Music Versus Distraction for Procedural Pain and Anxiety in Patients With Cancer

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Purpose/Objectives: To test the hypotheses that the effects of a music intervention are greater than those of simple distraction and that either intervention is better at controlling procedural pain and anxiety than treatment as usual.

Design: Randomized, controlled experiment.

Setting: A midwestern comprehensive cancer center.

Sample: 60 people with cancer having noxious medical procedures such as tissue biopsy or port placement or removal; 58 provided usable data.

Methods: Participants completed measures of pain and anxiety before and after their medical procedures and provided a rating of perceived control over pain and anxiety after the procedure.

Main Research Variables: Procedural pain, state anxiety, and perceived control over pain and anxiety.

Findings: Contrary to hypotheses, outcomes achieved with music did not differ from those achieved with simple distraction. Moreover, outcomes achieved under treatment as usual were not significantly different from those obtained with music or distraction interventions. Some patients found that the interventions were bothersome and reported that they wanted to attend to the activities of the surgeon and the medical procedure itself.

Conclusions: The effects of music, distraction, and treatment as usual are equivocal. In addition, patients have individual preferences for use of distraction during painful or anxiety-provoking procedures.

Implications for Nursing: Patients having noxious medical procedures should be asked about their desire to be distracted before and during the procedure and offered a strategy that is consistent with their preferences.

Key Points . . .

- Patients with cancer frequently experience noxious medical procedures that may provoke pain and anxiety. Cognitive-behavioral interventions such as music or distraction may help control pain for some patients having procedures.
- Although music may serve as a distracter, limiting attention available for pain, it also may influence pain by altering emotions, thoughts, and moods and by stimulating relaxation. However, in this study, the effects of music did not differ from those of simple distraction.
- Some patients want to attend to activities of the procedure and members of the healthcare team who are present. These patients may find cognitive-behavioral interventions to be bothersome and may prefer not to use them during the procedure.

Pain and anxiety are common symptoms experienced by people diagnosed with cancer (Bottomly, 1998; Cleeland et al., 1994; Newell, Swanson-Fisher, Girgis, & Ackland, 1999; Portenoy, Payne, & Jacobsen, 1999). Early in the experience of cancer, much of the pain and anxiety that patients experience is related to unfamiliar, frightening, and noxious medical procedures used in diagnosis and treatment of the disease such as tissue biopsy and placement of central venous access devices. Unrelieved pain and anxiety associated with these noxious procedures may lead to inability to complete procedures and withdrawal from therapy (Levin, Mermelstein, & Rigberg, 1999; Williams, 1997). Pain and anxiety experiences also may contribute to anticipatory distress and long-term psychological consequences such as intrusive memories, avoidance, and hyperarousal (Chrisler, 1994; Smith, Redd, Peyser, & Vogl, 1999). Cognitive-behavioral interventions such as the use of music or distraction may reduce procedural pain and anxiety. Although music can be used as a source of distraction, it also may reduce pain and anxiety by altering thoughts, emotions, or moods and by inducing relaxation (Chlan, 1998). Because of its additional mechanisms of action beyond merely distracting attention, music hypothetically may be more effective in the relief of pain and anxiety than a simple distraction intervention. The purpose of this study was to compare the effects of music, distraction, and treatment-as-usual (control) conditions on pain intensity and state anxiety in a group of patients having cancer-related medical procedures.

Background

Patients with cancer experience many medical procedures during the course of their illness. Diagnosis usually occurs with some type of invasive biopsy. For example, women with suspected breast cancer may have fine needle, core, or surgical breast biopsies; men with suspected prostate cancer may have prostate biopsies; and people with lymphoma may have lymph node biopsies. Treatment strategies such as chemotherapy often require the placement of central line catheters for extended or long-term infusions of chemotherapy, blood products, IV fluids, and, possibly, antibiotics or nutritional

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support. A recent study of patients' perceptions of pain associated with such medical procedures revealed a mean pain rating of 6.8 on a 1–10 scale for central line placement (Morrison et al., 1998). Kelly and Winslow (1996) reported mean pain intensity of 7.0 and mean anxiety of 5.3 (0–10 scale) in a sample of women undergoing needle wire localization for nonpalpable breast lesions. Puntillo et al. (2001) reported that less than 20% of patients undergoing potentially painful medical procedures received preprocedure opiates. Thus, patients may face moderate to severe pain and anxiety and often are left without medical intervention, forced to find their own methods of coping with the effects of noxious procedures.

Cognitive-behavioral interventions may be helpful in controlling the pain and anxiety associated with noxious medical procedures. These interventions are based on cognitive theory (Beck, 1993) and cognitive modulation of pain (Villemure & Bushnell, 2002) following the premise that people's thoughts and beliefs about a situation influence their responses and experiences. People's perceptions of pain may be changed using cognitive-behavioral interventions that influence beliefs, perceptions of control, and coping responses (Turk, 1996). More specifically, variables such as attention, emotion, and attitudes change perception and transmission of pain impulses through activation of the limbic system and sensory regions of the brain (Villemure & Bushnell). Mobily, Herr, and Kelley (1993), in their original work validating nonpharmacologic interventions for pain, identified distraction as a cognitive-behavioral intervention and listening to music as one strategy that could be used for distraction.

Distraction involves the purposeful focusing of attention away from undesirable sensations (McCloskey & Bulechek, 2000). This may be achieved by engaging in a mental activity such as counting, focusing on another stimulus, or becoming involved in a more enjoyable activity like reading or playing a game. Limited capacity theories propose that attentional resources are finite and attention toward one task draws from the resources available for other tasks (Johnson, Breakwell, & Douglas, 1998). Attending to a pleasant source of distraction occupies the capacity of the information processing system such that the individual is not capable of fully attending to the noxious stimulus. Less attention to this painful stimulus results in less perceived pain or anxiety. Distraction has been shown to be effective in helping children and adolescents with cancer cope with painful, distressing procedures and other treatments (Blount, Powers, Cotter, Swan, & Free, 1994; DuHamel, Redd, & Vickberg, 1999; Wint, Eshelman, Steele, & Guzzetta, 2002). Distraction using a three-dimensional video effectively reduced vasovagal reactions among people undergoing blood donation procedures (Bonk, France, & Taylor, 2001). Although distraction has been studied extensively in samples of pediatric patients with cancer, only a few studies have attempted to test these strategies with adult patients with cancer. Among adult patients with cancer, distraction interventions such as music, video games, and movies have been shown to be effective in relieving side effects of chemotherapy, including pain, nausea, and vomiting (Greene, Seime, & Smith, 1991; Rhiner, Ferrell, Ferrell, & Grant, 1993; Vasterling, Jenkins, Tope, & Burish, 1993).

The use of music as a cognitive-behavioral intervention commonly entails playing musical selections for patients during an episode of care to produce particular outcomes. The nursing interventions classification system defines music therapy as "using music to help achieve a specific change in behavior, feeling, or physiology" (McCloskey & Bulechek, 2000, p. 461). Music may be used in hospital settings by playing peaceful or soothing musical selections and allowing patients to listen with or without headphones. Investigators have noted the importance of allowing individuals to choose their own selection of music, as what is interpreted as soothing to one individual, actually may be annoying or distressing to another (Snyder & Chlan, 1999). Hirsch and Meckes (2000) identified specific benefits of using music in an oncology population, including increased control, decreased pain, and diminished anxiety.

Although music has been described as a strategy to produce distraction, advocates of the therapeutic use of music propose that it is more than just a source of distraction. Brown, Chen, and Dworkin (1989) proposed that music may be useful in producing pain relief through two distinct pathways: distraction of attention from pain and altering the affective dimension of pain by influencing mood or emotions. Pleasurable emotional states produced when patients listen to the music of their choice may allow them to express their feelings, relieving feelings of anxiety and hopelessness and enhancing perception of control (Daveson & Kennelly, 2000). Music may stimulate the brain to reduce stress hormones and exert a positive effect on emotional well-being through other hormonal pathways (Weber, Nuessler, & Wilmanns, 1997). Chlan (1998) described cognitive, affective, and sensory effects of music on a variety of health states. Investigators have described other mechanisms underlying the effects of music, including stimulation of the physiologic relaxation response (Beck, 1991; Magill-Levreault, 1993; O'Callaghan, 1996).

Research has demonstrated beneficial effects of music on chronic cancer-related pain and nausea and vomiting experienced during chemotherapy (Beck, 1991; Hilliard, 2001; Standley, 1992; Weber et al., 1997). Music has been used successfully to manage the discomfort and anxiety of flexible sigmoidoscopy (Chlan, Evans, Greenleaf, & Walker, 2000). However, music did not demonstrate any benefit in reducing pain or analgesic requirements during lithotripsy for renal stones (Cepeda, Diaz, Hernandez, Daza, & Carr, 1998), nor did it reduce state anxiety among patients undergoing treatment with radiation therapy for pelvic and abdominal cancers (Smith, Casey, Johnson, Gwede, & Riggin, 2001).

No research studies to date have focused on the use of music or distraction in adult patients with cancer experiencing procedural pain and anxiety. Therefore, assessing the impact of music and distraction interventions on a sample of patients with cancer undergoing noxious medical procedures would be useful. Because music has multiple mechanisms of action, the argument exists that music should have a greater effect on pain and anxiety than a simple distractive task alone. Thus, comparing these two interventions to determine whether music is more effective than distraction would be instructive.

The purpose of this pilot study was to compare the effects of music, distraction, and treatment as usual on pain and anxiety experienced by people with cancer during noxious medical procedures. Specific research hypotheses included

- People who receive a music intervention during a noxious medical procedure will report less pain and anxiety and more perceived control over pain than people who receive a distraction intervention.

- People who receive music or distraction during noxious medical procedures will experience less pain and anxiety and more perceived control over pain than people who receive treatment as usual (control group).

Methods

The study used a randomized, controlled, experimental design. Participants were assigned randomly to one of three conditions (experimental music intervention, experimental distraction intervention, or a control group [treatment as usual]) during a noxious medical procedure. A research nurse assisted participants in completing pain ratings and measures of state anxiety before and after the medical procedure. All study procedures received approval from the institutional review board prior to recruitment and data collection.

Sample and Setting

The study used a convenience sample of people diagnosed with cancer who were undergoing noxious medical procedures such as tissue biopsy or vascular port placement in the procedure room of an outpatient oncology clinic at a large midwestern comprehensive cancer center. To avoid differences in surgeon's practice patterns or interpersonal styles, recruitment was limited to patients being treated by one surgeon. Patients were excluded if they were unable to read and write in English or if they were not capable of completing questionnaires independently or with minor assistance from the researcher. A total of 69 patients met study criteria and were invited to participate; 60 of those agreed and completed study procedures. Data from two participants were excluded from analyses because experimental conditions had been contaminated. One participant assigned to the distraction group had an unusually long wait on the procedure table and requested music in addition to the distraction stimulus. One participant assigned to the control group was exposed to music when the surgeon requested that it be played while he was in the room.

Interventions

Music: People assigned to the music group (n = 24) selected a compact disc (CD) of their preferred style of music from a variety of music styles offered by the researcher. Participants listened to the CD through a portable CD player and headphones. One participant chose pop or rock, seven chose easy listening, four chose classical, three chose religious hymns, three chose jazz or blues, and six chose country music.

Distraction: People assigned to the distraction group (n = 14) were provided with their choice of a book on tape and a portable cassette player and headphones. A book on tape was chosen as the method of distraction for this study to minimize differences between the interventions other than the content of the audio stimulus itself. Both interventions occupied the auditory sensory modality, required the use of similar equipment, and demanded similar levels of patient involvement through attentive listening. Participants were allowed to select from a variety of story styles offered by the researcher. Eight participants chose humor, one chose poetry, one chose short stories, one chose mystery, one chose western, and two chose history. To ensure that patients attended to the story, they were informed of a short four- to five-item "quiz" on the content to be completed after their procedure.

Treatment as usual: Participants in the control group (n = 20) were asked to try to rest quietly prior to and during the procedure.

Because music and distraction were intended as adjuvant strategies for management of pain and anxiety, all participants were allowed to take analgesic medications or anxiolytics before and during the procedure based on their individual needs and physician preference. The same surgeon performed all procedures. No anxiolytic or analgesic medications other than local lidocaine were given routinely, but midazolam and morphine were available at patients' request. Use of analgesics or anxiolytics before or during the procedure did not differ among treatment groups.

Instruments

The research nurse recorded patient variables, including age, gender, ethnic heritage, education, yearly household income, type of cancer, procedure to be performed, previous procedures, and anxiolytic or analgesic medications used prior to or during the procedure.

Pain intensity was measured using a numeric rating scale. Participants were asked to rate the severity of their pain "right now" from 0 (no pain at all) to 10 (worst pain imaginable). This measure has been shown to be reliable and valid and has been recommended for use in clinical practice (Agency for Health Care Policy and Research, 1994). Ratings were made for three time points: prior to the procedure, during the procedure (retrospectively), and postprocedure.

Anxiety was assessed with the **Speilberger State-Trait Anxiety Inventory–state portion (STAI-s)** (Speilberger, 1983). The STAI-s measures feelings of apprehension, tension, nervousness, and worry. Scores increase in response to physical danger and psychological stress. The scale consists of 20 statements that evaluate how respondents feel "right now, at this moment," rated on a 1 (not at all) to 4 (very much so) scale, with potential scale scores ranging from 20–80. A sample item states, "I feel at ease." The scale has been demonstrated to be reliable and valid and has been used with patients with cancer (Morasso, Constantini, Baracco, Borreani, & Capelli, 1996). Cronbach's alpha for the STAI-s was 0.94 in this sample. The STAI-s was completed pre- and postprocedure.

Perceived control over pain and anxiety during the procedure was measured using a single-item rating created for this study. Participants were asked to rate their "overall sense of control over pain and anxiety" using a numeric rating scale with options ranging from 0 (absolutely no control) to 10 (complete control). The item was based on the single-item rating of control over pain from the Coping Strategies Questionnaire (Rosenstiel & Keefe, 1983), with response format changed from a 7-point scale to an 11-point scale for consistency with the current measure of pain intensity. A 0–10 numerical rating scale measure of control over pain has been used successfully in recent research by other investigators (Hawksley, 2000; Somov, 2000).

Procedures

The research nurse invited patients who met eligibility criteria to participate in the study when they arrived at the clinic on the day of their procedure. After they provided informed consent, participants completed baseline measures of pain and anxiety. Participants then were randomized to one of the three

treatment groups. Randomization was completed within categories of procedures (tissue biopsy, port placement or removal, or other) to ensure that the different types of procedures were distributed equally among the three study groups. The research nurse explained the treatment instructions to patients and provided them with necessary equipment (CDs, tapes, players, headphones). Participants in the treatment-as-usual control condition were asked to rest quietly prior to and during the procedure. Participants in the music and distraction groups began listening to their recordings after completing baseline pain and anxiety measures and continued listening until the procedure was completed. A comfortable level of volume was established as the recordings were started. A nurse was available to help participants adjust the volume throughout the study. Intervention conditions typically began about 5–15 minutes before the surgeon arrived to perform the procedure. All participants completed anxiety and pain ratings and the rating of perceived control over pain and anxiety after their procedure was finished. A retrospective rating of pain during the procedure also was determined at this time. Participants in the distraction group completed four brief, multiple-choice items regarding the story line of their chosen book on tape after their procedure was completed.

Data Analysis

All analyses were carried out using SPSS® software, version 10.0 (SPSS Inc., Chicago, IL). Descriptive statistics were used to summarize the demographic variables. Outcome variables analyzed included mean procedural pain rating (average of pain during the procedure and postprocedure), postprocedure anxiety score, and rating of perceived control over pain and anxiety. Outcomes were compared between groups using analysis of covariance (ANCOVA). Baseline pain rating, use of analgesic medications, and gender were included as covariates in analyses of mean procedural pain rating. Baseline anxiety score, use of anxiolytic medications, and gender were included as covariates in analyses of postprocedure anxiety score. Baseline pain rating, baseline anxiety score, use of analgesic or anxiolytic medications, and gender were included as covariates in analyses of perceived control over pain and anxiety.

Results

The majority of participants were Caucasian (n = 55), and the sample included 40 females (69%) and 18 males (31%). Their mean age was 53.28 years (SD = 15.71), and they had an average of 14.29 (SD = 4.87) years of education. A variety of cancer diagnoses were represented, with the most common being breast cancer (n = 17), lymphoma (n = 17), and leukemia (n = 9). Procedures performed included Hickman catheter or port placement (n = 30), breast biopsy (n = 9), lymph node biopsy (n = 8), Hickman catheter or port removal (n = 7), excision biopsy (n = 3), and hematoma evacuation (n = 1). Ten participants had undergone the same procedure in the past. These participants were distributed equally between the three groups. A total of 24 participants were randomized to the music intervention, 14 to the distraction intervention, and 20 to treatment as usual. Full demographic data are described in Table 1.

Mean and standard deviation scores as well as possible and observed ranges for pain and anxiety are reported in Table 2. No differences in demographic variables were noted between the music and distraction groups or between the experimental groups and the control group.

Results of ANCOVA indicated no differences in mean procedural pain, postprocedure anxiety, or perceived control over pain and anxiety between people assigned to the music intervention and those assigned to the distraction intervention. Mean procedural pain scores adjusted for covariates were similar for the music group ($\overline{X}$ = 2.33, SD = 0.37) and the distraction group ($\overline{X}$ = 2.76, SD = 0.49). Postprocedure anxiety scores were $\overline{X}$ = 33.45 (SD = 1.77) in the music group and $\overline{X}$ = 32.25 (SD = 2.40) in the distraction group. Ratings of perceived control over pain were $\overline{X}$ = 6.57 (SD = 0.55) in the music group and $\overline{X}$ = 6.61 (SD = 0.75) in the distraction group.

Mean procedural pain, postprocedure anxiety, and ratings of perceived control over pain and anxiety reported by people in the experimental groups (music and distraction) did not differ from those reported by the control group. Mean pain and anxiety scores adjusted for covariates in the control group were $\overline{X}$ = 1.47 (SD = 0.40) and $\overline{X}$ = 30.59 (SD = 1.93), respectively. Perceived control over pain and anxiety rating was $\overline{X}$ = 6.44 (SD = 0.60) in the control group. Unadjusted (raw) pain and anxiety scores at each measurement point are displayed in Figures 1 and 2.

Discussion

No significant differences were found in pain, anxiety, and perceived control outcomes between the music and distraction groups. The researcher hypothesized that music would distract attention and stimulate affective (mood and emotion) and relaxation mechanisms, resulting in larger effects than those achieved with simple distraction alone. This negative finding may indicate that music listening, used as a brief intervention to control procedural pain and anxiety, simply acts as a mode of distraction.

The patients assigned to the distraction condition were asked a series of four questions about the content of their book on tape to determine whether they were attending to the stimulus. Forty-seven percent (n = 7) answered all four questions correctly, 27% (n = 4) answered 3 questions correctly, 20% (n = 3) answered two questions correctly, and 7% (n = 1) answered all four items incorrectly. The majority of participants in the distraction condition answered at least one of these simple content items incorrectly. This may indicate that people in the distraction group were not fully attending to the distractive stimulus or that other things occurring during the procedure made them forget the correct answer. Unfortunately, the researcher could not determine whether people in the music group were fully attending to the music stimulus.

The researcher also hypothesized that people who had an opportunity to be distracted from the noxious experience by using music or a book on tape would experience less pain and anxiety and more perceived control than those who did not have these coping strategies available. Surprisingly, people in the control group reported similar pain, anxiety, and control ratings as the people in the experimental groups. Although differences were not significant, people in the control group appeared to fare better than those in the experimental groups. These findings are similar to those of Smith et al. (2001), who found no difference in anxiety ratings of men with cancer

Table 1. Demographic Variables by Treatment Group

Variable	Music (n = 24)		Distraction (n = 14)		Treatment as Usual (n = 20)		Total (N = 58)	
Age (years)								
$\bar{X}$ (SD)	51.96 (15.21)		55.50 (14.12)		53.30 (17.83)		53.28 (15.71)	
Education (years)								
$\bar{X}$ (SD)	14.46 (4.03)		13.21 (2.69)		14.85 (6.73)		14.29 (4.87)	
Variable	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gender								
Male	9	38	2	14	7	35	18	31
Female	15	62	12	86	13	65	40	69
Race								
Caucasian	21	88	14	100	20	100	55	95
Other	3	12	–	–	–	–	3	5
Diagnosis								
Breast	6	25	6	43	5	25	17	29
Lymphoma	5	21	4	29	8	40	17	29
Leukemia	6	25	–	–	3	15	9	16
Colorectal	2	8	–	–	1	5	3	5
Other	5	21	4	29	3	15	12	21
Procedure								
Line placement	12	50	8	57	10	50	30	52
Line removal	3	13	2	14	2	10	7	12
Biopsy	8	33	4	29	8	40	20	34
Hematoma	1	4	–	–	–	–	1	2
Had this procedure before	3	13	3	21	4	20	10	17
Used analgesics								
Preprocedure	2	8	1	7	1	5	4	7
During	1	4	–	–	–	–	1	3
Used anxiolytics								
Preprocedure	1	4	1	7	1	5	3	5
During	8	33	3	21	7	35	18	31

Note. Because of rounding, percentages may not total 100.

undergoing radiation therapy when listening to the music of their choice compared to men receiving standard care. Findings also are similar to those of Cepeda et al. (1998), who found no enhancement of pain management in people using music during lithotripsy procedures for renal stones. Results are not consistent, however, with those of Chlan et al. (2000), who demonstrated less discomfort and anxiety during screening flexible sigmoidoscopy procedures when patients used a single music therapy intervention compared to usual care.

The experimental conditions may not have been helpful in the current study because participants did not want to be distracted or inattentive during their medical procedure. Many of these patients were at an early point in their cancer trajectory experiencing their initial diagnostic work-up. At this early stage, people may have had a heightened need to monitor what was happening to them and their bodies. Being distracted from the activities of the surgeon and any information or feedback he may have had for them during the procedure could have added to their distress as they tried to make sense of their new cancer experience. In fact, three participants specifically commented that the music or distraction condition made them unable to hear and focus on the surgeon, implying that the intervention was a bothersome distraction as they tried to pay attention to the procedure. Some of these participants may have preferred to cope by monitoring what is happening to them, whereas others may have preferred to ignore the procedure. Miller (1987) and Miller, Fang, Diefenbach, and Bales (2001) described these personal styles of coping in response to both physical and psychological stressors as "monitors" (people who cope by attending to threatening cues) and "blunters" (people who cope by distracting themselves from threatening cues). Recent research using this conceptualization of monitoring and blunting styles has demonstrated that during medical procedures monitors cope better with symptoms when given procedural information and blunters cope better if they can be distracted from the experience (Bonk et al., 2001; van Zurren, 1998).

In contrast, people using the music or distraction intervention may have been unsuccessful because they were distracted from attending to the music or book on tape by the conversations and voices of the surgeon and other personnel in the room. Three participants commented that it was hard to concentrate on the book or music because the surgeon was distracting. In addition, two people indicated that either their pain or anxiety was too great for them to be able to concentrate on

Table 2. Pain and Anxiety Scores

Variable	$\bar{X}$	SD	Possible Range	Observed Range
Baseline pain	1.52	2.29	0–10	0–8
Pain during procedure	2.84	2.23	0–10	0–10
Pain postprocedure	1.43	2.19	0–10	0–10
Anxiety preprocedure	37.78	13.04	20–80	20–62
Anxiety postprocedure	32.17	12.42	20–80	20–72

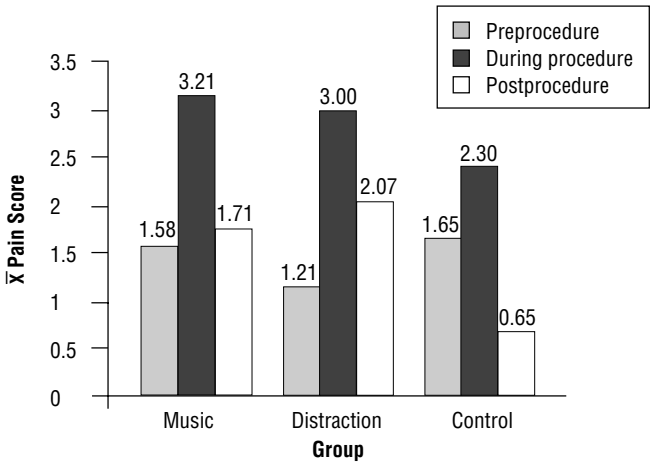

Figure 1. Pain Scores by Group at Baseline, During Procedure, and Postprocedure

Note. These scores are not adjusted for covariates (analgesics used, gender).

the music or distraction interventions. Many participants commented that they enjoyed the music or distraction stimulus (n = 22), particularly while waiting for the physician to arrive and the procedure to take place. Ten participants specifically stated that the music or distraction was "helpful" and gave them something else to think about. Only two people commented that they did not like their assigned intervention.

Participants in the control group were aware that other subjects had been given specific nonpharmacologic interventions for pain and anxiety during their procedures. This knowledge may have contributed to the lack of significant differences in outcome variables between the experimental and control groups. Participants in the control group may have consciously chosen to draw on their own strengths and coping behaviors because the researcher was not providing supplementary interventions to them. People in this group may have used innate coping strategies such as focused breathing or mental imagery to help themselves through the procedure. Because pain and anxiety are subjective variables, people in the control group may have rated these variables lower during and after the procedure because they were expecting pain and anxiety to be much worse without any nonpharmacologic intervention.

The participants' ratings of pain and anxiety during noxious procedures differ from those found by some investigators. In the current study, mean pain was rated as 2.84 (SD = 2.23), which is lower than ratings reported during central line placement (6.8 on a 1–10 scale) and needle localization for breast biopsy (7.0 on a 0–10 scale) in other investigations (Kelly & Winslow, 1996; Morrison et al., 1998). Pain ratings reported in the current study are similar, however, to those of Puntillo et al. (2001), who reported that average procedural pain among acutely ill adults ranged from 2.65–4.93 on a 0–10 scale. Anxiety ratings are more challenging to compare because of differences in measurement scales used. In the current study, mean anxiety prior to the procedure was 37.78 (SD = 13.04) and 32.17 (SD = 12.42) after the procedure, both in the lower third of the possible range (20–80). Mean anxiety reported with needle localization of breast lesion reported by Kelly and Winslow was 5.3, which is above the midpoint of the possible 0–10 range. Thirty-one percent of people in the current sample received anxiolytic medications during the procedure, but only 7% received analgesic medications prior to the procedure. This finding also is consistent with Puntillo et al.'s work, which indicated that less than 20% of patients received opiates prior to procedures that were known to produce pain. Interestingly, in the current sample, a significantly larger proportion of males (50%) received anxiolytic medications during their procedure than females (23%), (C^2 [1 (N = 58)] = 4.39, $p < 0.05$). No gender differences were noted in the use of analgesic medications.

After the study, participants provided comments about the interventions. Two people in experimental conditions commented that headphones were uncomfortable, and one person was bothered by fluctuations in volume. Several participants assigned to the distraction (book on tape) condition stated that they would have preferred music. None of the people assigned to the music condition commented that he or she would have preferred the book on tape. One inherent difficulty in randomly assigning participants to treatment conditions is that participants are not allowed to select the strategies that they prefer or with which they have more experience and skill. Consequently, people may be assigned to treatments that they are not able to use effectively or in which they are not particularly interested. Such skills and preferences for interventions may influence outcome expectancies and symptom relief achieved with the intervention (Kwekkeboom, 2001).

Limitations

This was a small sample, and, thus, results are not generalizable. Another limitation relates to the frequency and timing of anxiety assessments. The preprocedure anxiety rating was determined when patients were brought to the procedure room and positioned on the table, approximately 5–15 minutes before the doctor arrived. Anxiety was not measured again until the procedure was completed. An additional rating made just before the surgeon arrived and the procedure began could have assessed usefulness of the cognitive-behavioral interventions while waiting for the noxious procedure to begin. The experimental interventions possibly were more effective in reducing anxiety than treatment as usual while patients were waiting for the procedure to begin, but once the procedure started, anxiety may have increased with competing stimuli from the intervention and the procedure itself. A rating of anxiety during the procedure also may have yielded different results because anxiety may have abated once the procedure was over.

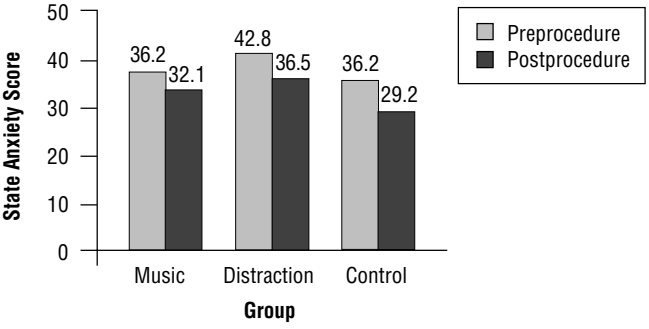

Figure 2. Anxiety Scores by Group Pre- and Postprocedure

Note. These scores are not adjusted for covariates (anxiolytics used, gender).

A small number of participants (n = 10) had undergone the same medical procedure at some point in their past. This previous experience could have influenced their experience of pain, anxiety, or perceived control during the current procedure. To determine if previous experience of the procedure influenced outcomes, analyses were repeated with this variable controlled; however, the results did not change.

Finally, although only about one-third of patients used medications, the effects of analgesics and anxiolytics may have been sufficient for those participants to be comfortable throughout their procedure, producing a relative floor effect that nonpharmacologic interventions could not improve upon.

Implications

A few practice implications can be made from the findings of this study. First, clinicians should ask participants if they are interested in using a strategy such as music or distraction while waiting for a procedure to begin. In selecting a treatment, nurses may find asking patients about their history with the strategies being offered and encourage the use of strategies that have been effective in the past to be helpful. Second, clinicians should ask patients whether they want to be distracted when the doctor arrives and during the procedure itself, or whether they would prefer to have more information, be told what is happening at each step, and be able to converse with the healthcare team present. In a recent systematic review of research, Evans (2002) suggested that although music has not been found to significantly reduce pain or anxiety associated with unpleasant procedures, it should be offered to all patients in situations that are known to be stressful because of its potential benefit. Patients also could be given the opportunity to use strategies such as distraction, imagery, or relaxation based on their personal preferences.

The effects of music on pain, anxiety, and perceived control over these symptoms during noxious medical procedures were not different from those of a simple distraction intervention in the current study. Moreover, the addition of music or distraction interventions did not result in significantly better pain, anxiety, or perceived control ratings compared to those achieved with treatment as usual. Desire for information and a need to monitor activities during the actual procedure itself may limit patients' abilities to benefit from these strategies during a procedure. In addition, the effects of these interventions over and above analgesic and anxiolytic medications may be too small to detect with subjective measurements. Puntillo et al. (2001) called for more individualized attention to preparation for, and control of, procedural pain. Patients may want to request music or distraction prior to the use of medications or up until the physician arrives and the procedure begins, but they may want the intervention to cease as the medications take effect and the procedure starts.

Future research is needed to compare the effectiveness of different types of distraction interventions, contrasting the effects of various activities or stimuli that occupy patients' attention. Investigators should consider measuring coping styles and compare the effectiveness of music and distraction interventions for procedural pain and anxiety within groups of people categorized as monitors or blunters. Further, if appropriate screening tools were developed, researchers could exclude people who do not have skill with the interventions being investigated or who are not interested in using the interventions. The potentially confounding effects of patient skill or preferences for treatment could then be eliminated prior to randomization.

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