (86)</td>
<td>16 (76)</td>
<td>18 (86)</td>
<td>18 (88)</td>
<td>7.86</td>
</tr>
<tr>
<td>Married</td>
<td>16 (76)</td>
<td>11 (52)</td>
<td>13 (62)</td>
<td>14 (67)</td>
<td>11.40</td>
</tr>
<tr>
<td>Employed</td>
<td>11 (52)</td>
<td>9 (43)</td>
<td>9 (43)</td>
<td>12 (57)</td>
<td>7.96</td>
</tr>
<tr>
<td>Blue Collar</td>
<td>12 (57)</td>
<td>13 (62)</td>
<td>11 (52)</td>
<td>12 (57)</td>
<td>5.26</td>
</tr>
<tr>
<td>High School</td>
<td>13 (62)</td>
<td>14 (67)</td>
<td>14 (67)</td>
<td>11 (52)</td>
<td>4.68</td>
</tr>
</tbody>
</table>

Note. All Chi Squares $p > .05$.

*aPercentages

Surgical Experience Subjects spent an average of 3.5 ($SD = 2.2$) hours in surgery ranging from 44 minutes to 11.4 hours that was not significantly different among the groups, $F (3, 80) = .72, p > .05$. During surgery, cancer was found in less than a quarter (22%) of the subjects and was not significantly different among the groups, $X^2 = .74, p > .05$. Most subjects ($n = 79, 94%$)
ambulated by the first postoperative day with a mean of .76 days that was not significantly different between the groups $F(3, 80) = .69, p > .05$. Five subjects ambulated as late as 2 to 5 days after surgery.

Patients with the more extensive surgeries were often admitted to the Intensive Care Unit (ICU) either for observation or stabilization. Eighteen subjects (21%) spent from 1 to 5 days in an ICU after surgery, with half of these discharged to the surgical unit after an overnight stay. Days in ICU was not significantly different among the groups, $\chi^2 = 2.13, p > .05$.

Most subjects had been hospitalized for surgery before this admission ($n = 75, 89\%, M = 3.51, SD = 2.74, \text{range} = 1 \text{ to } 12 \text{ days}$), and $70\%$ of the sample had undergone more than one surgical operation in the past ($n = 59, M = 3.59, SD = 2.72, \text{range} = 2 \text{ to } 12 \text{ days}$). This was not significantly different among the groups $F(3, 80) = 1.10, p > .05$.

Reports of tolerance to pain from previous experience found that 33 (53%) tolerated pain well, 18 (29%) were very sensitive to pain and 10 (16%) reported that they were neither very tolerant nor very sensitive. Perceived tolerance to pain was significantly related with sensation ($r = .32, p = .01$) and distress ($r = .43, p = .001$) after ambulation and was not significantly
different among the groups, \( X^2 = 6.39, \text{df} = 9, p = .70 \).
The control group, however, had only two subjects who
were very sensitive to pain, while the treatment groups
each had five or six.

The mean weight for the sample was 165 pounds with
women averaging 166 pounds and men 200 pounds. To
express weight in relation to height, the Quetelet Index
of body mass (kg/m\(^2\)) was calculated. In this sample, the
mean was 28.41 with a range of 18.70 to 51.15. The
overall mean and the mean for men (28.07) and for women
(28.55) were similar as well as among the groups, \( F (3, 80) = .83, p = .48 \). Because body mass was not
significantly correlated with measures of pain, it was
not used as a covariate.

Nearly half of the subjects received intramuscular
injections for pain (\( n = 37, 44\% \)), and one-fourth
received nurse-given intravenous injections (\( n = 20, 24\% \)). A third received intravenous medication at first,
and later, were given intramuscular analgesics (\( n = 27, 32\% \)) with no difference among the groups. Table 5
presents the route of medication by group.
Table 5
Frequencies and Percentages of Route of Medication Administration by Group

<table>
<thead>
<tr>
<th>Route</th>
<th>Relaxation Music</th>
<th>Combination</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 21</td>
<td>n = 21</td>
<td>n = 21</td>
</tr>
<tr>
<td>IM</td>
<td>9 (43)*</td>
<td>9 (43)</td>
<td>7 (33)</td>
</tr>
<tr>
<td>IV</td>
<td>5 (24)</td>
<td>6 (29)</td>
<td>8 (38)</td>
</tr>
<tr>
<td>IV then IM</td>
<td>7 (33)</td>
<td>6 (29)</td>
<td>6 (29)</td>
</tr>
</tbody>
</table>

Note. IM = intramuscular injection; IV = intravenous injection; all Chi Squares p > .05.
*Percent of group n.

The locations of surgical incisions were upper abdomen, lower abdomen and both sites. The location of the incision by group is shown in Table 6 and was not significantly different among the groups. However, the control group had a greater percentage of lower abdominal incisions than the other groups.

Table 6
Frequencies and Percentages of Location of Incision By Group

<table>
<thead>
<tr>
<th>Location</th>
<th>Relaxation Music</th>
<th>Combination</th>
<th>Control</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Abdomen</td>
<td>8 (38)*</td>
<td>12 (57)</td>
<td>10 (50)</td>
<td>5 (24)</td>
</tr>
<tr>
<td>Lower Abdomen</td>
<td>8 (38)</td>
<td>6 (33)</td>
<td>7 (33)</td>
<td>13 (62)</td>
</tr>
<tr>
<td>Both</td>
<td>5 (24)</td>
<td>3 (14)</td>
<td>4 (19)</td>
<td>3 (14)</td>
</tr>
</tbody>
</table>

Note. All Chi Squares p > .05.
*Percent of group.
Testing of Hypotheses

Means and standard deviations of dependent and control variables for each treatment group are listed in Table 7. Using Cochran’s C test and the Bartlett-Box F test, the control variables, pretest sensation, distress, anxiety and narcotic intake were found to be not significantly different from a normal distribution and also displayed homogeneity of variance. Although the control variables were not different between the groups, orthogonal a priori contrasts revealed a significant difference between the relaxation and music groups on pretest measures of sensation, $F (2, 78) = 3.91$, $p < .05$, and distress, $F (2, 79) = 4.00$, $p < .05$; and between the relaxation and music groups taken together versus the combination group on presurgical anxiety, $F (2, 78) = 11.85$, $p = .001$. There were no differences among the four groups on pretest narcotic intake.

Using Cochran’s C Test and the Bartlett-Box F Test for postambulatory sensation, distress, state anxiety of pain, and 24 hour narcotic intake after ambulation were not significantly different from normal distribution and displayed homogeneity of variance.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Relaxation</th>
<th>Music</th>
<th>Combination</th>
<th>Control</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Amb</td>
<td>5.01 (2.86)a</td>
<td>6.56 (2.35)</td>
<td>5.79 (2.32)</td>
<td>5.69 (2.59)</td>
<td>.31</td>
</tr>
<tr>
<td>While Amb</td>
<td>5.95 (2.90)</td>
<td>6.19 (2.55)</td>
<td>6.33 (1.90)</td>
<td>5.81 (2.39)</td>
<td>.19</td>
</tr>
<tr>
<td>After Amb</td>
<td>5.28 (2.62)</td>
<td>6.58 (2.25)</td>
<td>5.94 (2.15)</td>
<td>5.23 (2.52)</td>
<td>1.48</td>
</tr>
<tr>
<td>Distress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Amb</td>
<td>4.20 (2.95)</td>
<td>5.92 (2.59)</td>
<td>5.22 (2.51)</td>
<td>5.37 (3.08)</td>
<td>1.39</td>
</tr>
<tr>
<td>While Amb</td>
<td>5.51 (2.77)</td>
<td>5.64 (2.78)</td>
<td>5.68 (2.13)</td>
<td>5.58 (2.95)</td>
<td>.01</td>
</tr>
<tr>
<td>After Amb</td>
<td>4.53 (2.54)</td>
<td>5.74 (2.52)</td>
<td>5.60 (2.06)</td>
<td>5.33 (2.73)</td>
<td>1.00</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Sur</td>
<td>37.40 (9.69)</td>
<td>34.81 (6.78)</td>
<td>44.76 (9.80)</td>
<td>37.14 (10.76)</td>
<td>4.45***</td>
</tr>
<tr>
<td>After Amb</td>
<td>38.25 (8.86)</td>
<td>40.00 (12.72)</td>
<td>45.10 (7.11)</td>
<td>41.67 (10.42)</td>
<td>1.75</td>
</tr>
<tr>
<td>Narcotic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5° Bf Amb</td>
<td>6.87 (4.50)</td>
<td>4.73 (5.02)</td>
<td>6.61 (5.12)</td>
<td>4.82 (5.56)</td>
<td>1.07</td>
</tr>
<tr>
<td>24° Af Amb</td>
<td>34.78 (24.11)</td>
<td>33.31 (20.68)</td>
<td>28.91 (23.41)</td>
<td>34.67 (26.52)</td>
<td>.29</td>
</tr>
</tbody>
</table>

*aStandard deviation.
*p < .05, **p < .01, ***p < .001.
To determine the differences in pain between the treatment groups, orthogonal a priori contrasts (Table 8) were used. Contrast one compared the relaxation group versus the music group (H1 and H4). Contrast two

Table 8
Orthogonal a Priori Contrasts

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Relaxation</th>
<th>Music</th>
<th>Combination</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1</td>
<td>1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td># 2</td>
<td>1/2</td>
<td>1/2</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td># 3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>-1</td>
</tr>
</tbody>
</table>

compared the relaxation and music groups taken together versus the combination group (H2 and H5). Contrast three compared the relaxation, music, and combination groups taken together, versus the control group (H3 and H6).

Significance was assessed by univariate analysis of variance and covariance (Kirk, 1982) and was considered significant at an alpha of .05. Because the degrees of freedom were greater than 40, the contrasts were independent and the alpha was not adjusted for multiple contrasts (Kirk, 1982).

There were six dependent variables tested with hypotheses 1, 2 and 3. Table 9 displays the variables tested without covariates and the significance of the
contrasts. To test hypotheses 4, 5 and 6, four covariates, sensation and distress before ambulation, preoperative anxiety, preambulatory narcotic intake, age and body mass were used with the dependent variables with which they were correlated.

Table 9

**Significance of Contrasts Without Covariates**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hypothesis 1</th>
<th>Hypothesis 2</th>
<th>Hypothesis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contrast 1</td>
<td>Contrast 2</td>
<td>Contrast 3</td>
</tr>
<tr>
<td>SW</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>DW</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>SA</td>
<td>.041*</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>DA</td>
<td>.058</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>A2</td>
<td>ns</td>
<td>.015*</td>
<td>.031*</td>
</tr>
<tr>
<td>N24</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>

*Note. SW = Sensation while ambulating; DW = distress while ambulating; SA = sensation after ambulation; DA = distress after ambulation; A2 = Anxiety after ambulation; N24 = 24 h narcotic intake; ns = Not significant. *

* = $p < .05$.

**Relaxation versus music (H1).** The relaxation group had significantly less sensation of pain after ambulation ($M = 5.28$) than the music group ($M = 6.58$) $F (2, 79) = 3.10$, $p < .05$, while distress of pain after ambulation approached significance. There were no significant differences in sensation or distress while ambulating, nor in anxiety of pain or 24 hour narcotic intake after ambulating.
Relaxation and music versus combination (H2) The relaxation ($M = 38.25$) and music ($M = 40.00$) groups, taken together, had significantly less anxiety of pain after ambulation than the combination group ($M = 45.10$), $F(2, 78) = 4.94, p < .05$. There were no significant differences in sensation or distress during or after ambulating, nor in 24 hour narcotic intake after ambulating. A post hoc test using Duncan's Multiple Range indicated that it was the relaxation group, rather than music, that had significantly less anxiety than the combination group $p < .05$.

Relaxation, Music, Combination versus Control (H3) The treatment groups, relaxation ($M = 38.25$), music ($M = 40.00$), and combination ($M = 45.10$) had significantly less anxiety after ambulation than the control group ($M = 41.67$) $F(2, 78) = 3.58, p < .05$. There were no significant differences in sensation or distress during or after ambulating, or 24 hour narcotic intake after ambulating.

Relaxation versus Music with Covariates (H4) Sensation and distress of pain prior to ambulation were significantly correlated with most dependent variables: sensation while ambulating ($r = .56$, $r = .44$); distress while ambulating ($r = .44$, $r = .36$) sensation after ambulation ($r = .63$, $r = .41$); distress after ambulation
(r = .47, r = .42) anxiety after ambulation (r = .29, r = .42) 24 hour narcotic intake (r = .31, r = .20) respectively. Therefore, preambulatory sensation and distress were used as covariates in the planned contrasts.

Preoperative anxiety was significantly related only to postambulatory anxiety of pain (r = .37) and 24 hour narcotic intake (r = .20), and thus, was used as a covariate in the analyses using these variables. Preambulatory narcotic intake was significantly related only to 24 hour narcotic intake after ambulation (r = .42). Age and body mass were significantly related only to anxiety of pain (r = -.27, r = -.20).

Controlling for pretest measures of sensation, distress, and when correlated anxiety, narcotic intake, age, and body mass, there were no significant differences between the relaxation and music groups on sensation or distress, during or after ambulating, nor on postambulatory anxiety or 24 hour narcotic intake.

Relaxation and Music versus Combination with Covariates (H5) While controlling for pretest measures of sensation, distress, and when correlated, anxiety, narcotic intake, age, and body mass, there were no significant differences between the relaxation and music groups taken together versus the combination group on
sensation or distress, during or after ambulating, anxiety after ambulating nor on 24 hour narcotic intake.

Relaxation, Music, Combination versus Control with Covariates (H6) While controlling for pretest measures of sensation, distress, and when correlated, anxiety and narcotic intake, age, and body mass, there were no significant differences in sensation or distress during or after ambulation, nor 24 hour narcotic intake after ambulating between the relaxation, music and combination groups taken together and compared to the control group. However, the three treatment groups, relaxation, music and combination, taken together, had significantly less anxiety of pain after ambulation than the control group when controlling for pretest sensation, distress, anxiety, age, and body mass, $F(1, 79) = 6.10, p < .05$, or when controlling for pretest sensation, distress, anxiety and either age, $F(1, 79) = 6.54, p < .05$, or body mass $F(1, 79) = 6.94, p < .05$. A post hoc Duncan Multiple Range test indicated that there was no significant difference in anxiety between any of the groups. The adjusted means for the relaxation ($M = 39.83$) and music ($M = 39.80$) groups were lower than the control group ($M = 42.33$) while that of the combination group was higher ($43.06$).

Prior to controlling for covariates, the relaxation
group had less sensation than the music group; the relaxation and music groups taken together had less anxiety than the combination group; and the relaxation, music and combination groups, taken together, had less anxiety than the control group. However, when controlling for identified covariates, there were no significant differences for comparisons one and two, which were similar to pretest measures, but there was a significant difference on contrast three which revealed that the relaxation, music and combination groups, taken together, had significantly less anxiety of pain after ambulation than the control.

Factors in Self-Management of Pain

To determine the self-care techniques that subjects used for pain, they were asked 48 hours after ambulation about other methods they initiated to manage pain after surgery. The ranked responses of "moderately" to "very helpful" were collapsed into one category, "helpful", because these ranks indicate clinically significant benefits. The other self-care methods subjects used are presented in Appendix D in terms of the frequency and percent of those who used the technique, the frequency of those who used each technique and found it to be helpful, the modal rank of amount of reported help, the frequency and percent of those who used the technique and were
helped a moderate amount or a lot, and the percent of the total sample helped.

Nearly all postoperative patients (n = 83, 99%) asked for medication for pain, and 95% of these found that it helped a moderate amount or a lot, $X^2 = 2.21$, $p > .05$. Of nonpharmaceutical methods used, the most helpful were the individual's own techniques for managing pain. One hundred percent of the subjects who used their own method, other than the ones listed, found it helpful (Appendix F). Eighty percent of those who used a relaxation technique learned in the past reported it was helpful for pain (Appendix E). Prayer helped 33 (75%) and splinting with a pillow helped 50 (72%) of those who used it.

Methods used, but reported as least helpful, were keeping a stiff upper lip (n = 29, 40%) and watching television (n = 12, 32%). This compares with 48 (76%) of those who used the experimental techniques and who said that they were moderately to very helpful. Differences between groups in relation to the amount of help achieved are presented in Table 10.
Table 10  
Frequencies and Percentages of Helpful Self-Care Methods by Group

<table>
<thead>
<tr>
<th>Method</th>
<th>Relaxation</th>
<th>Music</th>
<th>Combination</th>
<th>Control</th>
<th>Modal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 21</td>
<td>n = 21</td>
<td>n = 21</td>
<td>n = 21</td>
<td></td>
</tr>
<tr>
<td>Meds</td>
<td>21 (100)</td>
<td>18 (86)</td>
<td>19 (90)</td>
<td>21 (100)</td>
<td>2.21</td>
</tr>
<tr>
<td>Stiff Lip</td>
<td>10 (48)</td>
<td>3 (14)</td>
<td>11 (52)</td>
<td>5 (24)</td>
<td>4.43</td>
</tr>
<tr>
<td>Pillow</td>
<td>13 (62)</td>
<td>14 (67)</td>
<td>12 (57)</td>
<td>11 (52)</td>
<td>3.97</td>
</tr>
<tr>
<td>Refused</td>
<td>5 (24)</td>
<td>3 (14)</td>
<td>9 (43)</td>
<td>6 (29)</td>
<td>5.84</td>
</tr>
<tr>
<td>Prayer</td>
<td>10 (48)</td>
<td>7 (33)</td>
<td>7 (33)</td>
<td>9 (43)</td>
<td>4.25</td>
</tr>
<tr>
<td>TV</td>
<td>0 (00)</td>
<td>4 (19)</td>
<td>4 (19)</td>
<td>4 (19)</td>
<td>4.86</td>
</tr>
<tr>
<td>Own Relax</td>
<td>4 (19)</td>
<td>4 (19)</td>
<td>4 (19)</td>
<td>4 (19)</td>
<td>1.53</td>
</tr>
<tr>
<td>Own Music</td>
<td>2 (10)</td>
<td>3 (14)</td>
<td>2 (10)</td>
<td>3 (14)</td>
<td>1.54</td>
</tr>
<tr>
<td>Own Way</td>
<td>7 (33)</td>
<td>6 (29)</td>
<td>8 (38)</td>
<td>11 (52)</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Note. Moderately to very helpful (of clinical benefit); All Chi Squares p > .05.

aPercent of group.
bScale: 1=none, 2=a little, 3=a moderate amount, 4=a lot.

Responses to Relaxation and Music  Because the jaw relaxation technique could be used without using a tape recorder and the music could not, subjects in the relaxation and combination groups were asked about their independent use of the relaxation technique (Table 11). Sixteen (38%) of those who were taught the jaw relaxation technique used it prior to receiving the tape recorder, and 30 (71%) used the jaw relaxation technique independently of the tape recorder after they received it. The majority said they would use the jaw relaxation technique again for surgery. These responses were evenly distributed among the groups.
Table 11
Frequencies and Percentages of Use of Relaxation Technique Without Tape by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Relaxation n = 21</th>
<th>Combination n = 21</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Care Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior to Receiving Tape</td>
<td>7 (33)(^a)</td>
<td>9 (43)</td>
<td>.09</td>
</tr>
<tr>
<td>After Receiving Tape</td>
<td>18 (86)</td>
<td>12 (57)</td>
<td>3.37</td>
</tr>
<tr>
<td>Would Use Again</td>
<td>18 (86)</td>
<td>17 (81)</td>
<td>.22</td>
</tr>
</tbody>
</table>

Note. All Chi Squares p > .05.
\(^a\)Percent of group.

The 42 subjects in the music and combination groups were asked questions about their prior experience with music (Table 12). Most of these reported that they enjoy music and listen to it occasionally or frequently. Twelve subjects (29%) in these two groups played an instrument currently or in the past, with those in the music group playing more frequently than the combination group. Six (14%) sang with a group or solo in the past.

Table 12
Frequencies and Percentages of Prior Experience With Music by Group

<table>
<thead>
<tr>
<th>Experiences</th>
<th>Music n = 21</th>
<th>Combination n = 21</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoy Music</td>
<td>21 (100)(^a)</td>
<td>19 (90)</td>
<td>2.05</td>
</tr>
<tr>
<td>Listen to Music</td>
<td>21 (100)</td>
<td>19 (90)</td>
<td>2.15</td>
</tr>
<tr>
<td>Sing</td>
<td>3 (14)</td>
<td>3 (14)</td>
<td>.00</td>
</tr>
<tr>
<td>Play Instrument</td>
<td>10 (48)</td>
<td>2 (10)</td>
<td>6.77**</td>
</tr>
</tbody>
</table>

\(^a\)Percentage of group.
** = p < .01.
Subjects in the groups that chose music, most often selected the jazz or orchestral music and least often chose the harp or piano music (Table 13). Appendix G lists the pieces of music on each of the five tapes. Subjects responded favorably to their selected music. Thirty-three (79%) said that they liked the selections,

<table>
<thead>
<tr>
<th>Type of Music</th>
<th>Group 1 (n = 21)</th>
<th>Group 2 (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesizer</td>
<td>4 (19)*</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Harp</td>
<td>0 (00)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Piano</td>
<td>1 (5)</td>
<td>3 (14)</td>
</tr>
<tr>
<td>Orchestra</td>
<td>6 (29)</td>
<td>7 (33)</td>
</tr>
<tr>
<td>Jazz</td>
<td>10 (48)</td>
<td>7 (33)</td>
</tr>
</tbody>
</table>

*Percent of group.

and 8 (19%) said that they loved them. Only one person disliked the selections on the chosen tape. Thirty-four (81%) of those who used music said that the music calmed them moderately to a great deal with only one saying that it was not at all calming. Thirty-one (74%) of those who used music reported that the music was sedative or that it made them sleepy. Two subjects (5%) stated that the music was irritating (Table 14).
Table 14

Frequencies and Percentages of Responses to Chosen Music by Group

<table>
<thead>
<tr>
<th>Responses</th>
<th>Music n = 21</th>
<th>Combination n = 21</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liked the Music</td>
<td>18 (86)(^a)</td>
<td>15 (71)</td>
<td>.18</td>
</tr>
<tr>
<td>Loved the Music</td>
<td>3 (14)</td>
<td>5 (24)</td>
<td>.18</td>
</tr>
<tr>
<td>Calming</td>
<td>19 (91)</td>
<td>15 (71)</td>
<td>.06</td>
</tr>
<tr>
<td>Sedative</td>
<td>16 (76)</td>
<td>15 (76)</td>
<td>1.00</td>
</tr>
<tr>
<td>Not Irritating</td>
<td>20 (95)</td>
<td>20 (95)</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. All Chi Squares \(p > .05\).
\(^a\)Percent of group.

Because it was not known whether postoperative patients would use music to relax or to distract themselves from the pain, they were instructed to use it either way, and at the last visit, they were asked which they used. The majority (52%) used the music to both distract and relax, while a third used it to distract, and five (12%) to relax. These responses were not significantly different among the groups (Table 15).
Table 15
Frequencies and Percentages of Self-Care Use of Music Technique by Group

<table>
<thead>
<tr>
<th>Use of Music Technique</th>
<th>Music n = 21</th>
<th>Combination n = 21</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Relax</td>
<td>4 (19)\textsuperscript{a}</td>
<td>1 (5)</td>
<td>.32</td>
</tr>
<tr>
<td>To Distract</td>
<td>7 (33)</td>
<td>7 (33)</td>
<td>.32</td>
</tr>
<tr>
<td>Both Relax &amp; Distract</td>
<td>9 (43)</td>
<td>13 (62)</td>
<td>.32</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Percent of group, All Chi Squares \( p > .05 \).

Use and Helpfulness of Taped Interventions  Prior to surgery only 27 (43\%) of subjects in the treatment groups expected their assigned intervention to be moderately to very helpful for pain with 23 (37\%) expecting it to be somewhat helpful, 1 (2\%) expecting no help, and 12 (19\%) who did not know. Expectations of helpfulness were not significantly different among the groups, \( X^2 = 7.55, p = .48 \).

All subjects were able to use their assigned technique at the time of ambulation. The effectiveness scores ranged from 2 to 5 with higher scores indicating more effective use of the technique. The relaxation (\( M = 48.3, SD = .73 \)), music (\( M = 4.0, SD = .32 \)) and combination groups (\( M = 4.2, SD = .92 \)) were not significantly different different, \( X^2 = 4.64, p = .10 \). At the third visit 48 hours after ambulation, subjects in
the experimental treatment groups were asked about the ways they used the tape and how helpful it was. Most patients preferred to use the tape recorder and tape while in bed (n = 56, 89%) rather than when walking, because they said they had to concentrate on other things when they were ambulating (Table 16). Only 13 (21%) used the tape for ambulation other than the first time when the data collector walked with them. Ten subjects (16%) reported that they had a problem managing the equipment.

Table 16
Frequencies and Percentages of Reported Use of Tape in Postoperative Period by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Tape Use</th>
<th>Relaxation</th>
<th>Music</th>
<th>Combination</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>19 (90)(^a)</td>
<td>18 (86)</td>
<td>19 (90)</td>
<td>.38</td>
</tr>
<tr>
<td>In Bed</td>
<td>Walking</td>
<td>1 (5)</td>
<td>1 (5)</td>
<td>2 (10)</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>≥1 X Walking</td>
<td>3 (14)</td>
<td>5 (24)</td>
<td>5 (24)</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>Problem(^b)</td>
<td>2 (10)</td>
<td>5 (24)</td>
<td>3 (14)</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Note. All Chi Squares p > .05.
\(^a\)Percent of group.
\(^b\)Problem managing tape recorder.

The relaxation group reported that they listened to the tape from 15 to 180 minutes (M = 74, SD = 41.33), while the music group listened from 15 to 480 minutes (M = 156, SD = 92.06) and the combination group listened from 30 to 300 minutes (M = 108, SD = 61.63).
The 48 (76%) useable results from the Relaxation Timing Device (RTD) inside the tape recorder were examined. The relaxation group listened on the average 42 minutes ($n = 16$, $SD = 24.12$, range = 5 to 107), the music group 57 minutes ($n = 16$, $SD = 71$, range = 6 to 299), and the combination group 71 minutes ($n = 16$, $SD = 58$, range = 7 to 187 minutes).

When asked on the third postoperative day, most subjects ($n = 57$, 90%) said that listening to the tape increased their comfort, and 48 (84%) of these or 76% of subjects who used a tape reported that it was moderately to very helpful, with the most frequent response being moderately helpful. These ranked responses were collapsed to helpfulness because they indicate a clinically significant benefit in comparison to the response of a little helpful. Only 23 (37%) reported that the intervention was helpful when ambulating, with moderately helpful being the most frequent response. Twenty three (60%) of subjects whose preoperative expectations of helpfulness was low (not helpful, somewhat helpful, or did not know) reported at the final visit that the intervention was moderately to very helpful. Amount of helpfulness was not significantly correlated with preoperative perceived tolerance to pain ($r = .15$).
Table 17
Frequencies and Percentages of Descriptions of Helpfulness of Taped Interventions by Group

<table>
<thead>
<tr>
<th>Helped</th>
<th>Relaxation n = 21</th>
<th>Music n = 21</th>
<th>Combination n = 21</th>
<th>Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helpfulfulness[a]</td>
<td>16 (76)b</td>
<td>14 (66)</td>
<td>18 (86)</td>
<td>1.07</td>
</tr>
<tr>
<td>Helpful when Ambulating[a]</td>
<td>9 (43)</td>
<td>5 (24)</td>
<td>9 (43)</td>
<td>.70</td>
</tr>
<tr>
<td>Less Sensation</td>
<td>3 (14)</td>
<td>1 (5)</td>
<td>1 (5)</td>
<td>.80</td>
</tr>
<tr>
<td>Less Distress</td>
<td>6 (29)</td>
<td>6 (29)</td>
<td>6 (29)</td>
<td>.80</td>
</tr>
<tr>
<td>Less Sensation and Distress</td>
<td>13 (62)</td>
<td>10 (48)</td>
<td>10 (48)</td>
<td>.80</td>
</tr>
<tr>
<td>Felt in Control</td>
<td>16 (76)</td>
<td>14 (67)</td>
<td>13 (62)</td>
<td>2.18</td>
</tr>
<tr>
<td>Use Again</td>
<td>18 (86)</td>
<td>20 (95)</td>
<td>20 (95)</td>
<td>1.59</td>
</tr>
<tr>
<td>Recommend</td>
<td>20 (95)</td>
<td>19 (90)</td>
<td>21 (100)</td>
<td>.65</td>
</tr>
</tbody>
</table>

Note. All Chi Squares p > .05.
[a] Moderately or very helpful (clinically significant).
b Percent of group.

Thirty-three (52%) of the 63 subjects who used a tape said that it reduced both sensation and distress of pain, while 18 (28%) said that it helped their distress only, and 5 (8%) said it only decreased their sensation of pain. These responses were not significantly different among the groups (Table 17). Only 43 (68%) said that the intervention caused them to feel more in control. However, 58 (92%) said they would use the technique again if they were having surgery, and 60 (95%) would recommend it to other people.
Summary

The 84 subjects undergoing abdominal surgery in four hospitals were not significantly different among the relaxation, music, combination or control groups in demographic characteristics, body mass, number of previous surgeries, tolerance to pain, hours in surgery, days until ambulated, days in ICU, route of medication administration, amount of use of the assigned intervention, or other self-care methods for managing pain. Orthogonal a priori contrasts revealed significant differences on contrasts one and two on pretest measures of sensation, distress, and anxiety. Similar significant differences were found in postambulatory sensation, anxiety and a trend in distress. In addition, there was a significant difference between the three treatment groups together versus the control group. When controlling for preambulatory pain and anxiety there were no significant differences between any of the groups. However, with age and body mass also as covariates, there was a significant difference in anxiety between the three treatment groups together versus the control group. Subjects used the tape for two days after initial ambulation, and reported that it reduced sensation and distress, and that they would use it again and recommend it to others.
Chapter Five

Discussion

This study viewed the problem of pain among patients with abdominal surgery from the perspective of Orem's model of nursing and the gate control theory of pain. Compared were the effects of three self-care actions, relaxation, music and a combination of relaxation and music on the sensory and affective components of pain in a total sample from four hospitals. With a completely randomized design, 84 subjects scheduled for abdominal surgery were randomly assigned to one of the three intervention groups or to a control group. Interventions were tape recorded for teaching prior to surgery and for use postoperatively. Using the Sensation of Pain and Distress scales, pain was measured before, during and after the first ambulation, and anxiety was assessed after ambulation. Pain was also measured by narcotic intake during the 24 hours after initial ambulation. To compare the relaxation, music and combination groups on measures of pain, orthogonal a priori contrasts were used.

When controlling for pretest measures of sensation, distress, anxiety, and narcotic intake, there was no significant difference between the relaxation group and the music group on sensation or distress during or after
ambulation, anxiety after ambulation nor 24 hour narcotic intake after ambulation. There was no significant difference between the relaxation and music groups taken together versus the combination group on sensation or distress during or after ambulation, nor anxiety or 24 hour narcotic intake after ambulation. However, while controlling for age, body mass, and pretest measures of sensation, distress and anxiety, the three treatment groups taken together had significantly less anxiety of pain after ambulation than the control group. This difference was not present when preoperative anxiety was measured, and although there were no significant differences between any of the treatment groups individually, the relaxation and music groups had lower adjusted means than the control group.

**Relaxation**

Consistent with others (Horowitz et al., 1984; Voshall, 1989; Wells, 1982; Zeimer, 1983), relaxation was not effective in reducing reported sensation of pain, which is in contrast to others who found that it was effective (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Madden et al., 1978). This inconsistency in the results may be due to the higher and more variable levels of pain in the present study or to methodologic inadequacies in the previous studies such as lack of randomization,
unreliability in the implementation of treatments, or lack of control of analgesic medication and pretest measures that were corrected in the present study.

As found by others (Horowitz et al., 1984; Wells, 1982; Zeimer, 1983), relaxation did not decrease narcotic intake 24 hours after ambulation which is in contrast to others who found that it significantly diminished it (Ceccio, 1984; Egbert et al., 1964; Flaherty & Fitzpatrick, 1978; Voshall, 1981; Wilson, 1981). The measurement of narcotic intake as an outcome of an intervention is frequently confounded by differences in dosages and administration as well as by amount of use of the intervention and by the needs and requests of patients. These factors may have biased narcotic intake in this study. Perhaps subjects used it as an adjuvant to medication rather than a substitute.

Similar to others' findings (Horowitz et al., 1984; Voshall, 1980), relaxation did not reduce the distress of pain, and in contrast, others found that it significantly decreased it (Aiken, 1972; Ceccio, 1984; Egbert et al., 1964; Field, 1974 Flaherty & Fitzpatrick, 1978; Johnson, 1966). The inconsistency of findings between this study and those where an effect was not found may be due to higher and more variable pain in subjects in the present
study, and methodological inadequacies in the previous ones.

There are no known investigators that measured the effects of relaxation on the anxiety of pain. Thus, the findings of this study provide new information that while controlling for age, body mass, and pretest measures of sensation, distress and anxiety relaxation alone did not significantly affect anxiety of pain, but the three interventions taken together reduced anxiety significantly. The relaxation group had a lower mean for anxiety than those in the control group. The significant effect of this group of treatments on the anxiety of pain is encouraging for future research. The combination group had significantly higher preoperative anxiety than any of the other groups, and even though this was controlled, they may have had more postoperative emotion as found in previous studies (Johnson et al. 1971; Johnson, Rice et al, 1978).

Music

In contrast to findings of others who studied patients resting in bed (Locsin, 1981; Mullooly et al., 1988; Updyke, 1990), music did not reduce the sensation of pain during or after ambulation. During the next two days, most subjects used and found music helpful in bed.
rather than while ambulating, and thus, it is likely that music was more effective when the patient was resting.

As found by Locsin (1981) music did not reduce 24 hour narcotic intake. This outcome may have been due to differences in effectiveness of analgesics, or differences in the amount and timing of the use of music.

No known investigators have assessed the efficacy of music on reported distress of pain, and thus the findings in this study provide new knowledge that music did not reduce the distress of pain at time of ambulation. However, most subjects reported that music was helpful in decreasing distress during independent use in the 2 days following ambulation, suggesting that music may be useful for pain during rest.

In contrast to Mullooly et al. (1988), music alone did not decrease the anxiety of postoperative pain. This difference may be due to the fact that Mullooly used a graphic scale while the present investigator used a questionnaire or because Mullooly used resting patients while this investigator used ambulating patients. However, the mean for the music group was lower than the control group and contributed to the result that the three interventions together had less anxiety than the control group.
The effect of music on anxiety associated with various illnesses has been studied more frequently than the anxiety of pain. The findings of the present study supported those who found that music did not significantly reduce anxiety among persons in the intensive care units (Zimmerman et al., 1988), but not others who found music decreased anxiety associated with illness (Chetta, 1981; Jellison, 1975; Hanser, 1985; Levine-Gross & Swartz, 1982; Tanioka et al, 1988; Updyke, 1987, 1989). The inconsistency between the findings of the present study with surgical patients and those studying other types of patients may be because the anxiety of pain with its associated sensory component is perhaps different than other kinds of anxiety. In addition, music may be more effective in patients at rest than during ambulation.

Combination of Relaxation and Music

Inconsistent with the findings of others (Clark et al., 1981; Gaffam & Johnson, 1989; Hanser, et al., 1983; Swineford, 1987; Siegel, 1983), the combination of relaxation and music did not reduce sensation or distress of pain at time of ambulation, nor 24 hour narcotic intake. The inconsistency between this study and others may have been due to differences in measures, combinations of treatment modalities, and types of pain.
At the final visit in the current study, most subjects did report that the combination technique was helpful in decreasing sensation and distress during the 2 days following ambulation. However, subjects were not asked about anxiety at this time. The combination group was highest of the four groups in anxiety preoperatively, after ambulation and after controlling for covariates. Subjects in this group may have also been affected by the general anxiety associated with the experience of surgery.

Overall, the results in studies of the effect of relaxation and music on postoperative pain have been conflicting, and even in the studies with significant results, there were usually nonsignificant outcomes on some measures. This study attempted to overcome many of the methodological problems in previous ones by replicating and extending previous research on the jaw relaxation technique using a taped intervention, consistent measures of pain, a randomized total and adequate sample, and increased control of confounding variables. Resolution of these methodological inadequacies of previous studies resulted in nonsignificant findings for some measures in the present study. However, the three self-care interventions as a group were effective for anxiety, and the statistical
control for pretest pain differentiated between treatment effects and differences due to preexisting pain.

Rationale for Results Differing From Other Studies

Why did the jaw relaxation technique, sedative music and the combination of relaxation and music fail to be effective when other investigators have found otherwise? Perhaps, the increased methodological control, a total and adequate sample, as well as random assignment provided for an even distribution of some potentially confounding variables. Moreover, statistical control of preexisting pain may have removed that portion of pain reported preoperatively. Thus, postoperative pain was not confounded.

Numerous investigators assessing relaxation and music among surgical populations did not control for pain that existed prior to the treatment, but rather assumed that it was not significantly different among groups (Ceccio, 1984; Egbert et al., 1964; Flaherty & Fitzpatrick, 1978; Horowitz et al., 1984; Johnson et al. 1978a; Levin, Malloy, & Hyman, 1987; Locsin, 1981; Updyke, 1990; Voshall, 1981; Wells, 1982; Wilson, 1981). Several of these used random assignment (Ceccio, 1984; Levin et al., 1987), with Ceccio finding significant effects in sensation, and distress of pain and narcotic intake, while Levin et al. only found significant reductions in
sensation and distress combined into one index. Whether treatment effects in previous studies were confounded by preexisting pain is unknown but may account for the inconsistent findings between the studies.

However, the few investigators that did control for pretest pain (Miller & Perry, 1988; Mullooly, 1983; Swineford, 1987; Updyke, 1990) also had mixed results when more than one instrument was used to measure pain (Miller & Perry 1988; Mullooly et al, 1988; Swineford, 1987). Mullooly et al. (1988) were the only ones that used both randomization and control for pretest pain and anxiety. They found that 10 minutes of easy-listening music reduced anxiety on both the first and second evening after surgery, and decreased pain on the second evening. Perhaps, control of pretest pain and assignment of subjects may account for the more consistently positive results found by Mullooly et al. (1988).

Rationale for Outcomes of Relaxation and Music

In the present study, the groups were significantly different on preambulatory sensation, distress and anxiety that was controlled to discern the effect of the interventions. This control is an important feature of the study along with the methodological rigor, the total and adequate sample, and the random assignment to groups. These methodological aspects strengthened confidence in
the consistent findings of ineffectiveness of relaxation and music on several measures of pain. However, it is not known if other confounding variables had an impact on the outcomes in the study.

The lack of a treatment effect in this sample may be accounted for by the higher and more variable levels of pain on the Pain Rating Index of the McGill Pain Questionnaire than was found in a meta analysis of other studies using this instrument (Wilke et al., 1990). Also, subjects had higher sensation or distress than subjects in previous studies of relaxation using the Sensation and Distress scales (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Horowitz et al., 1984; Wells, 1982) and may have contributed to the ineffectiveness of the interventions.

The control group in the present study, however, had less pain than did the other treatment groups. Their sensation prior to ambulation was unexpectedly lower than the treatment groups and was only partially compensated for by the adjustment with pretest covariates. Perhaps, the lower pain in the control group was due to the greater number of lower abdominal incisions in this group, which are considered less painful during respiration than those that involve the upper abdomen. As compared to the treatment groups, fewer subjects in the control group reported being especially sensitive to
the control group reported being especially sensitive to pain in the past, and therefore, may have had less pain following this surgery.

In addition, the differences in personality, disease states, surgical procedures, surgeons, and analgesic efficacy may account for the larger variation in sensation and distress compared to previous studies (Ceccio, 1984; Flaherty & Fitzpatrick, 1978). Although factors thought to reflect variation in surgical procedure were not significantly different among the groups, the greater variation in indices of pain may suggest that other unknown confounding variables may have been present in the current study.

Using the interventions at the time of ambulation may not have been effective, because patients needed to concentrate on getting up and may not have been able to focus on relaxing or listening to music at the same time. The taped interventions were often in conflict with the explicit instructions of the accompanying staff nurse who was not told the nature of the tape and often gave specific directions about how to sit up and get out of bed. In contrast, most subjects reported that the tape was more helpful during the next 2 days while resting in bed rather than ambulating because they could relax better and less was happening. Perhaps ambulation was
not an optimal time to use relaxation and music. However, the results of previous studies would indicate that ambulation did not adversely affect the impact of relaxation (Flaherty & Fitzpatrick 1978; Horowitz et al., 1984), but their significant differences may have been confounded by pretest pain.

Positive treatment effects may be more likely with less intense pain found when subjects are in bed instead of ambulating. Although not every patient had increased pain during ambulation and some in fact felt better when walking, for many patients, pain during ambulation may have been too great for music and relaxation to be effective. The effectiveness of music in previous studies during rest (Levin et al., 1987; Locsin, 1981; Miller & Perry 1988; Mullooly et al., 1988; Swineford, 1987; Updyke, 1990; Voshall, 1981; Wells, 1982; Wilson, 1981) suggests that this may be a possible explanation.

Another explanation for the absence of differences between the treatment and control groups on most measures may be that relaxation, music or their combination were not strong enough to affect pain. This is supported by the finding that small differences were found in pain between groups before, during and after ambulation, smaller at posttest than many of those in previous studies where jaw relaxation was effective (Ceccio, 1984;
Flaherty & Fitzpatrick, 1978). However, the larger differences between groups found in the previous studies may have been confounded by preexisting pain. Perhaps, the oral instructions given by the nurse in the previous studies strengthened the intervention and resulted in greater differences between the groups.

Providing patients with taped instructions for relaxation rather than having the nurse give the suggestions verbally may have contributed to the nonsignificant findings in the present study. Others have also found that taped instructions were less effective that those given by a person (Snyder, 1985). The regular repetition of instructions by an unknown calming voice may not have been engaging enough to maintain the attention of patients during ambulation. Perhaps the involvement of the nurse is a necessary part of the intervention for providing coaching and feedback (Horiwitz et al., 1984), strong suggestion, ongoing observation and feedback, as well as rapport with the patient. Thus, future studies should compare taped instructions with ones given by a nurse.

Reduction of anxiety and the sympathetic arousal that accompanies it are known to be benefits of relaxation and soothing music. It is particularly interesting that they can reduce the anxiety associated
with intense, variable pain in this population. This is a new finding that may have bearing on the apparent effectiveness during the 2 days of independent use of the taped interventions. Perhaps since the majority of subjects in the treatment groups reported at the last visit that the intervention reduced sensation, this relief was modulated through the effect on anxiety. It may also be because the state anxiety inventory has demonstrated reliability and validity and is not a unidimensional measure as the sensation and distress scales are. Future studies could be planned to further understand anxiety as an important dimension of pain.

Although no differences in sensation, distress and narcotic intake were found between the treatment groups and the control group during and after ambulation, patients continued to use the tape recorded interventions for the following 2 days. They used them as much on the first day as on the second day after surgery, and some used them for hours. There were others, however, who did not use them. Perhaps patients who were aware that this intervention relieved pain during ambulation were more motivated to try it again during the next two days. Some said that they forgot, were too drowsy, or the tape recorder was out of reach. The ability of postoperative patients to participate in reducing their own pain may
have been compromised by their postoperative state. In future work, reminders could be scheduled to be carried out either by the investigator or the nursing staff. In practice, reminders and assistance with equipment from the nurse would aid in patient use of relaxation and music.

Although the intervention at time of relaxation was not effective, subject response to the use of the interventions for two days was generally very positive. At the final visit, most subjects reported that they liked the intervention, used it, that it was moderately to very helpful in relieving pain, that they would use it again if they had surgery, and would recommend it to others. This positive response may have been because the interventions were more effective when the patient was resting in bed and could be self-directed in concentrating on being distracted or relaxed as the tape was playing. Most of the subjects at the initial visit who expected it to be only somewhat helpful, in fact, found it to be moderately to very helpful for postoperative pain. The effect of the interventions surpassed patient expectations in many cases.

The inconsistency between the nonsignificant results on most measures at ambulation and the positive ratings obtained at the last visit may have been due to the
difference between bedrest and ambulation, or between heightened and moderate pain. The interventions may have modified some response to pain such as muscular or mental tension that may have had positive outcomes for patients. One patient with cancer said the music did not help her pain, but somehow it encouraged her. Another said that the jaw relaxation technique helped her forget the incision was hurting so much. A third said the intervention relaxed and prepared him for moving or walking. The tape reminded a fourth subject to use his own ways of relaxing. Still another said music was very helpful for mental distress after surgery. Research is needed to describe the value of the interventions to patients.

Perhaps, some responses at the last visit were biased by perceived experimenter expectations, patient forgetfulness, less sensitive measures, or the Hawthorne effect. Nevertheless, most patients used and were helped by relaxation and music. As suggested by Beck (1988), the choice of contextual factors such as time, activity, and amount of pain with which to use it may have been an important factor in their use during the postoperative period.
Limitations

The first limitation is associated with the measurement of pain. Although self-reported measures of pain are the most valid indications of this subjective experience, they lack sensitivity because medication, inexperience in measurement, or perceived experimenter expectations may affect the judgement of subjects. If a rating scale is used to measure pain during ambulation, ceiling effects are possible if pain is high and then increases. Furthermore, perceptions of distress associated with sensation may have been confounded by distress associated with other factors.

Another limitation was a possible testing effect from repeated assessment of pain, distress and anxiety measures. The subject was asked to report what was felt right at that time, on successive occasions and may have enhanced the rating because of familiarity with the instruments. This is an unavoidable limitation when effects are evaluated by using a pretest-posttest design. The heterogenous surgical sample with its high and diverse pain was a limitation as were the simultaneous presentation of taped interventions and instructions by staff nurses during ambulation.

Because pieces of music differ greatly in their impact on and meaning for people, it is important not to
generalize the effects to any music other than the selections tested on the tapes. Self-selection of music by the subject was restricted to the five tapes used and may not adequately reflect choices that the subjects might have made if they were not restricted to music on these tapes. However, self-selected music is a useful technique in practice and could be compared to music selected by the investigator. Similarly, results for the jaw relaxation technique cannot be generalized to other relaxation techniques but can be compared with results of others who used the jaw relaxation techniques.

Implications for Theory

Gate control theory That these activities were not effective in decreasing postoperative pain during or after initial ambulation suggests that modulation, filtration and abstraction of noxious impulses in the central nervous system did not attenuate the perception of pain as described by the gate control theory. Reduction in anxiety did not modulate the perception of the sensation or distress of pain. Perhaps the ability of patients to relax or be distracted during ambulation was overpowered either by the intensity of pain, or the by concentration on getting out of bed, therefore preventing the cortical modulation of the transmission of noxious impulses.
The effective use of relaxation and music during the first two days postoperatively seems to indicate that neural modulation of noxious impulses did attenuate the experience of postoperative pain during that time. This may have been because patient actions in choosing time, place, activity and amount of pain with which to use the technique were important for neural modulation, or because relaxation and music were strong enough influences on neural modulation of pain in the resting person. It may have been that a positive effect on the anxiety of pain at that time modulated the sensory perceptions. That neither the expectation that the intervention would be helpful nor the ability to tolerate pain recalled from past experience were related to perceived helpfulness of the interventions at the final visit is suggests that perhaps the interventions were not strong enough to overcome these theoretical influences on pain in the gate control theory during the two days of use.

**Self-care theory** The self-care activities of relaxation and music did not regulate the body function of the sensation of pain at the time of ambulation, but as a group they modified anxiety, one measure of the affective component of pain. The lack of effect on sensation may have been due to an inadequate technique,
or inadequate human input from either the patient or the nurse. Inadequacies may have been due to possible inherent weakness of the technique, or to intensity of pain in the patient. Patients may have been unable to carry it out due to multiple simultaneous demands for their attention and action. Coaching and feedback from the nurse were not a part of the taped intervention and may be necessary elements.

Patients reported that the self-care activities of relaxation and music did regulate the body function of pain during the two days following ambulation. Perhaps relaxation and music were more powerful in the resting patient because they could concentrate their attention and activity and there was less anxiety than during ambulation. Or it may be because deliberate patient actions in choosing time, place, activity and amount of pain with which to use the technique were important elements in initiating self-care to regulate pain.

Implications for Research

Researchers need to learn more about pain in different surgical populations as acuity changes. That is, to establish normal values of intensity, variability, and responses to medication, rest and changes in activity. Identification of variables in the postoperative period that relate to or affect the sensory
and affective dimensions of pain will assist in planning and interpreting future studies.

The work of Flaherty and Fitzpatrick (1978), who clarified the instruction to subjects for the distress scale, needs to be continued. Distress was originally conceptualized as emotional, and differentiated from sensation by healthy subjects in the laboratory when asked how much the sensation bothered them. Healthy subjects may not have had other discomforts as postoperative subjects do. In using the distress scale with surgical patients, Flaherty and Fitzpatrick asked them to report how much the sensation bothered them and the rest of their body. Because there may be other discomforts that bother surgical patients and because of occasional confusion noted in the present sample regarding distress, an adequate sample of patients need to be asked after they respond to the distress scales, what it is that they are feeling, or in what way do the sensations bother them and the rest of their body. It is not clear at the present time whether subjects are reporting emotions, other sensations, or perhaps nervousness.

Problems in finding surgical populations with significant pain will occur in the future. Laparoscopic and laser surgeries are being used more frequently and
are associated with little postoperative pain (Wolfe, Gardiner & Frey, 1991). Patients are often admitted to the hospital immediately prior surgery and are sent home the same or next day and allows little time for preoperative teaching and measurement of postoperative pain. After routine operations, surgeons are frequently using patient-controlled analgesia (PCA) that is thought to result in a more constant and moderate level of pain. Because this is sometimes questioned by nurses, other work is needed to explicate the effects of PCA and other interventions for pain. At this time, however, narcotic intake will be difficult to ascertain because the records of narcotic use vary from hospital to hospital and information on narcotic intake may be lost when a computerized pump is disconnected two days after surgery. If these problems can be solved, relaxation and music as adjuvants to the PCA method of analgesic delivery could be evaluated.

There need to be studies of how medicated patients with similar types of pain respond to music, relaxation and the combination as an adjuvants to analgesics. McCaffrey (1990) recommends the combination of pharmacological and behavioral techniques for practice, but there is little research that supports this technique (Cleeland, 1986). Melzak suggests that behavioral
techniques, such as relaxation, potentiate the effects of analgesic medication. With the frequent use of patient controlled analgesia and increased complexity of some surgeries, adjuvants to medication should be considered for practice and research both with patient controlled and nurse controlled delivery systems. With the perspective of relaxation and music as adjuvants, the investigator or practitioner would be more concerned with effective relief of pain. These interventions, alone, are usually inadequate for surgical pain, and measuring decreased narcotic use to indicate their effectiveness may not be realistic, comparable between groups, nor entirely ethical.

Efforts should be made to determine if relaxation and music are strong enough interventions to produce measurable differences in sensation and distress of pain. In addition to pretest and posttest measures of pain, patients should be asked immediately after the intervention as to the amount and nature of relief they think the intervention provided. This might improve the sensitivity of the measurement of pain because patients can be clearer and more accurate about changes in pain than to choose an absolute value every time. A limitation is that it may be more prone to confounding
due to experimenter or patient expectations in regard to an intervention.

An alternate method of measurement is to ask the patient to choose an 'anchor' or level in a measure of pain and report changes relative to the anchor rather than as absolute values. This method of eliciting relative values has shown strong relationships between indices of the MPQ when used to measure changes before and after a therapeutic intervention (Melzak, 1975). The two methods, eliciting either absolute or relative values of pain, should be compared to determine if the latter is a valid technique that increases sensitivity and reduces the testing effect.

Studies are needed to compare the effect of live or taped interventions both when ambulating and when in bed. The intensity of pain with which the interventions are helpful needs to be identified, as well as the active components such as relaxation, distraction, or personal control (Cleeland, 1986).

If ambulation is a time when the intervention is expected to be used, there first need to be comparison studies of nurse-directed and patient-directed ways of getting out of bed. If jaw relaxation or music are considered to be useful additions, they can be integrated
into an intervention that may be effective during ambulation.

In all further studies, randomization and controlling for preexisting pain are imperative. Randomization reduces confounding that is an important assumption when using when using inferential statistics. The cost in time and effort is small, and much more confidence can be placed in the conclusions of studies that use it. The incidence of preexisting pain as a confound of posttreatment measures needs to be documented.

The second implication for theory is that the self-care use of music and relaxation during the first 2 days postoperatively was reported to be moderately to very helpful for pain by most subjects. Although the measurement was not as precise as others, this finding suggests continuing the study of relaxation and music on postoperative pain.

The portable Relaxation Timing Device (RTD) used in this study requires further refinement if the duration of use of the tapes are to be monitored. The problems of fitting a watch and electrical parts into a small portable tape recorder and obtaining enough wattage from batteries to run the tape as well proved to be expensive. If the tape recorder was accidently dropped, the results of the timer were unreliable. The original device, the
RAD (Hoelscher, 1988) was designed to fit in a larger tape recorder which used an electric wall outlet. If placed on the bedside table for self-care research, an attachment would need to be found that would allow patients to use the controls without reaching for it. **Implications for Practice.**

Although subjects used and appreciated relaxation and music for relief of sensation and distress of pain during the two days after abdominal surgery, the results indicate that at the time of ambulation, these interventions as a group, were effective in reducing the anxiety of pain but individually ineffective for decreasing the sensation and distress of pain. The number of favorable responses on the last day, suggests that nurses can continue using these interventions with patients, knowing that most, but not all, benefitted from using them for pain after surgery.

Both relaxation and music require knowledgeable, skillful and artful implementation. The recommendations found in the extant practice literature (Buckwalter, Hartsock, & Gaffney, 1985; Guzzetta, 1988; Kolkmeier, 1988; Scandrett, & Uecker, 1985; Snyder, 1985) or educational programs are advised. However, these interventions should not be used in place of medication. The jaw relaxation technique is easily learned with brief
instructions. Although music involves more of an expenditure for tape recorders and tapes to accommodate patients' preferences, it is also easy to implement and is often helpful and appreciated by patients.

As a result of this study, five tapes of calming music, another five of a combination of relaxation and music, and one of jaw relaxation were made. The tapes were liked by patients and reported helpful for pain. They could be used in practice and augmented by patients' own tapes of music to provide variety and the therapeutic effects of self-selected musical preferences (Davis & Thaut, 1989; Hadsell, 1989; Locsin, 1981). The tapes from this study could also be used for further research on relaxation and music with comparisons between using a tape recorder or a pillow speaker.

This study of the effects of relaxation and music at the time of ambulation is the first to demonstrate the general effectiveness of these interventions on the anxiety of postoperative pain. Although corresponding effects on measures of sensation, distress and narcotic intake were not found, the majority of patients reported that relaxation and music were moderately to very helpful for sensation and distress during the two days they used them independently. The positive nature of the interventions complimented the usual kinds of hospital
experiences and was appreciated by patients as a thoughtful dimension of professional nursing care.
References


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Harvey, A. W. (1987). Utilizing music as a tool for healing. Unpublished paper, Department of Music, Eastern Kentucky University, Richmond, KY.


## Appendix A

### Frequency of Surgical Procedures

<table>
<thead>
<tr>
<th>Surgical Procedure</th>
<th>Frequency</th>
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<tbody>
<tr>
<td><strong>Upper Abdominal Incisions</strong></td>
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</tr>
<tr>
<td>Antrectomy/Vagotomy</td>
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<tr>
<td>Cholecystectomy</td>
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<tr>
<td>Gastrectomy</td>
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</tr>
<tr>
<td>Hepatic Resection</td>
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</tr>
<tr>
<td>Nephrectomy</td>
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</tr>
<tr>
<td>Pancreatectomy</td>
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</tr>
<tr>
<td>Portal-Caval Shunt</td>
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<tr>
<td>Splenectomy</td>
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<tr>
<td>Spleno-Renal Shunt</td>
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<td>Ventral Hernia</td>
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<td><strong>Total</strong></td>
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<td><strong>Lower Abdominal Incisions</strong></td>
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<tr>
<td>Bladder Suspension</td>
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<tr>
<td>Cesearian Section</td>
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<tr>
<td>Colectomy</td>
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<td>Incision and Drainage</td>
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<td>Laparotomy</td>
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<td>Myomectomy</td>
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<td>Oophorectomy</td>
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<tr>
<td>Prostatectomy</td>
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<tr>
<td>Take-Down Ostomy</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>34</td>
</tr>
</tbody>
</table>

| Both                                |           |
| Aorto-Bifemoral Bypass              | 2         |
| Cystogastrostomy                    | 1         |
| Colon Resection                     | 2         |
| Hepatic Resection                   | 1         |
| Ileostomy                           | 1         |
| Laparotomy                          | 4         |
| Coಲosotomy                          | 2         |
| Take-Down Ostomy                    | 2         |
| **Total**                           | 15        |

| **Total**                           | 84        |
Dear Surgical Patient,

I need your help in understanding new ways to reduce discomfort after surgery. I am Marion Good and I am conducting a nursing research project at St. Vincent Medical Center. I am a registered nurse, and a doctoral candidate at Case Western Reserve University. I have spoken to your surgeon and he has identified you as someone who would fit into the study. I need your permission to contact you by telephone to explain the study and see if you would like to take part. If it is all right for me to call you, please tell your surgeon's office nurse.

Participation in the study is easy and harmless. You will see me or my assistant when you come for your preadmission testing the week before surgery. We will also be with you when you walk for the first time after surgery, and again in the hospital two days later. We may provide you with a modification of the usual postoperative nursing care. We will spend about a half an hour with you at each visit, and ask you some easy questions about yourself and how you are feeling. Your answers will be kept confidential. Of course, you are free to withdraw from the study at any time.

It is all right if you decide not to participate in the study. If you do not wish to be telephoned, please let your surgeon's office nurse know. We thank you for your time in reading this, and wish you well following your surgery.

Thank you for your assistance.

Sincerely,

Marion Good, RN, MSN
PhD Candidate
Frances Payne Bolton School of Nursing
Case Western Reserve University
Cleveland, Ohio

Frances Payne Bolton School of Nursing
Appendix C
CONSENT FORM

SURGICAL STUDY

I am a registered nurse and data collector for a nursing research study. You are invited to participate in a study of hospital patients and their responses to surgery which is being conducted at several area hospitals. We hope to learn about ways to increase patients' comfort after surgery. You were deselected as a possible participant in this study because we are studying patients undergoing abdominal surgery. If you decide to participate, I will ask you a few questions today, have you fill out a short questionnaire, and then weigh you and measure your height. This will take about 30 minutes.

You will be randomly assigned to one of four situations. In addition to standard postoperative nursing care from the staff of this hospital, you may receive some slight modification of standard care procedure. I cannot give you more specific information because we are trying to get an honest opinion about small differences in care. None of them can possibly harm you, and they do not involve any medication or physical modification. Of course I cannot and do not guarantee or promise that you will receive benefits from this study.

At the time of your first walk after surgery, I will visit you and I will ask you about the amount of discomfort and distress you are having before, during, and after your walk. After you are settled in bed again, I will ask you to fill out two questionnaires. I will visit you again two days later to ask a few questions and make brief notes from your hospital record.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Your name will not be connected with the study. We will use only a number on the questionnaire. In any published reports of this study, we will refer only to surgical patients.

The Principal Investigator of this study is Marion Good, RN, MSN, Doctoral Candidate at Case Western Reserve University and Assistant Professor of Nursing at Medical College of Ohio. Your decision whether or not to participate will not prejudice your future relations with the hospital where you are having your surgery, nor with cooperating institutions, Case-Western Reserve University or the Medical College of Ohio. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without prejudice and without it affecting your care.

Please turn this page over.
Before you sign this form, please ask me any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think this over.

You will be given a copy of this form to keep.

AUTHORIZATION

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

________________________
Date

________________________
AM PM

________________________
Time

________________________
Signature

________________________
Signature of Data Collector

________________________
Signature of Primary Investigator

Marion Good, R.N., M.S.N.
419-435-2160 (H)

If you have any questions concerning any part of this study or consent form beyond those answered by the investigator, please feel free to contact Dr. Jerome A. Levin, Associate Dean for Academic Resources, Medical College of Ohio at 419/381-4242.
Appendix D

Frequencies and Percentages of Subjects Who Used Other Self-Care Methods for Pain and Amount Helped

<table>
<thead>
<tr>
<th>Method</th>
<th>Used</th>
<th>None</th>
<th>A Little</th>
<th>Moderate Amount</th>
<th>A Lot</th>
<th>Modal Rank</th>
<th>If Used, Helped</th>
<th>% of Total Sample Helped</th>
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<tbody>
<tr>
<td>Medication</td>
<td>83 (99)</td>
<td>1</td>
<td>4</td>
<td>19</td>
<td>60</td>
<td>3</td>
<td>79 (85)</td>
<td>(94)</td>
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<td>Stiff Upper Lip</td>
<td>73 (87)</td>
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<td>15</td>
<td>2</td>
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<tr>
<td>Pillow</td>
<td>69 (82)</td>
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<td>20</td>
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<td>4</td>
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<td>(59)</td>
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<tr>
<td>Refused to Think</td>
<td>51 (61)</td>
<td>8</td>
<td>20</td>
<td>15</td>
<td>8</td>
<td>2</td>
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<td>(27)</td>
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<tr>
<td>Prayer</td>
<td>44 (52)</td>
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<td>9</td>
<td>14</td>
<td>19</td>
<td>4</td>
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<td>(39)</td>
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<td>Television</td>
<td>12 (38)</td>
<td>5</td>
<td>15</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>12 (32)</td>
<td>(14)</td>
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<tr>
<td>Own Way</td>
<td>32 (38)</td>
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<td>15</td>
<td>7</td>
<td>4</td>
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<td>2</td>
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<td>6</td>
<td>3</td>
<td>16 (80)</td>
<td>(19)</td>
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<td>Own Music</td>
<td>17 (20)</td>
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<td>5</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>10 (59)</td>
<td>(12)</td>
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</table>

Amount helped: 1 = none, 2 = a little, 3 = moderate amount, 4 = a lot.
A moderate amount to a lot.
Percent of those who used technique.
Percent of those who used a technique & were helped moderately to a lot.
Percent of total sample helped a moderate amount to a lot.
Appendix E

Reports of Own Relaxation Techniques Used in the Past

Relaxation
Relax face and all muscles until I get floaty
Contract and relax all muscle groups
Relax muscles of the whole body progressively
Rush technique
Lamaze (n = 5)
Deep breathing allowing abdomen to rise
Rest whole body progressively
Just resting
Yoga: close eyes and breathe
Control breathing
Relaxation tape
Biofeedback for migraine
Used music for years for relaxation (n = 2)

Imagery
Sit back and visualize beautiful things (n = 2)
Tape of birds chirping
Surround self with a white light
Release tensions and negative thoughts

Thinking
Just being there
Changing my thinking (n = 2)
Can't change what exists
Must go on from this point
Turn off worries
Everything should be fun
Get past the discouragement
Blank things out
Keep mind off of it
I am a universal being
Meditation

Distraction
Reading novels constantly
Count backwards
Crossword puzzles

Activity
Working out; exercising at night
Walk and commune with nature and my dogs
Subjects Own Self-Care Methods to Manage Pain

Position
Sitting in chair eased gas (n = 2)
Lie on back (prefers to sleep on side at home)
Turn side to side (n = 2)
Bend knees with a pillow under legs
Lie very still (n = 6)
Change bed position up and down (n = 7)
Taught to turn on side and use side rails to get up
Got in bed with knees first, then rolled onto side
Held hand (rather than pillow) against incision (n = 2)

Activity and Rest
Got up and walked (n = 3)
Moving helped; lying still intensified pain (n = 2)
Isolate myself: being by myself and trying to nap
Tried to sleep; slept a lot (n = 2)

Distraction
Did homework
Read
Baby in room (C-section mother)

Social Interaction
Telephoned adult children or kids at home
Talked with visitors: family, friend
Talking to roommate helped quiet me

Relaxation
TV off, close eyes, relaxed, put pain out of mind (n = 3)
Told deep breaths (n = 3) Pant as in labor (n = 2)

Thinking
Remember: one step at a time
Kept my mind off of it
Say "it doesn’t hurt"; "I’m not giving in to this" (n = 2)
Think about pleasant things
Positive thinking
Sense of humor

Spiritual
Great faith in God; Family read scriptures and daily text

Medication
Got doctor to order more pain medication
Didn’t want medication: braved it until couldn’t stand it
### Appendix G

**Selections of Taped Music**

**Synthesizer Music**

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<th>Selection</th>
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<th>Artist</th>
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<tr>
<td>1. Selection #1</td>
<td>Comfort Zone</td>
<td>Steven Halpern</td>
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<tr>
<td>2. Selection #2</td>
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<td>3. Selection #4</td>
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<td>4. Soft Focus</td>
<td>Soft Focus</td>
<td>Steven Halpern</td>
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<td>5. Echos</td>
<td>Soft Focus</td>
<td>Steven Halpern</td>
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<tr>
<td>6. Stranger in Paradise</td>
<td>Coral Seas</td>
<td>Kobliaka</td>
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<tr>
<td>7. Misty</td>
<td>Soft Focus</td>
<td>Steven Halpern</td>
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<tr>
<td><strong>Side B</strong></td>
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<tr>
<td>1. Keynote C: Re</td>
<td>Spectrum Suite</td>
<td>Steven Halpern</td>
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<td>2. Keynote D: Orange</td>
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<td>3. Keynote E: Yellow</td>
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<td>4. Inner Journey</td>
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<td>5. Crystal Visions</td>
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<td>6. Earthrise Part I</td>
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<td>7. Playing Light</td>
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<td>8. Keynote B: Violet</td>
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## Harp Music

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<td>1. Gnossienne #5</td>
<td>Fresh Impressions</td>
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<td>2. All the Things You Are</td>
<td>Harpo at Work</td>
<td>Harpo Marx</td>
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<td>3. Chinese Sunrise</td>
<td>Seapeace</td>
<td>Georgia Kelly</td>
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<tr>
<td>4. They Say That Falling In Love is Wonderful</td>
<td>Harpo</td>
<td>Harpo Marx</td>
</tr>
<tr>
<td>5. Aeolian Temple Music</td>
<td>Seapeace</td>
<td>Georgia Kelly</td>
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<td>6. Can't Help Lovin' Dat Man</td>
<td>Harpo</td>
<td>Harpo Marx</td>
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<td>7. The Quiet Garden</td>
<td>Harp</td>
<td>Philip Boulding</td>
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<tr>
<td>8. Nilapadma (Blue Lotus)</td>
<td>Seapeace</td>
<td>Georgia Kelly</td>
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<tr>
<td><strong>Side B</strong></td>
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<tr>
<td>1. Young William Plunkett</td>
<td>Celtic Harp</td>
<td>Patrick Ball</td>
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<td>2. Carolan's Ramble To Cashel</td>
<td>Celtic Harp</td>
<td>Patrick Ball</td>
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<tr>
<td>3. Carolan's Welcome</td>
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<td>4. Blind Mary</td>
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<td>5. Give Me Your Hand</td>
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<td>6. Greensleves</td>
<td>Celtic Harp</td>
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<td>7. Morning Calm</td>
<td>Harp of Branciswiere</td>
<td>Sylvia Woods</td>
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<td>8. Yano Mori (Yugoslavian Traditional)</td>
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<td>Georgia Kelly</td>
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<td>9. Bilyana (Yugoslavian Traditional)</td>
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<td>1. Gigi</td>
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<td>2. Mona Lisa</td>
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<td>Roger Williams</td>
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<td>3. By the Time I Get to Phoenix</td>
<td>The Best of Paul Cramer</td>
<td>Paul Cramer</td>
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<td>4. You Needed Me</td>
<td>The Roger Williams Collection</td>
<td>Roger Williams</td>
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<td>5. Theme for Elvira</td>
<td>Nadia's Theme</td>
<td>Roger Williams</td>
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<td>6. Thanksgiving</td>
<td>December</td>
<td>George Winston</td>
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<td>7. Nocturne in B Major</td>
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<td>Vladmir Ashkenazy</td>
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<td>8. You'll Never Walk Alone</td>
<td>Somewhere in Time</td>
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<td>1. Tammy</td>
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<td>2. Try To Remember</td>
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<td>3. Aubrey</td>
<td>Nadia's Theme</td>
<td>Roger Williams</td>
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<td>4. Almost Persuaded</td>
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<td>Floyd Cramer</td>
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<td>5. Reflection</td>
<td>Winter into Spring</td>
<td>George Winston</td>
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<td>6. Unchained Melody</td>
<td>The Best of Floyd Cramer</td>
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<td>7. Last Date</td>
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<td>8. Lady</td>
<td>The Roger Williams Collection</td>
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<td>Bach</td>
<td>Bach Festival Chamber Orchestra</td>
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<td>4. Nocturne from a Midsummer Night's Dream</td>
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<td><em>from World Hits</em></td>
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<td>5. Reverie</td>
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## Jazz Music

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<td>1. When Joanna Loved Me</td>
<td>Easy Living</td>
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<td>2. Last Night When We Were Young</td>
<td>Guitar Forms</td>
<td>Kenny Burrell</td>
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<td>3. Easy Living</td>
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<td>4. Blue to Green</td>
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<td>6. Second Time Around</td>
<td>Ahmad Jamal At His Very Best</td>
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<td>7. In A Sentimental Mood</td>
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<td>8. Warm Valley</td>
<td>Pure Desmond</td>
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<td>9. Sweet Rain</td>
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<td>12. Skylark</td>
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<td>13. Three of a Kind</td>
<td>Duotones</td>
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<td>14. Embraceable You</td>
<td>Atlantic Jazz Mainstream</td>
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Appendix H
Correlations of Demographic, Control, and Dependent Variables

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<th>Demographic Variables</th>
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<th>Educ.&lt;sup&gt;b&lt;/sup&gt;</th>
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</table>

**Note.** SB = sensation before ambulating; DB = distress before ambulating; A1 = anxiety before surgery; N2.5 = narcotic Intake 2.5 h before ambulating; BM = body mass; SW = sensation while ambulating; DW = distress while ambulating; SA = sensation after ambulating; DA = distress after ambulating; A2 = anxiety after ambulating; N24 = narcotic intake 24 h after ambulating.

<sup>a</sup>Gender values: 1 = male, 2 = female.

<sup>b</sup>Education values: 1 = none, 2 = grade school, 3 = high school, 4 = college, 5 = graduate school.

*p < .05, **p < .01, ***p < .001.
Appendix H (Continued)

Correlations of Demographic, Control, and Dependent Variables

<table>
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<td>.20*</td>
<td>-.11</td>
<td>.42***</td>
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</table>

**Note.** SB = Sensation before ambulating; DB = distress before ambulating; A1 = anxiety before surgery; N2.5 = narcotic intake 2.5 h before ambulating; BM = body mass; SW = sensation while ambulating; DW = distress while ambulating; SA = sensation after ambulating; DA = distress after ambulating; A2 = anxiety after ambulating; N24 = narcotic intake 24 h after ambulating.

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Appendix H (Continued)
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<table>
<thead>
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Appendix I  Data Collection Instrument CONFIDENTIAL
Surgical Patients Study

A. INSTRUCTIONS TO DATA COLLECTOR ARE IN CAPITAL LETTERS.
B. CODE FOR MISSING DATA: 9, 99, 999; CODE FOR N/A: 8, 88, 888; CODE FOR DON'T KNOW 7, 77, 777,
C. IT IS IMPORTANT TO MAKE RAPPORT WITH SUBJECT BEFORE
ADMINISTERING STATE ANXIETY INVENTORY.

1. ID. .................................................. 1

2. Data Collector Code. ....................... 2
   1. Marion Good    4. Patricia Gray
   2. Virginia Young  5. Frances Wimbush

3. Hospital Code. ............................... 3
   1. St. Vincent Medical Center
   2. Blanchard Valley Hospital
   3. Medical College Hospital
   4. Parkview Hospital

4. Treatment Group. ............................. 4
   1. Combination
   2. Control
   3. Relaxation
   4. Music

5. Date of interview. ......................... 5-10

6. Date of surgery. ............................. 11-14

7. Time of surgery (Military time). ........ 15-18

8. Time left operating room. ............... 19-22

9. Date of first ambulation. ............... 23-26

207
10. Time of first ambulation....................... 27-30
11. Date 48 hours after first ambulation............. 31-34

STRUCTURED INTERVIEW:

First, I'd like to ask you a few questions to fill out a questionnaire. Please answer as carefully as you can. Of course, all information will be kept confidential.

12. Is this the first time you have been hospitalized?................................. 35
   1. No
   2. Yes

13. Have you been hospitalized for surgery before? ........................................ 36
   1. No
   2. Yes (If yes go to question 14)

14. How many times?................................. (If no, record 88) 37-38

15. From past experience, how would you describe your pain tolerance?...................... 39
   1. You tolerate pain very well
   2. You are very sensitive to pain
   3. You neither tolerate it very well, nor are you very sensitive.

16. What is the month and year you were born?

   Month.................................................... 40-41
   Year...................................................... 42-43
   Age....................................................... 44-45
17. What is your marital status?.................
   1. Never married
   2. Married
   3. Divorced
   4. Widowed

18. What is your ethnic or racial background?....
   1. White
   2. Black
   3. American Indian
   4. Spanish American
   5. Other (Please specify)

19. Are you presently:..........................
   1. Employed
   2. Unemployed
   3. Retired
   4. Full-time homemaker
   5. Student

20. What is your usual occupation? .............
    (If retired, what was the usual occupation
    before retirement)
    Title
    Kind of work
    Company or business

21. What is the usual occupation of your spouse?.
    Title
    Kind of work
    Company or business
22. What is highest level of education you had?...

1. No formal education
2. Grade school
3. High school
4. College (specify major)
5. Graduate school (specify degree & major)
Thank you for answering these questions.

STATE ANXIETY SCALE

Next, I would like you to fill out a simple questionnaire. It asks how you feel right now, as you prepare for surgery.

HAND SUBJECT STAI FORM Y-1, CLIPBOARD TO WRITE ON, AND A PENCIL
You do not need to fill in the information at the top. I would like you to read the directions to yourself while I read them aloud to you. Then if you have questions I will be happy to answer them. (Do you need your glasses?)

READ DIRECTIONS ALOUD. THEN READ RESPONSE CHOICES.
ASK: Do you have any questions?
  a) IF SPECIFIC QUESTIONS ARISE, THE DATA COLLECTOR SHOULD RESPOND SHOULD RESPOND IN A NONCOMMITTAL MANNER: "Answer the way you feel right now" WILL USUALLY SUFFICE.

b) IF SUBJECT ASKS IF HE MUST ANSWER ALL OF THE QUESTIONS, THE DATA COLLECTOR MAY EMPHASIZE THAT: "it is best if you respond to all of the statements".

REMAIN IN THE ROOM WHILE SUBJECT ANSWERS ANX. INVENTORY

**************
Next, I would like to check your weight and height

23. Weight in Kg (Divide lbs by 2.2).............
(Round to 2nd decimal) 52-55

Weight in pounds__________________

24. Height in Meters (Divide inches by 39.37).....
(Round to 2nd decimal) 56-57
Height ___ft___inches, or _________Inches
CONTROL GROUP: ENGAGE SUBJECT IN CASUAL CONVERSATION FOR 5 MINUTES.

**********

RELAXATION GROUP
PLAY RELAXATION TEACHING TAPE. COACH SUBJECT ON STEPS OF PROCEDURE BY GIVING VERBAL FEEDBACK AND POSITIVE REINFORCEMENT AS NEEDED UNTIL HE IS ABLE TO PERFORM THE PROCEDURE CORRECTLY.

**********

MUSIC GROUP
PLAY MUSIC TEACHING TAPE

25. CHOICE OF MUSIC.................................

1. Harp
2. Synthesizer
3. Piano
4. Orchestral
5. Jazz
8. N/A (Relaxation, Combination, Control gps.)

PRESS COUNTER ON TAPE RECORDER TO ZERO. ADVANCE TAPE TO COUNTER NUMBER THAT BEGINS THE CHOSEN SEGMENT OF MUSIC. COACH SUBJECT ON LETTING THE MUSIC DISTRACT AND RELAX HIM: GIVE VERBAL FEEDBACK AND POSITIVE REINFORCEMENT. REPEAT MUSIC SEGMENT IF NECESSARY, UNTIL MASTERY.

COUNTER # 000 SYNTHESIZER
COUNTER # 018 HARP
COUNTER # 033 PIANO
COUNTER # 051 ORCHESTRAL
COUNTER # 068 JAZZ

**********

COMBINATION GROUP:
PLAY THE COMBINATION TEACHING TAPE:

26. CHOICE OF MUSIC.................................

1. Harp
2. Synthesizer
3. Piano
4. Orchestral
5. Jazz
8. N/A (Relaxation, Music, Control gps.)
COMBINATION GROUP (Continued):

PRESS COUNTER ON TAPE RECORDER TO ZERO. ADVANCE TAPE TO NUMBER THAT BEGINS THE CHOSEN SEGMENT OF MUSIC. COACH SUBJECT ON LETTING THE MUSIC DISTRACT AND RELAX HIM: GIVE VERBAL FEEDBACK AND POSITIVE REINFORCEMENT. REPEAT MUSIC/RELAXATION SEGMENT IF NECESSARY UNTIL MASTERY.

COUNTER # 000 SYNTHESIZER
COUNTER # 031 HARP
COUNTER # 056 PIANO
COUNTER # 077 ORCHESTRAL
COUNTER # 099 JAZZ

ALL GROUPS: MAKE OBSERVATIONS AND MARK YES, NO: (OR N/A FOR CONTROL GROUP).

27. Face relaxed..........................  
   1. No 
   2. Yes 
   8. N/A (Control gp) 

28. Grimace or frown absent...............  
   1. No 
   2. Yes 
   8. N/A (Control gp) 

29. Lips apart................................  
   1. No 
   2. Yes 
   8. N/A (Control gp) 

30. Talking absent.........................  
   1. No 
   2. Yes 
   8. N/A (Control gp) 

31. Slow respirations.....................  
   1. No 
   2. Yes 
   8. N/A (Control gp) 

Do you have any questions?
IF THE SUBJECT IS UNABLE TO ACHIEVE A SCORE OF 80% OR MORE, OBSERVE HIM AGAIN DURING AMBULATION. IF HE IS NOT ABLE TO PERFORM THE TECHNIQUE CORRECTLY AT THAT TIME, THEN HIS DATA WILL BE ANALYZED SEPARATELY.

TREATMENT GROUPS:

32. Do you believe that this tape will be helpful for pain after surgery? .............

   1. No
   2. Somewhat helpful
   3. Quite helpful
   4. Very helpful
   5. Don't know
   6. N/A (Control gp)

ALL GROUPS: PAIN AND DISTRESS SCALES

   When I visit you after your surgery, I will ask you about the pain you may be having. I will be using these two scales (SHOW THEM TO THE SUBJECT) and asking you to mark on them.

   When I visit you after your surgery, I will show you this pain scale before and after you walk, and ask you to estimate the discomfort you are having at that time.

   I want you to think of your pain in two ways:
   a) First, think about how strong or intense the sensations are.
   b) Then think about how much distress or discomfort the sensations cause.

   By sensation, I mean the physical feel of the pain at the area of your operation.

   By distress, I mean how much those sensations bother you and the rest of your body.

READ INSTRUCTIONS ALOUD WHILE SUBJECT FOLLOWS, SUBSTITUTING THE WORDS, "right at that time" or "right now" IN THE LAST LINE.
Please use one slash like this:________________________/

DEMONSTRATE ON SCALES BY DRAWING A SLASH IN TWO PLACES ON THE SENSATION SCALE AND THEN ON THE DISTRESS SCALE.
PLEASE NOTE

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Appendix I

Sensation of Pain Scale, 214
Distress of Pain Scale, 215

University Microfilms International
ALL GROUPS:
AT TIME OF AMBULATION:

GIVE BEDPAN PRIOR TO AMBULATION IF PT DOES NOT HAVE FOLEY. ARRANGE TO HAVE BED MADE AND HEAD OF BED UP READY FOR SUBJECT'S RETURN.

33. Minutes since last pain medication............

34. Milligrams of last pain medication.............

35. Type of pain medication given...............  
   1. Demerol
   2. Morphine
   3. Other (Specify)___________________________

36. Mg. of Morphine Equivalent of last pain med.  
   (Mg. Demerol/ 75, then x 10) (2 DECIMALS)  

GREET SUBJECT, ASSESS AND REMIND THAT YOU ARE GOING TO HELP WALK HIM ACROSS THE ROOM. READ INSTRUCTIONS FOR PAIN AND DISTRESS SCALES, GIVE HIM A CLIPBOARD AND A PEN AND ASK HIM TO MARK THEM.

TREATMENT GROUPS
ELEVATE HEAD OF BED TO HIGH FOWLER'S POSITION.
ASSIST THE SUBJECT TO PUT THE EARPHONES ON AND ADJUST THE VOLUME ON THE TAPE RECORDER. ASK SUBJECT TO LISTEN TO THE TAPE FOR TWO MINUTES BEFORE STARTING TO GET OUT OF BED. GET ROBE AND SLIPPERS READY. USE THE TECHNIQUE WHILE WALKING THE DISTANCE OF THE ROOM AND BACK (APPROXIMATELY 30 FEET). GET ROBE AND SLIPPERS READY.

CONTROL GROUP  ELEVATE HEAD OF BED TO HIGH FOWLER'S POSITION AND GET ROBE AND SLIPPERS READY. ACCOMPANY SUBJECT AND NURSE WHILE WALKING THE DISTANCE OF THE ROOM AND BACK (APPROXIMATELY 30 FT.).
ALL TREATMENT GROUPS: OBSERVE SUBJECT FOR ALL THE FIVE PERFORMANCE CRITERIA; MARK YES, NO (NA FOR CONTROL GROUP).

37. Face relaxed..............................................

1. No
2. Yes
3. N/A (Control gp)

38. Grimace or frown absent...............................  

1. No
2. Yes
3. N/A (Control gp)

39. Lips apart................................................

1. No
2. Yes
3. N/A (Control gp)

40. Talking absent............................................

1. No
2. Yes
3. N/A (Control gp)

41. Slow respirations.......................................  

1. No
2. Yes
3. N/A (Control gp)

42. In addition, does subject use pillow or hand to splint incision during ambulation..............

1. No
2. Yes
ALL GROUPS POST-AMBULATION:

AFTER SUBJECT IS SETTLED IN BED, SAY: I want to ask you about your pain again. READ DIRECTIONS AND ASK PATIENT TO MARK SCALES FOR PAIN AND DISTRESS RIGHT NOW AFTER RETURNING TO BED.

I want you to think of your pain in two ways:
a) First, think about how strong or intense the sensations are.
b) Then think about how much distress or discomfort the sensations cause.

By sensation, I mean the physical feel of the pain at the area of your operation.
By distress, I mean how much those sensations bother you and the rest of your body.

You may mark anywhere on the line even between the numbers or words.
Please use one slash like this: ________/______

SUBJECT: MARK SENSATION OF PAIN & DISTRESS SCALES: TIME 2

THEN ASK SUBJECT TO MARK THE TIME 3 SCALES CORRESPONDING TO HOW MUCH PAIN EXPERIENCED WHILE WALKING.

MCGILL PAIN QUESTIONNAIRE

Now I would like you to tell me more about your pain. HAND SUBJECT A CLIPBOARD WITH THE MPQ ON IT.
Please place a mark on these pictures to show me the parts of your body that are having pain at this time.
Next, I will read the words aloud as you read them to yourself. I would like you to tell me which words describe the pain you are having right now.

READ ALL OF THE WORDS IN A BOX AND ASK SUBJECT IF THERE IS ONE THAT DESCRIBES HIS PAIN. IT IS NOT NECESSARY FOR THE SUBJECT TO CHOOSE ONE FROM EVERY BOX, BUT HE SHOULD NOT CHOOSE MORE THAN ONE FROM A BOX. IF SUBJECT IS NOT SURE WHETHER A WORD IN A PARTICULAR BOX IS APPROPRIATE, YOU MAY RE-READ THE WORD, SEVERAL TIMES, IF NECESSARY, UNTIL THE SUBJECT CAN DECIDE. IT IS IMPORTANT THAT YOU USE PATIENCE AND UNDERSTANDING SO THAT HURRIED DECISIONS ARE NOT MADE.
AFTER AMBULATION (Continued)

STATE ANXIETY INVENTORY

Now I would like you to fill out the same questionnaire you answered before surgery. This time I want you to answer how you feel right now in relation to the pain you are having.

HAND SUBJECT STAI FORM Y-1, CLIPBOARD AND PEN.

Again, you do not need to fill in the information at the top. I would like you to read the directions to yourself while I read them aloud to you. (Do you need your glasses?)

READ DIRECTIONS ALOUD. THEN READ RESPONSE CHOICES.
ASK: Do you have any questions?
REMAIN IN ROOM WHILE SUBJECT ANSWERS THE STATE ANXIETY INVENTORY.

REMIND SUBJECTS IN RELAXATION, MUSIC, AND COMBINATION GROUPS TO CONTINUE TO USE TECHNIQUE WHENEVER THEY WANT TO COPE WITH DISCOMFORT AND WHEN THEY MOVE IN BED OR GET OUT OF BED.

THANK SUBJECT FOR HELPING.

THANK NURSE.
PLEASE NOTE

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Appendix I

Before Walking
Sensation of Pain Scale, 220
Before Walking
Distress of Pain Scale, 221
After Walking
Sensation of Pain Scale, 222
After Walking
Distress of Pain Scale, 223
Think Back!
During the Walk
Sensation of Pain Scale, 224
Think Back!
During the Walk
Distress of Pain Scale, 225

University Microfilms International
Medication Record

During first 48 hours:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Medication</th>
<th>Milligrams given</th>
</tr>
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<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td>Recovery Room dose?</td>
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<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>c.</td>
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<td>d.</td>
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<td>f.</td>
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<td>g.</td>
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<td>h.</td>
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<td>i.</td>
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<td>j.</td>
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<td>k.</td>
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<td>l.</td>
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</tbody>
</table>

49. Total number of doses of analgesic given 1st 24 hours.................................

   a. Date of end of 1st 24 hours postop_____
   b. Time at end of 1st 24 hours postop_____

50. Total mg. Morphine Equivalent 1st 24 hours... (e.g. Mg. Demerol/ 75; X 10) (2 DECIMALS) 32-35

51. Total number of doses of analgesic given 2nd 24 hours.................................

   a. Date of end of 2nd 24 hours postop_____
   b. Time at end of 2nd 24 hours postop_____

52. Total mg. Morphine Equivalent 2nd 24 hours... (e.g. Mg. Demerol/ 75; X 10) (2 DECIMALS) 40-43

53. Location of incision....................... 44

1. Upper abdominal
2. Lower abdominal
3. Both
ALL GROUPS: VISIT PATIENT 48 HOURS AFTER AMBULATION

54. Direction of incision......................... 45
   1. Horizontal
   2. Vertical
   3. Oblique

55. Postoperative diagnosis____________________

56. Surgical Procedure________________________

57. Anesthetic Agent __________________________

58. Was cancer found in this surgery?............. 46
   1. No
   2. Yes

59. Did surgery result in an ostomy?.............. 47
   1. No
   2. Yes

60. Time of final interview....................... 48-51

Now I would like to ask a few questions about relaxation.

61. Have you used any kind of relaxation technique in the past, prior to being in our study?........ 52
   1. No (go to Question 60)
   2. Yes (If yes, go to Questions 62, 63, 64, 65)

62. What technique did you use?

63. How often have you used it in the month before you came to the hospital?........ 53
   1. occasionally
   2. once a week
   3. once a day
   4. more than once a day
   5. never
64. How often did you use it following this surgery? .................
   1. once
   2. twice
   3. three or more times
   4. never

65. How helpful was your technique in decreasing your pain? ........
   1. Not helpful
   2. A little helpful
   3. Moderately helpful
   4. Very helpful

What (other) ways did you use to manage your pain in the hospital?

66. Asked for medication ......................
   1. No
   2. Yes (If yes, go to 65)

67. How much did medication help? ..............
   1. A little
   2. A moderate amount
   3. A lot

68. Used a pillow ..............................
   1. No
   2. Yes (If yes, go to 67)

69. How much did the pillow help? ..............
   1. None
   2. A little
   3. A moderate amount
   4. A lot

70. Watched TV to reduce pain ................
   1. No
   2. Yes (If yes, go to 69)
71. How much did TV help the pain?........... 
   1. None 
   2. A little 
   3. A moderate amount 
   4. A lot 

72. Prayed.................................... 
   1. No 
   2. Yes (If yes, go to 71) 

73. How much did prayer help your pain?..... 
   1. None 
   2. A little 
   3. A moderate amount 
   4. A lot 

74. Kept a stiff upper lip.................... 
   1. No 
   2. Yes (If yes, go to 73) 

75. How much did this help your pain?...... 
   1. None 
   2. A little 
   3. A moderate amount 
   4. A lot 

76. Refused to think about it............... 
   1. No 
   2. Yes (If yes, go to 75) 

77. How much did this help your pain?...... 
   1. None 
   2. A little 
   3. A moderate amount 
   4. A lot
78. Listened to music (other than mine).............. 68
   1. No
   2. Yes (If yes, go to 77, 78, 79)
   8. N/A (music, combination gps)

79. Did you use................................. 69
    1. radio
    2. a tape of your own

80. When and how often did you use it?
    (Specify)______________________________

81. How much did music help your pain?....... 70
    1. None
    2. A little
    3. A moderate amount
    4. A lot
    8. N/A (Relax & combination gps)

82. What other ways did you use to decrease pain?
    (Specify)______________________________

83. How much did they help the pain?....... 71
    1. None
    2. A little
    3. A moderate amount
    4. A lot
    8. N/A
MUSIC AND COMBINATION GROUP ONLY:

RECORD N/A FOR THE RELAXATION GROUP AND THE CONTROL GROUP

Now I would like to ask you some questions about music.

84. Do you generally enjoy music?.........................
   1. No
   2. Yes
   8. N/A. (Relax & Control gps)

85. Do you listen to music?..............................
   1. Rarely
   2. Occasionally
   3. Frequently
   8. N/A (Relax & Control gps)

86. Do you play an instrument?.........................
   1. I have never played
   2. I have played one in the past
   3. I play one now
   8. N/A (Relax & Control gps)

87. Do you sing either with a group or solo?.......  
   1. No
   2. In the past
   3. I have sung within the last 3 months
   8. N/A (Relax & Control gps)

88. Do you like the music selections on the tape? 
   1. Hated
   2. Disliked
   3. Liked
   4. Loved
   8. N/A (Relax & Control gps)

89. Was the music calming to you?.....................
   1. Not at all
   2. A little bit
   3. A moderate amount
   4. Quite a bit
   5. A great deal
   8. N/A (Relax & Control gps)
90. Did you use the music more to relax your body, or to distract your attention from the pain, or both? ...........................................

1. To relax
2. To distract
3. Both
8. N/A (Relax & Control gps)

91. Was the music irritating in any way? ...........

1. Not at all
2. A little bit
3. A moderate amount
4. Quite a bit
5. A great deal
8. N/A (Relax & Control gps)

92. What did you not like about it? (Specify) ________

93. Would you say the music was sedative? ...........

1. No
2. Yes
8. N/A (Relax & Control gps)

RELAXATION AND COMBINATION GROUP ONLY

94. Did you use the jaw relaxation technique prior to receiving the tape? ....................

1. No
2. Yes
8. N/A (Music and Control Groups)

95. Did you use the jaw relaxation technique without the tape even after receiving it? ........

1. No
2. Yes
8. N/A (Music and Control Groups)

96. Would you use the jaw relaxation technique again if you were having surgery? ........

1. No
2. Yes
8. N/A (Music and Control Groups)
TREATMENT GROUPS ONLY (RECORD N/A FOR CONTROL GROUP)

Now I am going to ask you how often you used the tape on the first and second day you had it.

97. How often did you use the tape on the first day, the day I brought it to your bedside?...

   1. Just when I walked with you
   2. 1 more time that first day
   3. 2 times that day (If 2,3,4 go to 96,97)
   4. 3 times that first day
   5. 4 or more times that first day
   6. N/A (Control Group)

98. How often did you use the tape on the second day?

   1. Not at all
   2. Once
   3. Twice
   4. Three times
   5. Four or more times

99. How long did you listen at one time?

   1. Less than one side
   2. One complete side
   3. One side and half of the other
   4. Both sides
   5. Longer (specify how long)
   6. N/A (Control Group)

100. Total amount of the music tape (or # times) heard?

   1. Less than one side
   2. One complete side
   3. One side and half of the other
   4. Both sides
   5. Longer (specify how long)
   6. N/A (Control Group & Relaxation Gp)
101. During the past two days, did using the tape help make you feel more comfortable?............

1. No
2. Yes
3. Maybe
4. N/A (Control Group)
(If yes or maybe, go to Question 100, 101)

102. In what way did the tape help most?...

1. Lessened the pain
2. Decreased my distress
3. Both
4. N/A (Control Group)

103. How much did it help?.................

1. A little
2. A moderate amount
3. A great deal
4. N/A (Control Group)

104. Did you prefer to use the tape when you were in bed, or when you were up walking?............

1. In bed
2. Up walking
3. N/A control group

105. Why? (Please explain)__________________________

106. How often did you use the tape when you were up walking?........................................

1. Just when I walked with you
2. 2 more times
3. 3 more times
4. 4 more times (If 2,3,or 4 go to 105)
5. More than 4 more times
6. 1 more time
7. N/A (Control Group)

107. How much did it help when walking?..............

1. Not at all
2. A little
3. A moderate amount
4. A great deal
5. N/A (Control Group)
108. Did listening to the tape help you feel more in control of your pain?______________
   1. No
   2. Yes
   7. Don't know
   8. N/A (Control Group)

109. Would you recommend using this technique to other people who have surgery?_________
   1. No
   2. Yes
   7. Don't know
   8. N/A (Control Group)

110. Would you use a tape like this again if you were having surgery?__________________
   1. No
   2. Yes
   7. Don't know
   8. N/A (Control Group)

109. Was managing the tape recorder and headphones a problem?_______________________
   1. No
   2. Yes
   3. N/A (Control Group)

110. If yes, explain______________________________________________________________

111. Is there anything else you would like to tell me about the technique?__________
   (N/A Control Group)

THANK SUBJECT FOR HIS/HER ASSISTANCE IN HELPING NURSES TO LEARN MORE ABOUT PAIN MANAGEMENT.
112. Minutes tape was played (recorded on RTD)...
   a) Hours__ Minutes__
   b) Clock stopped__ Or running__?
   c) Record clock just as you see it__________
   d) Is there a colon? Yes__ No__
   e) Does clock go to zero when pressed? Yes__No__

113. Gender of Subject__________________________
    1. Male
    2. Female

114. Number of days in ICU______________________

115. Number of days on ventilator_______________

116. Days on swan-ganz catheter_______________

117. Delivery system for medication____________
    1. IM prn
    2. IV
    3. IV in recovery, then IM
    4. PCA
    5. Oral
    6. Other (specify)_____________________

112. Surgeon's name ______________________________