A Comparison of the Effects Of Jaw Relaxation and Music On Postoperative Pain

MARION GOOD

This experimental study compared the effects of jaw relaxation and music, individually and combined, on sensory and affective pain following surgery. Abdominal surgical patients (N = 84) were randomly assigned to four groups: relaxation, music, a combination of relaxation and music, and control. Interventions were taught preoperatively and used by subjects during the first ambulation after surgery. Indicators of the sensory component of pain were sensation and 24-hour narcotic intake. Indicators of the affective component of pain were distress and anxiety of pain. With preambulatory sensation, distress, narcotic intake, and preoperative anxiety as covariates, the four groups were compared using orthogonal a priori contrasts and analysis of covariance. The interventions were neither effective nor significantly different from one another during ambulation. However, after keeping the taped interventions for 2 postoperative days, 89% of experimental subjects reported them helpful for sensation and distress of pain.

Pain following abdominal surgery is an unpleasant sensory and affective experience that can contribute to postoperative complications, prolonging hospitalization and recovery. Pain is not always controlled by prescribed analgesics. To augment medication, patients may use self-care methods such as simple relaxation and soothing music (Acute Pain Management Guideline Panel, 1992). Although a few studies have shown that both relaxation and music reduce postoperative pain, others have not, and none have compared these interventions to a combination of relaxation and music. The purposes of this study were: (a) to conduct a controlled experiment to compare the individual and combined effects of jaw relaxation and music on the sensory and affective components of pain after the first postoperative ambulation, and (b) to describe self-care use and helpfulness of these interventions during the next 48 hours.

Relaxation reduced self-reported sensation of pain (Madden, Singer, Peck, & Nayman, 1978), narcotic intake (Egbert, Battit, Welch, & Bartlett, 1964; Voshall, 1980; Wilson, 1981), and affective pain (Aiken, 1972; Egbert et al., 1964; Field, 1974; Johnson, 1966) in a few postoperative studies, but had no effect in others on sensation (Levin, Malloy, & Hyman, 1987; Voshall, 1980; Wells, 1982; Zeimer, 1983) or affective pain (Levin et al., 1987; Voshall, 1980). These differing outcomes may be due to lack of control of pretreatment pain and narcotic intake, inconsistent definitions of the distress of pain as emotional or physical, and use of a variety of relaxation techniques.

None of these effectiveness studies replicated the same relaxation technique. The jaw relaxation technique, however, has been replicated four times and tested after initial ambulation, or, in the case of hip surgery, after initial turning. There was, however, insufficient control of pretreatment pain and narcotic intake in these replications. Jaw relaxation reduced sensation, distress of pain, and narcotic intake in patients after ambulation in cholecystectomy and herniorrhaphy patients (Flaherty & Fitzpatrick, 1978) and in hip surgery patients after turning (Ceccio, 1984). However, it failed to decrease any of these outcomes following ambulation in cardiac surgery patients (Horowitz, Fitzpatrick, & Flaherty, 1984) or

abdominal surgery patients (Mogan, Wells, & Robertson 1985), possibly because oral treatment implementation varied within and among investigations.

Preliminary results of studies of the effect of music on postoperative pain were also conflicting. Pretest pain was not usually controlled, and differences in types of surgery, postoperative day, setting, measures of pain, and types of music may have contributed to the mixed results. None of the studies tested music during ambulation. Preferred music reduced behavioral responses to postoperative pain (Locsin, 1981); classical or contemporary music reduced descriptive reports of emotional and physical pain in the ICU (Updyke, 1990); and easy-listening music reduced visual analogue measures of postoperative pain and anxiety of patients in bed (Mullooly, Levin, & Feldman, 1988). However, precategorized stimulating or sedative music did not reduce reports of pain or morphine requirements of patients in a postanesthesia recovery unit (Heitz, Symreng, & Scamman, 1992). It is not known whether patients in most of these studies liked the music. No studies comparing music to relaxation for relief of postoperative pain were found. The combination of relaxation and music has been used effectively with Lamaze training (Standley, 1986), but results were mixed when combined with imagery for postoperative pain (Gaffam & Johnson, 1987; Swinford, 1987).

The conceptual framework for the study, based on Orem's (1991) self-care deficit theory of nursing and the gate-control theory of pain (Melzak, 1982; Wall, 1979), proposed that self-care action for pain relief could improve well-being by reducing the sensory and affective components of pain. One of Orem's three related theoretical constructs, the theory of self-care, states in part that nurses assist patients in using self-care activities to regulate health and well-being. Nurses instruct and support patients in the use of self-care interventions, such as relaxation and music, to improve well-being during pain.

The gate-control theory posits that pain is the result of an integrated sensory, affective, and motivational system that modulates noxious input, attenuates the perception of pain, and stimulates action to relieve it. Patient reaction to pain includes muscular and mental tension that increases sympathetic outflow and its effect on the integrated modulation centers. Use of relaxation and music may reduce tension and pain by reducing sympathetic influences on the centers, thereby modulating input and perception of both components of pain.

The nurse's role is to adjust the dose and interval of prescribed medication until there is satisfactory pain relief. If relief is unsatisfactory or if side effects are unacceptable, adding an adjuvant self-care intervention is one option to be considered (Acute Pain Management Guideline Panel, 1992). This study is an investigation of the effectiveness of three such techniques.

This experimental study was designed to investigate differences in sensory and affective pain for three self-care actions: relaxation, music, and the combination of relaxation and music. The sensory component of pain was measured by sensation of pain and narcotic intake; the affective component by distress and anxiety of pain. The treatments were chosen because they are easily learned, efficient, and safe, but have uncertain effectiveness. Because of equivocal results in quasi-experimental studies and lack of data about the relative strength of these interventions, a controlled experiment was needed to determine single and combined effectiveness. Three hypotheses were posed:

I. Controlling for preambulatory sensation, distress, narcotic intake, and preoperative anxiety, there will be a difference between the individual groups (relaxation and music) in sensation, distress, and anxiety of pain after the first postoperative ambulation and in narcotic intake during the next 24 hours.

II. Controlling for preambulatory sensation, distress, narcotic intake, and preoperative anxiety, there will be a difference between the relaxation and music groups taken together and compared to the combination group in sensation, distress, and anxiety of pain after the first postoperative ambulation and in narcotic intake during the next 24 hours.

III. Controlling for preambulatory sensation, distress, narcotic intake, and preoperative anxiety, the relaxation, music, and combination groups taken together will have less sensation, distress, and anxiety of pain after the first postoperative ambulation and less narcotic intake during the next 24 hours than the control group.

Method

Sample: The sampling frame included every eligible patient listed for elective abdominal surgery in two teaching and two community hospitals during a 7-month period. Patients were identified daily by the investigator from surgery lists, and eligibility was decided in consultation with office nurses. Inclusion criteria were: (a) aged 21 to 65 years, (b) scheduled for major abdominal surgery, (c) receiving intramuscular (IM) PRN or intravenous (IV) PRN analgesia, and (d) hospitalized 2 or more days postoperatively. Patients who had laparoscopic surgeries or psychosis or retardation were excluded. All eligible patients (N = 126) were contacted in the nursing unit, holding area, clinic, or by telephone. Of the 102 patients who consented and were assigned, 2 patients later withdrew and 16 were excluded from the analysis because of cancelled surgery (n = 4), inability to ambulate after surgery (n = 2), unforeseen patient-controlled analgesia (n = 9), or treatment error (n = 1).

Thus, the sample consisted of 84 subjects, 25 men and 59 women aged 23 to 64 years (M = 46 years, SD = 12.54) in four treatment groups of 21 each: relaxation (4 males), music (6 males), combination (8 males), or control (7 males). Most subjects were white (n = 70, 83%), married (n = 54, 64%), and high school graduates (n = 52, 62%). Almost half were employed (n = 41, 49%), and most had undergone previous surgery (n = 75, 89%, M = 3.51 surgeries, SD = 2.74).

Subjects spent an average of 3.5 (SD = 2.2) hours in surgery, and 18 (21%) spent from 1 to 5 days in surgical intensive care units. Most (n = 79, 94%) ambulated by the first postoperative day. Surgical procedures involved upper (n = 35, 42%), lower (n = 34, 41%), and com-

bined abdominal incisions (n = 15, 18%). Nearly half the subjects received IM PRN narcotics (n = 37, 44%), a fourth received IV PRN (n = 20, 24%), and a third received both (n = 27, 32%).

Measures: The sensory component of pain was defined as the unpleasant, physical perception of hurt associated with tissue damage following surgery. It was measured by the Sensation of Pain Scale (Johnson, 1973) and 24-hour narcotic use. The affective component of pain is the presence of general bodily feelings (Flaherty & Fitzpatrick, 1978) and emotions (Johnson, 1973) concurrent with the sensory component. It was measured by the Distress of Pain Scale (Johnson, 1973) and the State Anxiety Inventory (Spielberger, 1983).

The Sensation of Pain and the Distress of Pain scales each consist of a horizontal line numbered from 0 to 10 with three verbal anchors: no sensation, medium sensation, and most sensation, and no distress, moderate distress, and extremely distressing. Subjects marked the sensation scale to indicate the amount of physical pain felt at the area of the operation. They marked the distress scale to indicate how much the sensations bothered them and the rest of their body. There were no vertical lines corresponding with the numbers on the scales. Later, a transparent overlay with markings for each number and four markings between numbers was used to estimate scores to the nearest 20% of each interval. Validity of the scales was supported by Johnson (1973), who found that subjects could differentiate between pain and distress during induced ischemic pain. However, reliability of these single-item measures of changeable states was not addressed. The presence of verbal anchors was expected to enhance accuracy in surgical patients.

The State Anxiety Inventory (STAI) was used twice: preoperatively, to measure anxiety in relation to approaching surgery, and, after the first ambulation following surgery, to measure the emotional factor of affective pain. As a factor in pain, it augmented the concept of distress, which has been used in a more physical sense as the affective component of pain. Anxiety is an emotion consisting of feelings of apprehension, tension, and worry in relation to a situation. The STAI has been used to study anxiety of approaching surgery and of postoperative pain. Subjects were asked how they felt in relation to the situation of interest, that is, the approaching surgery or pain following ambulation. The STAI consists of 20 statements on a 4-point Likert scale, with responses ranging from 1 (not at all) to 4 (very much so). Construct and divergent validity and test-retest reliability of the STAI are described by Spielberger (1983). Patients with higher preoperative anxiety report greater pain (Johnson, Leventhal, & Dabbs, 1971); therefore, in this study, preoperative anxiety was measured to control this extraneous influence. Internal consistency reliability using Cronbach's alpha was .89 for preoperative anxiety and .90 for postambulatory anxiety of pain, with a correlation of r = .37, p < .001 between the two measures.

The amount of postambulatory narcotic intake was measured during the 24 hours after ambulation. To control for the extraneous influence of analgesic action at the time of the intervention, narcotic intake within 2.5 hours before ambulation was also measured. Both measures of narcotic intake were obtained by record review and converted to milligrams of morphine equivalent. Because the possibility exists that incisional strain in heavy persons will affect pain when ambulating, body mass was calculated with the Quetelet Index (weight/height^2) (Jequier, 1987).

Pain was also measured after ambulation with the Pain Rating Index (PRI-R) of the McGill Pain Questionnaire (MPQ) to evaluate the validity of the single-item sensation and distress scales. The PRI-R contains 78 descriptors of pain, presented in 20 groups of two to six words that have been ranked by patients and physicians according to severity. Subjects chose one word from each group if there was one that described their pain. The rank assigned to that descriptor was the score for that group of words. The PRI-R has demonstrated construct and concurrent validity and test-retest reliability (Melzak, 1975). In the present study, the internal consistency reliability of the PRI-R, using Cronbach's alpha, was marginal (.60). Nevertheless, postambulatory scores of the PRI-R were positively and strongly correlated with those of the sensation (r = .44, p < .001) and distress (r = .55, p < .001) scales. Correlations in this range support the concurrent validity of the sensation and distress scales, especially in light of the weakness of the alpha for the PRI-R (Zeller & Carmines, 1980).

Procedure: At the first visit, preoperatively, the data collector obtained informed written consent and randomly assigned subjects to one of the four treatment groups: relaxation, music, combination, or control. Random assignment without replacement to a discrete pool of experimental conditions ensured an equal number of subjects per group. The data collector then conducted a structured interview to obtain demographic data, measured preoperative anxiety, and explained the Sensation and Distress scales. An introductory tape was used to describe the purpose, effects, and technique of each intervention. Repetition of the technique on the tape provided for practice, coaching by the data collector, and mastery. Instruction and experimenter contact took 20 minutes in each treatment group. Controls were engaged in casual conversation for 10 minutes in place of the tape. The data collector observed the experimental subjects during instruction and ambulation and rated them on five criteria for mastery of the technique: no tension around the mouth, no grimace or frown, not talking, slow respirations, face relaxed. During the preoperative visit, most subjects (95%) were observed to achieve mastery (4/5) using the tape (M = 4.68, SD = .56), with no difference in mastery among treatment groups, $F(2, 60)$ = .34, p > .05.

After surgery, the data collector brought the tape recorder, earphones, and the assigned 60-minute intervention tape to the bedside and measured preambulatory sensation and distress. Experimental subjects used the technique for 2 minutes before ambulation. As a check on manipulation, the data collector rated mastery of the technique during ambulation. Most of the subjects (89%) achieved mastery (4/5) at ambulation (M = 4.44, SD = .78), indicating that subjects had indeed used the assigned technique and used it effectively. There was

Table 1. Means, Standard Deviations, and *F* Tests of Comparisons on Four Indicants of Pain

	Indicants of Pain											
	Sensation			Distress			Anxiety			Narcotic Intake		
Comparisons	*M*	*SD*	*F*	*M*	*SD*	*F*	*M*	*SD*	*F*	*M*	*SD*	*F*
Pretest Using ANOVA												
Relaxation	5.01	(2.86)		4.20	(2.95)		37.40	(9.44)		6.87	(4.50)	
Music	6.56	(2.35)	3.91	5.92	(2.59)	4.00*	34.81	(6.78)	.81	4.73	(5.02)	1.88
Relaxation and Music	5.79			5.07			36.11			5.80		
Combination	5.79	(2.32)	.00	5.23	(2.51)	.05	44.76	(9.80)	12.10**	6.62	(5.12)	.37
Relaxation, Music, and Combination	5.79			5.12			38.99			6.07		
Control	5.69	(2.59)	.03	5.37	(3.08)	.13	37.14	(10.76)	.62	4.83	(5.57)	.96
Posttest Using ANCOVA												
Hypothesis I												
Relaxation	5.28	(2.62)		4.53	(2.54)		38.40	(8.66)		34.78	(24.11)	
Music	6.58	(2.26)	.54	5.74	(2.52)	.41	40.00	(12.72)	.00	33.81	(20.68)	.01
Hypothesis II												
Relaxation and Music	5.93			5.14			39.20			34.30		
Combination	5.94	(2.15)	.00	5.61	(2.06)	.57	45.10	(7.12)	1.76	28.91	(23.41)	1.51
Hypothesis III												
Relaxation, Music, and Combination	5.93			5.29			41.16			32.50		
Control	5.23	(2.52)	1.63	5.34	(2.73)	.01	41.67	(10.42)	.09	34.67	(26.52)	.78

*$p < .05$; **$p = .001$.

no difference among groups, $F(2, 60) = 2.86$, $p > .05$.

After subjects returned to bed following their first ambulation, the data collector measured postambulatory sensation, distress, and anxiety. Pain was then measured with the McGill Pain Questionnaire to assess the validity of the sensation and distress scales. Subjects kept the tape for 2 days to use for treatment of pain. The data collector visited subjects 48 hours after ambulation and asked if any other self-care methods were used for pain management. Experimental subjects were asked about the amount of use and helpfulness of the assigned technique. Tape recorders were returned.

Three comparisons were made: (a) between the individual treatment groups, (b) between the individual and combination treatment groups, and (c) between the three treatment groups and the no-treatment control group. The first two comparisons were exploratory. However, based on studies reviewed, the third comparison was expected to show that persons who used the treatments would have less pain compared to the controls who did not use them.

Experimental Interventions: The type of self-care intervention for pain management consisted of four levels: (a) jaw relaxation, (b) music, (c) a combination of relaxation and music, and (d) control.

Jaw relaxation was used to manage pain through reducing muscle and mental tension. The procedure described by Flaherty and Fitzpatrick (1978) was replicated. This involved lowering the jaw and making the lips soft, the tongue quiet, breathing slow, and thoughts absent. Instructions on its use were recorded on audiotape for consistent presentation to all subjects.

Listening to music was used to reduce pain through distraction and/or relaxation. Subjects chose one of five types of taped sedative music: synthesizer, harp, piano, orchestral, or slow jazz music. The music, without lyrics, was recorded from compact discs, with control of variations in volume and pitch.

The combination of relaxation and music involved use of the jaw relaxation technique while listening to the chosen music in the background. Nearly all subjects in the music and the combination groups ($n = 41$, 98%) liked their chosen music. The control group received routine care.

Data Analysis: To determine whether differences in sensation, distress, anxiety, and 24-hour narcotic intake existed between the individual and combined groups, three orthogonal a priori contrasts or comparisons were used. Because of differences in preambulatory distress and preoperative anxiety, analysis of covariance was used to assess the significance of the comparisons. Since these were orthogonal a priori contrasts, the alpha level of significance remained at .05 (Kirk, 1982). Use of comparisons is consistent with Kirk (1982) and Winer, Brown, and Michels (1991). First, individual treatment group differences following ambulation were examined by comparing the means of the relaxation and music groups. Second, differences between the individual and combination groups were explored. The mean of the combination group was compared to the average of the means of the relaxation and music groups. Third, differences between the treatment groups and the group that did not receive a self-care intervention were compared. The mean of the control group was compared to the average of the means of the three treatment groups. These comparisons were done with ANCOVA to control for covariates.

When postambulatory sensation and distress were tested, preambulatory sensation and distress were used

as covariates. For postambulatory anxiety of pain, covariates were preoperative anxiety and preambulatory sensation and distress. Covariates for 24-hour narcotic intake were preambulatory sensation and narcotic intake. Correlations of covariates with dependent variables ranged from $r = .29$ to .63, all p values < .01. Body mass was not significantly correlated with the dependent variables and was not used as a covariate.

Results

Means for each group, with F statistics for each comparison, are shown in Table 1. Comparisons were made before and after the first ambulation. The relaxation group scored significantly lower on preambulatory distress than the music group. The mean of the relaxation and music groups taken together was lower than the score of the combination group on presurgical anxiety. No other significant presurgical or preambulatory differences were found.

To check the randomization procedure, subjects in the four groups were compared and found equivalent on demographic and surgical variables. Using analysis of variance, no significant differences were found in age, number of previous surgeries, hours in surgery, days in intensive care, days until ambulation, or body mass. Using chi-square, no significant differences were found in sex, employment, ethnic group, marital status, education, mastery of the technique, use of other self-care methods of pain management, or route of medication administration.

None of the hypotheses were supported. With statistical control of extraneous influences, no significant differences were found in sensation, distress, anxiety, or narcotic intake between (a) relaxation and music, (b) the individual treatments and the combination of relaxation and music, or (c) the three treatment groups and the controls. Analysis of the 66 subjects who did not go to the ICU after surgery produced the same results. Controlling for preambulatory sensation and distress, no significant differences were found in pain measured by the McGill Pain Questionnaire (PRI-R).

Subjects kept their taped intervention to use whenever they wished for 48 hours after the first ambulation. In retrospect, the relaxation group reported listening to the tape from 15 to 180 minutes ($M = 74$, $SD = 41.33$) during the 2 days, 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 relaxation tape was used the least, perhaps because it was less interesting than the music and combination tapes. Subjects reported their tape moderately or very helpful ($n = 48$, 76%). It reduced sensation and distress ($n = 56$, 89%). However, subjects preferred to use it in bed ($n = 56$, 89%), would use it again for surgery ($n = 58$, 92%), and would recommend it to others ($n = 60$, 95%). There were no differences between the treatment groups.

Discussion

Contrary to expectations and the conceptual framework for the study, patient use of tape-recorded relaxation and music, alone or in combination, was neither effective nor differentiated in reducing four measures of the sensory and affective components of pain: sensation, distress, anxiety after ambulation, and narcotic intake during the next 24 hours. This finding, which refutes deductions from both Orem's theory of self-care and the gate-control theory, suggests that these particular self-care actions, taken by patients to relieve pain, did not improve well-being by modulating perception of pain during the activity of initial ambulation. Because reports after 48 hours of self-care use were favorable, however, future support for these relationships may be found by modifying the type, context, and timing of the self-care activities.

The lack of findings at ambulation is consistent with some previous studies that did not find relaxation and music effective for pain, but is in contrast to others that did. The disparities among previous studies may have been related to methodological problems rectified in the present study by using a taped intervention, replication of measures, a randomized and adequate sample, and control of extraneous variables. Even with methodological refinements, however, the inteventions were not effective at ambulation.

The findings may have been related to a number of factors that provide direction for practice and future research. First, the difficulty of demonstrating an effect might have been due to higher and more variable pain scores than in previous studies. Future studies could compare effects of interventions on pain during the first versus the second ambulation. Second, providing patients with taped relaxation instructions rather than verbal instructions by the nurse may have reduced the effectiveness of the relaxation and combination interventions (Snyder, 1992). Comparisons of taped and live relaxation instructions would demonstrate their relative usefulness. Comparisons also need to be made between different ambulation directives given by the nurse and with different patient characteristics.

Use of relaxation or distraction techniques during initial ambulation may have been difficult for some patients. If interventions were not strong enough for the complex activity of ambulation, they might be more effective during simple rest in bed. Patient reports at the final visit indicated that most preferred to use the tapes in bed and reported them to be moderately to very helpful. Mullooly et al. (1988), in a randomized study with control for pretest pain, found that easy-listening music decreased pain and anxiety of patients in bed.

Other relaxation techniques may be more effective. To augment medication for surgical pain, the Acute Pain Management Guideline Panel (1992) has suggested several relaxation techniques. Jaw relaxation and slow rhythmic breathing could be compared during activity. Clenching the fists, going limp, and yawning might be appropriate during rest. Progressive relaxation techniques of tensing and relaxing oral and jaw muscles may be added to the teaching of jaw relaxation to increase awareness of tension and relaxation in muscles (Snyder, 1992). Other techniques were found in the literature. Patients who were taught to allow the abdominal wall to relax were found to have lower narcotic intake and greater observed comfort (Egbert et al., 1964). Horowitz et al. (1984) found that Benson's relaxation response reduced distress of pain during ambulation while

jaw relaxation had no effect on either sensation or distress. Levin et al. (1987) found in a small sample that Benson's technique resulted in less combined sensation and distress than the attention control group, but not the usual-care control group. The most appropriate and effective types of relaxation technique for postoperative activity and rest have not yet been identified.

The music selections used in this study should be compared to others. Effectiveness of music on physiological variables has been reported to be related to patients' liking the selections (Standley, 1986). Although 33 (79%) of subjects who received music liked the selections, only 8 (19%) loved them. The study tapes could be compared to self-selected music and to other types, tempos, and cultural preferences for music.

Future research should be focused on exploring appropriate interventions in relation to contextual and personal variables, and then determining effectiveness using a controlled experiment. This study provided support for the concurrent validity of the sensation and distress scales using the MPQ as a criterion. In the past, single-item measures have been said to lack the validity and sensitivity of multiple-item measures, but recent research indicates that single-item scales may be psychometrically acceptable measures of global patient ratings (Youngblut & Casper, 1993). Increasing support for these simple and direct scales means that they can be used with more confidence in the future.

Because relaxation and music interventions pose a low risk to patients and may reduce pain and side effects of medication in some people, their usefulness should continue to be explored in practice and research. Nurses may try them in interested, capable, and adequately medicated patients who need additional analgesia or wish to reduce side effects. Patients should be asked about their pain intensity before and after use, and whether they think the intervention is helpful. **NR**

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Please send requests for reprints to: Marion Good, PhD, RN, Frances Payne Bolton School of Nursing, Case Western Reserve University, 10900 Euclid Ave., Cleveland OH 44106-4904.

MARION GOOD, PHD, RN, is an assistant professor of Nursing, Case Western Reserve University, Frances Payne Bolton School of Nursing, Cleveland, OH.

References

ACUTE PAIN MANAGEMENT GUIDELINE PANEL. (1992). *Acute pain management: operative or medical procedures and trauma. Clinical practice guideline.* AHCPR Pub. No. 92-0032, Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services.

AIKEN, L. H. (1972, June). Systemic relaxation to reduce preoperative stress. *Canadian Nurse,* 38–42.

CECCIO, C. M. (1984). Postoperative pain relief through relaxation in elderly patients with fractured hips. *Orthopaedic Nursing, 3,* 11–14.

EGBERT, L. D., BATTIT, G. E., WELCH, C. E., & BARTLETT, M. K. (1964). Reduction of postoperative pain by encouragement and instruction of patients. *New England Journal of Medicine, 270,* 825–827.

FIELD, P. B. (1974). Effects of tape recorded hypnotic preparation for surgery. *The International Journal of Clinical and Experimental Hypnosis, 22* (1), 54–61.

FLAHERTY, G. G., & FITZPATRICK, J. J. (1978). Relaxation technique to increase comfort level of postoperative patients: A preliminary study. *Nursing Research, 27,* 352–355.

GAFFAM, S., & JOHNSON, R. (1987). A comparison of two relaxation strategies for the relief of pain and its distress. *Journal of Pain and Symptom Management, 2,* 229–231.

HEITZ, L., SYMRENG, T., & SCAMMAN, F. L. (1992). Effect of music therapy in the postanesthesia care unit: A nursing intervention. *Journal of Post Anesthesia Nursing* 7 (1), 22–31.

HOROWITZ, B., FITZPATRICK, J. J., & FLAHERTY, G. G. (1984). Relaxation techniques for pain relief after open heart surgery. *Dimensions of Critical Care Nursing, 3,* 364–371.

JEQUIER, E. (1987). Energy, obesity and body weight standards. *American Journal of Clinical Nutrition, 45,* 1035–1036.

JOHNSON, J. E. (1966). The influence of a purposeful nurse patient interaction on the patients' postoperative course. In *Exploring progress in medical-surgical nursing practice* (pp. 16–22). New York: American Nurses Association.

JOHNSON, J. E. (1973). Effects of accurate expectations about sensations on the sensory and distress components of pain. *Journal of Personality and Social Psychology, 27,* 261–275.

JOHNSON, J. E., LEVENTHAL, H., & DABBS, J. M. (1971). Contribution of emotional and instrumental response processes in adaptation to surgery. *Journal of Personality and Social Psychology,* 20, 55–64.

KIRK, R. E. (1982). *Experimental design: procedure for the behavioral sciences* (2nd ed.). Belmont, CA: Brooks Cole.

LEVIN, R. F., MALLOY, G. B., & HYMAN, R. B. (1987). Nursing management of postoperative pain: Use of relaxation techniques with female cholecystectomy patients. *Journal of Advanced Nursing, 12,* 463–472.

LOCSIN, R. (1981). The effect of music on the pain of selected post-operative patients. *Journal of Advanced Nursing,* 6, 19–25.

MADDEN, C., SINGER, G., PECK, C., & NAYMAN, J. (1978). The effect of EMG biofeedback on postoperative pain following abdominal surgery. *Anesthesia Intensive Care, 6,* 333–336.

MELZAK, R. (1975). The McGill Pain Questionnaire: Major properties and scoring methods. *Pain, 1* (3), 277–299.

MELZAK, R. (1982). Recent concepts of pain. *Journal of Medicine, 13,* 147–160.

MOGAN, J., WELLS, N., & ROBERTSON, E. (1985). Effects of preoperative teaching on postoperative pain: A replication and expansion. *International Journal of Nursing Studies, 22,* 267–280.

MULLOOLY, V. M., LEVIN, R. F., & FELDMAN, H. R. (1988). Music for postoperative pain and anxiety. *Journal of the New York State Nurses Association, 19* (3), 4–7.

OREM, D. (1991). *Nursing: Concepts of practice.* New York: McGraw Hill.

SNYDER, M. (1992). Progressive relaxation. In M. Snyder (Ed.), *Independent nursing interventions* (2nd ed., pp. 47–62). Albany: Delmar Publications.

SPIELBERGER, C. D. (1983). *Manual for the State-Trait Inventory. STAI (Form Y).* Palo Alto, CA: Consulting Psychologists Press.

STANDLEY, J. M. (1986). Music research in medical/dental treatment: Meta-analysis and clinical applications. *Journal of Music Therapy, 23,* 56–122.

SWINFORD, P. (1987). Relaxation and positive imagery for the surgical patient: A research study. *Perioperative Nursing Quarterly, 3* (3), 9–16.

UPDYKE, P. A. (1990). Music therapy results for ICU patients. *Dimensions of Critical Care Nursing, 9* (1), 39–45.

VOSHALL, B. (1980). The effects of preoperative teaching on postoperative pain. *Topics of Clinical Nursing: Pain Management, 2,* (1), 39–43.

WALL, P. D. (1979). On the relation of injury to pain. The John J. Bonica lecture. *Pain, 6,* 253–264.

WELLS, N. (1982). The effect of relaxation on postoperative muscle tension and pain. *Nursing Research, 31,* 236–238.

WILSON, J. F. (1981). Behavioral preparation for surgery: benefit or harm? *Journal of Behavioral Medicine, 4* (1), 79–102.

WINER, B. J., BROWN, D. R., & MICHELS, K. M. (1991). *Statistical principles in experimental design* (3rd ed.). New York: McGraw-Hill.

YOUNGBLUT, J. M., & CASPER, G. R. (1993). Focus on psychometrics: Single-item indicators in nursing research. *Research in Nursing and Health, 16,* 459–465.

ZEIMER, M. M. (1983). Effects of information on postsurgical coping. *Nursing Research, 32,* 282–287.

ZELLER, R. A., & CARMINES, E. G. (1980). *Measurement in the social sciences: The link between theory and data.* New York: Cambridge University Press.