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Training nursing students in evidence-based nonpharmacological pain management techniques

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Abstract

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Pain is a common and potentially debilitating condition. Whereas there is vast literature on developmentally appropriate behavioral techniques for pain management, results of curriculum evaluations and knowledge surveys reveal a dearth of awareness of these strategies in healthcare professionals. This study evaluated the effects of a brief didactic training program for student nurses in developmentally appropriate behavioral pain management strategies for children. Results indicated that students who received the training program had significantly more knowledge of behavioral strategies following the training program than they had evidenced before the program. Further, these participants evidenced higher knowledge following the training program than did participants in the control group. There was a non-significant effect of the training on attitude toward behavioral strategies. Comparisons of students' ability to implement behavioral pain management were also conducted. Results revealed that students who received training used a higher ratio of behavioral to non-behavioral strategies and implemented these strategies in a higher quality manner than students who did not receive training. Taken together, these results suggest that a brief training program in behavioral pain management can improve knowledge of behavioral pain management strategies and can improve nursing students' ability to implement these strategies.

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Pain in children continues to be under treated, despite the growing body of literature on effective pain management techniques (Craig, Lilley, & Gilbert, 1996). This is especially the case in inpatient settings in which estimates of clinically significant pain have reached as high as 21 to 49% of hospitalized children (Cummings, Reid, Finley, McGrath, & Ritchie, 1996). This statistic is alarming given the growing body of recent evidence suggesting long term impacts of early exposure to pain. For instance, childhood medical distress has been linked to adults' reports of pain and fear around medical events and avoidance of future health care (Pate, Blount, Cohen, & Smith, 1996). In addition, early painful procedures have been associated with increased behavioral sensitivity to later medical insults (Taddio, Goldbach, Ipp, Stevens, & Koren, 1995), a finding that is supported by recent physiological evidence indicating that activation of the nociceptive system can alter neuropathways (Woolf & Salter, 2000).

Overview of Pain Management Strategies

Given the vast array of negative consequences of pain, the need for effective treatment is clear. As such, much research has been dedicated to the validation of pain management techniques. In general, these techniques are divided into pharmacological, physical, and behavioral categories. To complicate terminology, behavioral and physical techniques are often combined under a "non-pharmacological" heading. Although often used by medical professionals to differentiate them from drug interventions, grouping behavioral and physical interventions ignores the unique mechanisms that are responsible for the efficacy of each. As a result, the use of the more specific terms of pharmacological, physical, and behavioral strategies is preferable.

Pharmacological strategies. Some of the oldest and most widely used pain management strategies are pharmacological in nature (Caraceni, Cheville, & Portenoy, 2000). Common pharmacological treatments for pain include opioid and nonopioid analgesics, and local, regional, and general anesthetics. Although coverage of the mechanisms of action of drugs is beyond the scope of this paper, it is important to note that pharmacological strategies are generally considered to be an effective first line of treatment for pain (Julien, 2001). These treatments are not without side effects, however. For example, the use of opioid medications has been associated with risk of addiction, sedation, nausea, vomiting, constipation, and respiratory depression (O'Mahony, Coyle, & Payne, 2001).

Physical strategies. In addition to pharmacological pain management interventions, several physical strategies have received support. Commonly used techniques include stretching and reconditioning, application of heat or cold, and transcutaneous electrical stimulation (TENS). Alternative physical interventions have also received recent empirical attention. For example, the use of massage (Hasson, Arnetz, Jelveus, & Edelstam, 2004) and acupuncture (Eshkevari, 2003) have both received empirical validation.

Behavioral strategies. A significant body of research exists to support the effectiveness of behavioral strategies in the treatment of pain. For example, distraction has received a great deal of empirical support in the treatment of immunization (for a review, see DeMore & Cohen, 2005) and other procedural pain in children (e.g., Cohen, Blount, Cohen, Schaen, & Zaff, 1999; Dahlquist, Pendley, Landthrip, Jones, & Steuber, 2002). Distraction has also received attention in a post-operative setting (Palermo & Drotar, 1999). Whereas distraction strategies generally include attempts to orient children's attention toward external objects (i.e., distractors), other strategies rely on other methods to refocus children's attention. For example, guided imagery

strategies attempt to focus children's attention on an imaginal scene, rather than on an external object. Guided imagery strategies have received empirical support in the treatment of post-operative pain in children, and have been associated with shortened recovery hospital stays (Lambert, 1996).

The theoretical explanation for the effectiveness of distraction and imagery techniques lies in their ability to divert attention away from the painful stimulus. McCaul and Malott (1984) hypothesize that the brain has a limited capacity to focus attention on stimuli. Therefore, using up attentional resources while engaging in a distracting task leaves little capacity for attending to painful stimuli. The Gate Control Theory of Pain proposed by Melzack and Wall (1965, 1995) offers a physiological explanation of the effectiveness of attention diversion. In brief, the Gate Control Theory explains that pain perception can be affected by factors other than the stimulus itself. This theory suggests that pain perception is controlled by a neural mechanism or "gate" in the spinal cord. Depending on how the mechanism is activated, the gate can be opened or closed. When the gate is open, pain signals are transmitted to the brain, and when the gate is closed, they are not. Melzack originally proposed this theory to explain why physically stimulating an area can lead to reduced pain perception, but later modified his theory to suggest that cognitive factors can also open or close the gate. Cognitive and behavioral processes, such as distraction and imagery, can close the gate to subsequent pain perception by diverting attention away from the painful stimulus and toward focal points.

Studies that have examined both behavioral and non-behavioral treatments have revealed several strengths of behavioral techniques. Results suggest that behavioral techniques alone can be as effective as pharmacological techniques for immunization pain (Cohen et al., 1999). Behavioral strategies alone may not be adequate to manage pain in all situations however. As

such, the combination of behavioral and nonbehavioral strategies has been evaluated. In addition, behavioral techniques used in conjunction with non-behavioral techniques have been found to be more effective than non-behavioral techniques alone for acute pain (Kazak et al., 1996). The use of combined interventions has been shown to be cost-effective, with patients receiving both behavioral and non-behavioral interventions requiring significantly fewer post-treatment follow-up medical visits (Cipher et al., 2001). Given the demonstrated clinical and cost effectiveness of behavioral strategies for pain management, the importance of the inclusion of these techniques in patient care is clear.

Pain Curricula in Nursing Training

Given the high prevalence and potential for functional impairment of pain, the necessity for adequate pain management is undisputable. Unfortunately, despite an abundance of literature on appropriate techniques, pain management in children continues to be an issue (Cummings et al., 1996). Therefore, addressing the factors that serve as barriers to adequate treatment is important. In particular, it is important to target those individuals who are primarily responsible for the assessment and management of children. In many inpatient and outpatient settings, one such group of individuals is the nursing staff.

One barrier that appears to contribute to difficulty in the management of pain in children is the relative lack of pain management curricula in nursing training. This is especially the case with respect to behavioral techniques and children. For example, Zalon (1995) conducted a survey to evaluate the nature of pain management training provided to nursing students in associate and bachelor degree programs. Results indicated that a relatively small amount of the nursing curriculum was devoted to such training. Programs reported, on average, only 9.6 clock hours of instruction dedicated to pain. Of these, an average of only 2.9 hours was devoted to

coverage of non-pharmacological techniques. Non-pharmacological strategies receiving coverage were both behavioral and non-behavioral in nature and included massage, application of heat or cold, relaxation, distraction, and imagery. Although some programs reported the use of both theoretical and practical information on these techniques, the vast majority of program respondents reported that these strategies were "just mentioned" (p. 264). Unfortunately, the authors did not provide an estimate of the total number of clock hours in nursing curricula reviewed, nor did they provide information on number of hours of experiential training. Without this information, the findings are difficult to interpret. It appears, however, that the coverage of pain in nursing curricula is not proportionate to the incidence of pain or the impairment caused by the condition.

Ferrell, Virani, Grat, Wallerand, and McCaffery (2000) conducted a content analysis of 50 of the most frequently used nursing textbooks and evaluated their coverage of pain-related material. Of the 45,683 pages reviewed, 249 included pain content. Results examining the coverage of non-pharmacological interventions were promising. Half of the textbooks provided such information, with a total of 61 pages dedicated to behavioral and physical interventions. Although this appears to be a relatively low figure, it is interesting that it almost doubles the 31 pages dedicated to pharmacological interventions. The authors note that non-pharmacological strategies were presented in a positive manner, but that the level of detail provided on these strategies was inadequate to prepare nursing students to use them effectively. No information on the amount of child-specific coverage was provided.

Pain Management Knowledge in Nursing

Given the lack of training, it is not surprising that nurses' knowledge of pain management has been shown to be low. This is especially the case in knowledge of non-pharmacological

techniques (Titler & Rakel, 2001) and techniques appropriate for children. Pederson, Matthies, and McDonald (1997) evaluated pain management knowledge in a sample of pediatric critical care nurses. In addition to an inadequate understanding of analgesic medications for children, nurses in this study were not aware of the potential benefits of cognitive-behavioral treatments (e.g., modulation of pain signal transmission). Salantera, Lauri, Salmi, and Helenius (1999) conducted a similar study with nurses working on pediatric wards. Again, a lack of familiarity with developmentally appropriate non-pharmacological techniques was evidenced. Twenty one percent of 265 nurses failed (i.e., responded to less than 50% of items correctly) a survey evaluating knowledge of non-pharmacological interventions for pain in children. Not surprisingly, this lack of knowledge translated into the lack of use of these strategies, with only 50% of nurses reporting use of any behavioral or physical technique (e.g., distraction, massage) for children in pain. Notably, although several studies collected self-reports of use of behavioral interventions for pain, none examined the relations between knowledge of interventions and self-reported use. Further, no study evaluated relations between knowledge and actual ability to implement behavioral pain management strategies.

Taken together, results of curriculum evaluations and knowledge surveys demonstrate an overwhelming need for the education of nursing professionals in the area of pain. Whereas all pain management topics are important, there seems to be an especially large gap in the need for further training in behavioral and developmentally appropriate techniques.

Review of Pain Management Training Research

Researchers have recognized the lack of training and corresponding lack of knowledge of pain management strategies in nursing professionals. To address this inadequacy, several authors have developed and evaluated programs to teach pain management skills. Whereas the primary

purpose of all of these programs is to provide training in pain management, there is wide diversity in both the depth and the breadth of information they include. For example, some programs include coverage of behavioral interventions when others do not. In addition, some programs contain information that is applicable to the general population when others contain child-specific information. In terms of populations receiving the training, some programs target practicing nurses whereas others provide training to practicing healthcare professionals in all disciplines, and still others target healthcare professionals in training (i.e., students). Summaries of these training programs are provided in Tables 1 and 2. For greater detail on design, statistics, outcome measures, and results of studies see Tables 3 and 4.

Training practicing nurses. Several studies examined the effects of training programs provided as continuing education to practicing nurses. For example, Fisher, Nurse, and Kennedy (1989) examined a training program designed to train practicing nurses in behavioral techniques for general (i.e., not child-specific) pain management. Their program was designed to teach both behavioral principles (e.g., reinforcement and punishment) and pain management strategies. Results indicated significant positive changes from pre- to post-training on an author-designed measure of nurses' knowledge of general behavioral principles (e.g., reinforcement and punishment) and attitudes toward disabled persons. Although not statistically tested, the authors report that when confronted with a patient complaining of unrelieved back pain after being medicated, nurses offered more adaptive responses (i.e., encouraging behavioral coping strategies) following the program than they did before the program. Although these results are promising, nurses' ability to identify specific problem behaviors that interfered with patient pain management on their unit remained unchanged from pre- to post-training.

Whereas Fisher and colleagues (1989) provided training in generally applicable behavioral techniques, Pederson (1996) examined a program presenting child-specific behavioral techniques for pain management. In this study, a pre-test post-test design with the inclusion of a control group was used to evaluate changes in nurses' knowledge of, and perceived comfort with administration of the behavioral techniques. *T*-test comparisons revealed that treatment group nurses' knowledge of, and comfort using deep breathing, relaxation, imagery, and cognitive restructuring were significantly higher post-program than pre-program. Further, results indicated that the treatment group demonstrated more knowledge of all five interventions and reported more comfort using cognitive restructuring than the control group.

In addition to provision of training in behavioral techniques alone, several studies evaluated programs that included information on both behavioral and non-behavioral (i.e., physical and pharmacological) pain management for the general population. Three studies evaluated changes in practicing nurses' knowledge and attitudes following the implementation of a program containing this type of information (Ferrell, Grant, Ritchey, Ropchan, and Rivera, 1993; Francke, Luiken, Garssen, Abu-Saad, and Grypdonck, 1996; Lasch, Wilkes, Lee, & Blanchard, 2000). Variations in program content (e.g., hands-on experience versus didactic only), content coverage (number of behavioral strategies), and method of evaluation (knowledge and attitudes versus report of practice behavior) were evident across studies. However, results were generally consistent with improvements evidenced from pre- to post-program on all measures. In addition, all studies demonstrated that gains were maintained at a follow-up evaluation.

One study provided information on child-specific combined behavioral and non-behavioral pain management strategies. Knoblauch and Wilson (1999) evaluated the effects of

their program by examining patient outcomes, rather than nurses' knowledge and attitudes. The authors conducted chart reviews to ascertain the use of analgesics in a convenience sample of 22 pediatric post-surgery patients treated before and 20 children treated after the program (all surgeries were tonsillectomies/adenoidectomies). Results revealed that children treated after the program waited significantly *longer* for their first dose of analgesics and received *fewer* doses of this medication than children treated before the program. Interpretation of this result is difficult because the authors did not assess nurses' use of behavioral strategies. It is possible that children may have waited longer for analgesic administration because professionals were using nonpharmacological strategies more effectively following training. If nonpharmacological strategies decreased pain, then fewer analgesic agents would be required.

Training practicing healthcare professionals. Although nurses are unquestionably important figures in the management of pain, many other healthcare professionals are involved in patient care. As such, several studies included samples of healthcare professionals from disciplines other than nursing. Four studies evaluated effects of training programs on participants from various disciplines (e.g., physicians, nurses, psychologists, social workers). Breitbart, Rosenfeld, and Passik (1998) found positive attitude and knowledge changes following implementation of an ambitious, multicomponent program. Results of Zaza and Sellick (1999) were less encouraging and found that most of those professionals who participated in their programs felt that the sessions had no effect on their perceptions or planned use of the strategies. However, some positive effects were evidenced in this study, with professionals perceiving behavioral strategies to be more efficacious post-program than they had pre-program.

Brown (2000) reported on a system-wide attempt to improve pain management in adults and children in two rural hospitals. As with previous studies, following the program,

improvements were evidenced on knowledge and attitudes, as were improvements in the documentation of pain by nurses and physicians. Further, there was more documented use of non-pharmacological pain management techniques following the program than before the program. Finally, Solomon, Walco, Robinson, and Dampier (1998) showed that a training program could result in skill acquisition. Following a training program, 94% of healthcare professionals "attained high levels of skill" (p. 194), although the criteria upon which this classification was made was not specified.

Training students in healthcare professions. Two studies (Jones, 1999; Wilson et al., 1992) evaluated the effects of training programs provided to students in the health care professions. Wilson et al. evidenced some positive changes in medical students' knowledge and attitudes about pain management, although results indicated no change in students' overall knowledge of the frequency of pain problems and no change in their perception of the clinical difficulty of treating pain patients. Jones examined the effect of a training program provided to emergency residents on patient outcomes. According to self-report, patients treated after the program achieved a greater amount of pain relief than patients treated before the program did. Further, although not tested statistically, more patients treated after the program reported clinically significant post-treatment reductions of pain than those that were treated before the program did.

Taken together, these studies are promising in that they suggest that training programs may be an effective means of impacting patient pain management. These results must be interpreted with caution however, as the literature contains several conceptual and methodological limitations.

Critique of Pain Management Training Research

Summaries and conclusions based on the previously discussed research must consider the methodological and conceptual limitations in this body of literature. A recent paper by MacLaren and Cohen (2005) highlights some of these limitations. One limitation is the relative absence of justification for which pain management techniques were included in programs. Knoblauch and Wilson (1999) stated that their program was based on recommendations provided by the Agency for Healthcare Policy and Research, but did not include further discussion. Only three studies offered empirical data to support their programs (Francke et al., 1996; Pederson, 1996; Solomon et al., 1998). This lack of justification is especially concerning as some of the interventions that received coverage in these programs have not received empirical support. For example, Jones (1999) offered information on three behavioral strategies: room atmosphere, music, and positive reassurance. Although not much more information was offered as to the nature of the coverage of these interventions, positive reassurance has been found to correlate with *increased* patient pain and distress during acute medical procedures (e.g., Blount, Sturges, & Powers, 1990; Gonzalez, Routh, & Armstrong, 1993).

The nature of the outcome measures used in these studies also presents potential problems. The exclusive use of self-report measures by most of these studies is problematic. Although self-report offers valuable data, this means of evaluation is flawed as participants can manipulate their responses in reaction to demand characteristics. This is especially the case in studies that assessed participants' attitudes toward pain management in which more positive responses were clearly more desirable (e.g., Lasch et al., 2000). Unfortunately, only four studies used outcome measures other than self-report. Solomon and colleagues (1998) were the only

authors to conduct direct observations of participants' skills in administering behavioral pain management strategies. Although results of this study demonstrated that participants could indeed implement the strategies taught, it is important to note that the behavioral observations were conducted in an experimenter designed and administered setting. This procedure limited the generalizability of these results to actual clinical care. Three studies (Brown, 2000; Jones et al., 1999; Knoblauch et al., 1999) used patient-care indicators (e.g., patient pain reports, administration of analgesia) instead of participant reports or performance to assess program success. Although these studies hold promise because they demonstrate that training can impact patient care, none collected self-reports from program participants. Collecting both forms of assessment information would have allowed the authors to examine the relations among changes in participants' self-reported knowledge and attitudes and changes in patient care.

In addition to problematic outcome measures, the failure to include control groups in most training research limits the internal validity of these studies. Although many studies evidenced improvements in variables of interest from pre-program to post-program assessment, the lack of control groups limits the ability to conclude that these changes were due to implementation of the program. It is possible instead that the passage of time or some other potential confounding factor was responsible for the results. Three studies should be recognized for their use of a control group (Franke et al., 1996; Lasch et al., 2000; Pederson, 1996). In particular, the study by Lasch and colleagues is especially strong because it included both a non-treatment and a didactic only treatment control. Results of these studies should still be viewed with caution however, as none of the authors reported on how participants were assigned to treatment or control groups. Without random assignment to groups, the validity of differences found between control and treatment participants may be questionable.

In addition to evaluating the efficacy of training programs in the production of immediate effects, it is important to assess the durability of these effects over time. In this case the use of follow-up evaluation is warranted. Unfortunately, few studies included follow-up evaluations of their procedures, and of these, still fewer considered attrition rates. For example, Lasch and colleagues (2000) and Zaza and Sellick (1999) reported favorable results on follow-up data at one year and three months respectively. Neither reported on the number of original participants who completed follow-up however, limiting the interpretation of these results. Unfortunately, the one study that provided this information (Wilson et al., 1992) had low response rates, with only 41% of the original sample completing follow-up measures. Attrition is potentially problematic because it can result in a lack of representativeness of participants who completed follow-up evaluations. It is possible, for example, that those participants who were impacted most positively by the programs were those who responded to follow-up evaluations.

Summary and Current study

In sum, pain is a common and potentially debilitating condition. Although several effective and developmentally appropriate behavioral techniques for pain management exist, results of curricula evaluations and knowledge surveys reveal a dearth of awareness of these strategies in healthcare professionals. As a result, the development and evaluation of pain management training programs is an important endeavor. Although research thus far has revealed several potential benefits of such programs, further systematic work is warranted to determine effective ways to deliver training.

This study was designed to replicate and extend previous findings in the area of pediatric pain management training by evaluating the effects of a training program in behavioral pain management strategies provided to nursing students. Similar to other studies, the current study

evaluated whether didactic training can result in increased knowledge and more favorable attitudes of developmentally appropriate behavioral pain management strategies when compared to no training. Further, this study extended previous findings by evaluating whether such training resulted in the ability to implement these behavioral strategies and also whether these gains are evident at follow-up.

Five primary aims were addressed in this study: 1) To determine whether training in evidence-based behavioral pain management strategies could impact nursing students' attitudes about behavioral pain-management for children; 2) To determine whether training could increase nursing students' knowledge of evidence-based behavioral pain-management strategies for children; 3) To determine whether changes found after the training program were still evident at 3-month follow-up; 4) To determine whether training could result in nursing students' abilities to implement behavioral strategies in a clinical role-play setting; and 5) To explore whether nursing students' attitudes toward, and knowledge of nonpharmacological pain strategies predicted their ability to implement these strategies in a clinical role-play setting.

Method

Participants

Participants were 58 nursing students recruited from the pediatric clinical rotation of the junior-level class of the School of Nursing at West Virginia University (WVU). Junior-level nursing students were selected because of two curriculum-related issues. First, nursing students at the junior level have received an education module on pain and would therefore have a background in this subject. Second, junior-level WVU nursing students are enrolled in a pediatric nursing class, providing them with a clinical opportunity to practice the administration of nonpharmacological pain management strategies with children.

The structure of the nursing program is such that junior-level students are divided into four groups, receiving their pediatric training in successive quarters. Students were recruited for the current study during the third and fourth quarters of the 2004-2005 academic year and the first quarter of the 2005-2006 academic year. All students who were approached agreed to participate, resulting in a sample of 58 participants; 21 participants from the third quarter, 20 participants from the fourth quarter, and 17 participants from the first quarter. Three participants in the third quarter, one in the fourth quarter, and four in the first quarter were absent on the day of post evaluation and therefore did not complete role-play or post questionnaires. One participant in the second quarter completed the post questionnaires, but did not complete the role-play. One participant in the fourth quarter completed the role-play, but not the post questionnaires. Participants missing both post questionnaires and role-play were removed from analyses, resulting in a final sample of 50 participants (18 from third quarter, 19 from fourth quarter, and 13 from first quarter).

Participants were mostly female (92%) and Caucasian (92%), with additional participants identifying themselves as African American, Hispanic, Native American, and Other ethnicity (2% each). Participants ranged in age from 19 to 35 years (M = 22.02 years, SD = 3.41 years). Mean estimated GPA in nursing theory courses was 3.35 (SD = .41), and in nursing clinical courses was 3.52 (SD = .44). Twenty-nine (58%) of participants reported that they were considering specializing in Pediatrics, 23 (46%) were considering specialization in maternal-child, 20 (40%) were considering specializing in critical care, and 16 (32%) were considering specializing in emergency medicine. Other specialty areas being considered included geriatrics (14%), surgery (10%), psychiatry (6%), anesthesia (4%), rural/community (4%), and operating room (2%).

Measures

Demographic information form (Appendix A). Nursing students completed a short demographic questionnaire to assess their age, gender, race, and annual income. In addition, students provided estimates of their grade point averages (GPA) in nursing theory and clinical classes and specified what areas of nursing specialization they intended to pursue.

Experience and education questionnaire (Appendix B). The Experience and Education Inventory (EEI) was developed for this study. Participants responded to 9 items ascertaining their perceived level of experience and education in three areas: pain-related issues, children (e.g., child development, pediatric nursing classes), and psychology. Participants also provided ratings of their perceived familiarity with pharmacological, physical (e.g., massage, physical therapy), and psychological (e.g., relaxation, imagery) pain management strategies. All ratings were made using 5-point Likert scales with the anchors "Not at all" and "Very Much."

Knowledge and attitudes questionnaire (Appendix C). The Knowledge and Attitudes of Pain Management Questionnaire (KAPMQ) is a measure designed by the primary investigator in collaboration with colleagues in the Department of Psychology and School of Nursing at WVU. The questionnaire includes a vignette presenting a case-scenario of a child in pain and a series of short and long-answer questions. Three versions of the vignette were developed to assess participants' management of pain in three contexts (tumor, post-surgical, and procedural-fracture setting). Participants responded to one vignette at each time point (baseline, post, and follow-up evaluation). The order of vignette presentation was counterbalanced across participants. The vignettes were designed by a faculty member responsible for supervising students in the pediatric clinical rotation in the school of nursing. The content of the vignettes were chosen by this faculty member to represent typical pain management cases on the pediatric

ward. In response to the vignettes, students were asked to identify all possible strategies for managing the child's pain. Pain management methods identified by participants on the vignette portion of the knowledge questionnaire were coded into one of three categories: Pharmacological, Physical, and Behavioral. An undergraduate research assistant who was blind to study hypotheses and participant group coded each response using operational definitions provided (Appendix D). To ensure reliability of coding, an independent, trained research assistant coded 20% of the questionnaires. Results of reliability analyses revealed a Kappa of 0.72, indicating a Good level of agreement in coding of number of behavioral strategies (Fleiss, 1981).

In addition to the vignette, the KAPMQ consists of six multiple choice and three short-answer items. Each multiple-choice question has a maximum value of 1 point, whereas the maximum values for short answer questions range from 2 to 4 points. The maximum total score on this portion of the KAPMQ was 14 points. Knowledge scores from the KAPMQ were derived by adding the number of behavioral strategies identified by the participant on the vignette to the participant's score on the multiple choice and short answer questions on the measure (items 2-10). For example, if the participant scored 12 on items 2-10 and identified 2 behavioral strategies in response to the vignette, their score would be 14.

Three items designed to measure attitudes toward pain management were included at the end of the KAPMQ (items 11-13). These items were ratings of the perceived effectiveness of pharmacological, physical (e.g., massage, physical therapy), and psychological (e.g., relaxation, imagery) pain management strategies. All ratings were made using 5-point Likert scales with the anchors "Not at all" and "Very Much." For the purposes of this study, attitudes toward psychological pain management strategies was used as the dependent variable. Questionnaire

methods of gaining information on participant's knowledge and attitudes are consistent with prior research strategies (e.g., Brown, 2000).

Role-play scenario. In order to assess abilities to implement behavioral pain management strategies, students participated in a role-play in which a confederate presented as a child with uncontrolled pain and another confederate who presented as the child's primary caregiver. Confederates were 3 undergraduate research assistants from the Department of Psychology. One confederate portrayed the parent in all, another research assistant portrayed the child in 23 role-plays, and a third research assistant portrayed the child in 27 role-plays. Analyses indicated no significant difference in number of behavioral techniques, t (45) = 0.69, *ns*, ratio of behavioral techniques, t (45) = 0.24, *ns*, or rate of behavioral techniques, t (45) = 0.193, *ns*, between research assistants. Confederates were trained by the primary investigator with input from a WVU nursing faculty member. Specifically, confederates were educated about the typical behavior of a parent and child following surgery. Confederates were provided with a script to follow to help standardize the role-play (see Appendix E). The following information was included in the script: (a) Personal information about the character that they were portraying. For the child confederate, this included age, hobbies, favorite sports, and family make-up. For the parent confederate, this included age and family makeup. (b) Type of surgery undergone by the child and medication administered. (c) Information regarding experience in the medical setting (i.e., this is the child's first surgery and first time in hospital).

The scenario was developed by four faculty members from the School of Nursing and was designed to approximate an actual clinical case in which behavioral pain management strategies would be appropriate recommendations. The participant was provided with the status of the mock patient (i.e., diagnosis, history of pain treatment, current pain rating) and informed

that they should behave as if this was a real patient, displaying all behaviors that they would if in an actual clinical setting. Role-plays were limited to 5 minutes and were videotaped. The short period of time provided to the participants was chosen to simulate time constraints placed on nurses in actual clinical practice. Due to space limitations, role-plays took place in 2 different settings (nursing laboratory and conference room). Materials typically accessible in patient rooms (books, toys, etc.) were made available in all settings.

Pain management strategies used by participants were coded into three categories in the same manner as responses to the knowledge vignettes. Given that a goal of the study was to examine how well participants implemented behavioral strategies, the quality of implementation of each of these strategies was assessed. Participants' implementation of each behavioral strategy was coded for the presence or absence of the following quality indicators: Rationale, Instruction, Modeling, Coaching, and Parent Inclusion. Thus, role-play scores could range from 0 to 5 for each behavioral intervention used by the participant. If more than one behavioral intervention was used by a participant, an average quality score was computed by adding individual scores for each behavioral intervention and dividing by number of behavioral interventions implemented. For example, a participant who scored a 3 for on use of distraction and a 4 on use of guided imagery received a mean quality score of 3.5. An undergraduate research assistant who was blind to study hypotheses and participant group coded each response using operational definitions provided (Appendix F). To ensure reliability of coding, an independent, trained research assistant coded 20% of the role-plays. Results of analyses revealed a Kappa value of 0.79, indicating a Good level of agreement between raters on number of behavioral strategies identified (Fleiss, 1981).

Procedure

A flow chart depicting the procedure is included in Figure 1. Data collection began in the third quarter of the 2004-2005 academic year and continued into the fourth quarter of the 2004-2005 academic year and the first quarter of the 2005-2006 academic year. Students who were enrolled in Pediatrics during this quarter were informed of the study and all agreed to participate. Students all provided informed consent and were assigned to one of two treatment groups, Training or Control. Given that students enrolled in Pediatrics are assigned to one of two clinical rotations (Wednesday and Friday or Tuesday and Thursday), treatment group assignment was dependent on clinical rotation. Assignment of clinical rotation was randomly made by the nursing school administration. Data collection took place on Thursdays and Fridays. Those students who were in the Wednesday and Friday clinical rotation were assigned to the training condition, whereas those who were in the Tuesday and Thursday clinical rotation were assigned to the control condition. This group assignment procedure was selected because students within clinical rotations have a great deal of contact with one another. It is therefore possible that those who received training may be likely to share this information with their counterparts who did not. Providing the same treatment (i.e., Training, No training) to all students in a clinical rotation minimized the potential of treatment diffusion. Collection of data from the Control group before the Training group minimized the potential that Training participants would share their experiences and information provided in the training program to participants in the Control condition.

Training program. The training program was provided once in each academic quarter. Training was completed in small group formats of approximately 6-8 students in a classroom. Participants in the training group received a 20-minute didactic information session on

behavioral techniques for pain control in children. Only information that had received consistent empirical support was included in the program. The training session included a rationale for the efficacy of behavioral techniques as well as "how to" sessions on the implementation of two strategies: distraction and guided imagery. These two strategies were chosen because of their relative ease of implementation and their wide basis of empirical support. In fact, both strategies have been included in a review of empirically-supported treatments for acute pain in children (Powers, 1999). Unfortunately, no research has been conducted on the best means to provide training in pain management strategies. A fair amount of research has been conducted on training in other areas of child psychology, however. For example, literature in the area of parent-training for children with disruptive behavior is extensive and several important components of this training have been identified (e.g., Forehand & Long, 1996; Hembree-Kigin & McNeil, 1995). Based on this literature, five components were identified to receive coverage in the current training program: rationale, instruction, modeling, coaching, and parental involvement. The importance of using each of these components in the implementation of pain-management strategies with children was emphasized in the current training program.

Training involved the use of slides and followed a script (see Appendix G); however, some flexibility in presentation style and minor wording was allowed to simulate actual classroom teaching and increase interest level. Students were provided with handouts of the training program slides for reference at the conclusion of the program. At the end of the program, students were instructed to practice implementation of these strategies over the next week as a homework assignment. Participants in the control condition did not receive information or training.

After providing informed consent, participants in both groups completed the demographic questionnaire, KAMPQ (with one version of vignette), and EEI. The training program was then provided to the Training group. Post assessments were conducted one to three weeks following baseline assessments. The variation in time between assessment points was a result of data collection difficulties (inclement weather, unexpected absences). This variation did not appear to be problematic however as there were no significant relations between baseline-post time and dependent variables (Knowledge, $r = 0.23$, Attitude, $r = 0.14$, Role play number of behavioral strategies, $r = 0.11$, Role play ratio of behavioral strategies, $r = 0.15$, Role play quality of behavioral strategies, $r = 0.28$, all ns. At post assessment, participants completed the KAPMQ (with a counterbalanced version of the vignette) and clinical role-play. In addition to immediate evaluation of program outcomes, follow-up assessments were conducted to evaluate the durability of any evidenced changes. The KAPMQ (containing the version of vignette not yet presented) and EEI were sent to participants approximately 3 months following the initial assessment session. A question was added to the end of the KAPMQ to ascertain how aware the participant was of what was offered to the other treatment group. Email prompts were sent to participants who did not return questionnaires after two weeks. Phone calls were placed to participants who had not returned questionnaires after one month.

Results

All Analyses of Variance (ANOVAs) and regression summary tables are included in Appendix H.

Preliminary Analyses

Treatment condition. Preliminary analyses were conducted to determine whether the Training group differed from the Control group on demographic or experience variables (see

Table 5). Results of *t*-test analyses indicated no significant differences between groups on age, *t* (48) = 0.37, *ns*, estimated GPA in nursing theory and clinical courses, *t*s (48) = .02 and 1.7 respectively, *ns*, or familiarity with psychological treatments for pain, *t* (48) = .07, *ns*. Chi-square analyses indicated no significant differences between conditions on sex, χ^2 (1) = .92, *ns*, race, χ^2 (1) = 4.3, *ns,* or intent to specialize in pediatrics, χ^2 (1) = .28, *ns.*

Treatment diffusion. Participants responses on an item rating their awareness of what was offered to the other treatment group (0 = not at all aware, 5 = extremely aware) were examined at follow-up evaluation. Mean awareness rating of participants who returned follow-up measures (n = 15) was 2.4 (*SD* = 1.24). There was no difference between ratings of Training participants' and Control participants' awareness, *t* (13) = 0.87, *ns*.

Academic quarter. Given that data was collected during three academic quarters, preliminary analyses were conducted to determine whether nursing students participating during each of the academic quarters differed on demographic or experience variables differed across academic quarters (see Table 5). Results of one-way analyses of variance (ANOVAs) indicated no significant difference across academic quarters on age, *F* (2, 47) = 1.39, *ns*, estimated GPA in nursing theory and clinical courses, *F*'s (2, 47) = .51 and .41 respectively, *ns*, or familiarity with psychological treatments for pain, *F* (2, 47) = 2.21, *ns*. Chi-square analyses indicated no significant differences across academic quarters on sex, χ^2 (2) = 2.69, *ns*, race, χ^2 (8) = 9.48, *ns,* or intent to specialize in pediatrics, χ^2 (2) = .36, *ns.*

Differences between vignettes. Analyses were conducted to ensure that the three vignettes from the KAPMQ equally elicited comparable behavioral interventions from participants. Results of a one-way ANOVA indicated no differences across vignette versions on number of behavioral strategies identified, *F* (2, 103) = .14, *ns*.

Aim 1: Immediate Effect of Training on Attitudes toward Behavioral Pain Management

A 2 x 2 [Condition (Training, Control) by Phase (Baseline, Post-Training)] mixed factors ANOVA was conducted to evaluate the effect of training on Attitude toward the effectiveness of behavioral pain management strategies (see Table 6). Assumptions for repeated measures ANOVA (i.e., normality, homogeneity of variance, and compound symmetry) were met. Assumptions for repeated measures ANOVA (i.e., normality, homogeneity of variance, and compound symmetry) were met. Results indicated no significant main effects for Phase, F (1, 46) = 2.63, *ns,* and Condition, F (1, 46) = 1.03, *ns*. The Condition by Phase interaction was also not significant, F (1, 46) = 2.63, *ns*.

Aim 2. Immediate Effect of Training on Knowledge of Behavioral Pain Management

A comparable 2 x 2 Condition by Phase mixed factors analysis of variance ANOVA was conducted to examine the effect of training on KAPMQ score (Knowledge) (see Table 6). Assumptions for repeated measures ANOVA (i.e., normality, homogeneity of variance, and compound symmetry) were met. Results indicated a significant main effect for Phase, F (1, 47) = 11.05, $p < .05$, and a significant main effect for Condition, F (1, 47) = 5.86, $p < .05$. A significant Condition by Phase interaction was also evidenced, F (1, 47) = 6.67, $p < .05$. Follow-up t-tests with Bonferroni corrections were conducted to explicate this interaction. Results indicated that the Training and Control conditions did not significantly differ on Knowledge at baseline assessment, t (48) = .71, *ns*, but that the Training condition evidenced significantly higher Knowledge at post assessment than the Control condition, t (47) = 4.23, $p < .025$, Cohen's d = 1.22.

Aim 3. Follow-up Analyses

Despite repeated attempts to contact participants and obtain follow-up data, attrition rates for follow-up were high. Only five of the 24 participants in the control condition and 11 of the 26 participants in the training condition returned follow-up measures. It is not surprising therefore that results of the 2 x 3 [Condition (Training, Control) by Phase (Baseline, Post-Training, Follow-Up)] mixed factors ANOVA on Knowledge indicated no significant main effects for Phase, F (2, 30) = 1.83, *ns*, or Condition, F (1, 15) = 2.22, *ns*, nor a significant Condition by Phase interaction, F (2, 30) = 1.24, *ns*. Although not significant, the direction of change in Knowledge was in a favorable direction. Scores of participants in the control group decreased from Post-Training to Follow-Up whereas participants receiving training exhibited increased knowledge from Post-Training to Follow-Up (see Table 7). Despite the lack of statistically significant effects, examination of effect sizes indicate a large effect size when comparing training to control participants at follow-up, Cohen's d = 1.30.

Analyses of attitude were similarly limited by the small sample size. No significant main effects for Phase, F (2, 28) = 2.16, *ns*, or Condition, F (1, 14) = 0.14, *ns,* were evidenced and there was no significant Condition by Phase interaction, F (2, 28) = 0.45, *ns*. Examination of the direction of means in this analysis revealed that participants in the control condition had slightly more favorable attitudes than participants in the training condition at both Baseline and Post-Training, but participants in the training condition had more favorable attitudes at the Follow-Up assessment. In addition, there were small non-significant increases in attitude scores for both groups from pre- to post-assessment, and these scores dropped back to baseline for the control group and stayed roughly stable for the training group (see Table 7).

Aim 4. Effect of Training on Ability to Implement Behavioral Pain Management

Effect of location of role-play. Given that role-plays were conducted in two locations, *t*-test analyses were conducted to determine whether location of role-play influenced the Number, Ratio, and Quality of behavioral strategies observed during the role play assessment. Significant effects of Location on Ratio, t (46) = 2.44, $p < .05$, and Number of behavioral strategies, t (46) = 2.33, *ns*, were evidenced with a higher number and ratio of behavioral strategies used in the nursing lab in comparison to the conference room setting. Location did not have a significant effect on Quality scores, t (46) 1.99, *ns*. There were significantly more participants who were assessed in the nursing lab setting in the Training condition (10 participants) than participants in the Control condition (1 participant), χ^2 (1) = 10.6, $p < .05$.

Treatment effect on role-play. T-test analyses with Bonferroni corrected *p* values of .016 were conducted to evaluate the effect of the training program on role-play responses (Number, Ratio, and Quality of behavioral interventions) (Table 8). Of note, all t-tests on ratio of behavioral interventions revealed significant Levene's tests indicating that the assumption of homogeneity of variance was violated. Results indicated that participants in the Training condition used a higher ratio of behavioral strategies to overall strategies, t (30.3) 3.22, $p < .016$, Cohen's $d = 1.02$, and had higher quality scores, t (46) = 3.83, $p < .016$, Cohen's $d = 1.11$, than participants in the Control Condition. There was not a significant difference between conditions on number of behavioral strategies used, t (46) = 1.92, *ns,* although a medium effect size was evident, Cohen's $d = 0.54$.

Given that there were significantly more participants in the Training condition than the Control condition who completed role-plays in the nursing lab, further analyses were conducted to ensure that Location did not account for differences between Conditions. As such, analyses of

only those participants who completed role-plays in the conference room were conducted (Table 8). Results of these analyses were similar to those including all participants. Specifically, participants in the Training condition who completed role-plays in the conference room used a higher ratio of behavioral strategies, t (33.1) = 2.70, $p < .016$, and had higher quality scores, t (34) = 2.87, $p < .016$, than participants in the Control condition who completed role-plays in the conference room. There was no significant difference between Conditions on number of behavioral strategies used, t (34) = 0.93, *ns*.

A similar comparison between Control and Training conditions in the nursing lab was not possible as there was only one participant in the control condition tested in this location. Instead, analyses were conducted to ensure that there were no differences between participants in the Training condition in the nursing lab and in the conference room. Results indicated no differences between locations on Number of behavioral strategies, t (23) = 1.67, *ns*, Quality of behavioral strategies, t (23) = 0.73, *ns*, or Ratio of behavioral strategies, t (22.5) = 1.25, *ns*.

Aim 5. Prediction of Behavioral Strategy Implementation by Knowledge and Attitudes

Regression analyses were used to explore whether participants' KAPMQ scores (Knowledge) and attitudes about the effectiveness of behavioral strategies (Attitude) were related to participants' abilities to implement behavioral strategies. Three regressions were conducted. Each entered post assessment KPMQ score and post assessment rating of effectiveness of behavioral strategies as predictors. Dependent variables were Number, Ratio, and Quality of behavioral strategies implemented during role-plays. Because these regressions were exploratory in nature, no correction for multiple tests was made. Results of the regressions predicting Quality and Ratio of behavioral interventions were non-significant, $R^2 = 0.03$, F (2, 45) = 0.80, *ns*, and $R^2 = 0.08$, F (2, 45) = 2.00, *ns*, respectively.

The regression predicting Number of behavioral interventions used by participants during the role play was statistically significant, $R^2 = 0.15$, F (2, 47) = 3.85, $p < .05$. Examination of beta weights for Knowledge and Attitude variables revealed that Knowledge significantly contributed to the prediction of Number of Behavioral Strategies in this equation, $\beta = 0.378$, $t = 2.73$, $p < .01$, whereas Attitude did not, $\beta = 0.03$, $t = 0.23$, *ns*.

Discussion

The current study was designed to evaluate the effectiveness of a brief training program in evidence-based behavioral pain management strategies on nursing student's attitudes, knowledge, and skill acquisition. Five primary aims were addressed in this study. The first aim was to determine whether the training program impacted nursing students' attitudes about behavioral pain-management for children. Results indicated that students who received training did not have improved attitudes following the training program and did not evidence more favorable attitudes than students in the control group at the conclusion of training. These findings stand in contrast to previous programs which evidenced favorable changes in attitudes following training (e.g., Lasch et al., 2000). Given the nature of attitudes and the design of the current training program, this difference in findings is not surprising. Attitudes are long-standing interactions of affect, cognition, and behavior and attitude change can be a complex and difficult process (Petty, 1995). The current training program was not designed as an attitude modification intervention; rather it was designed to impart knowledge and skills on participants. More information on the importance of pain management and the efficacy of nonpharmacological interventions may have resulted in changes in attitude, but this degree of information was not possible given the time restrictions of the current program. The lengths of previous training

programs may have allowed for such information to be covered and may have accounted for their positive findings (e.g., Ferrell et al., 1993).

It is also possible that the lack of findings for attitude improvement was a function of the method of assessing this attitude. Attitude in this study was measured by single item querying queries of students' beliefs of the efficacy of nonpharmacological interventions. It is possible that the training program resulted in changes on domains of attitude other than the one assessed by this item. The development of multiple item inventories to better assess attitudes will allow the evaluation of this hypothesis. It is also possible that restriction of range, or a ceiling effect accounted for the failure to find significant results for attitude. Students' attitudes were highly favorable at baseline assessment, making further improvements difficult.

The second aim of this study was to determine whether training increased nursing students' knowledge of evidence-based behavioral pain-management strategies for children. In light of the non-significant findings for attitude, it is interesting to note that changes in knowledge following the training program were evidenced. Knowledge of nonpharmacological pain management increased significantly from baseline to post-program for the Training group, resulting in significantly higher knowledge in the Training group at post-program compared to the Control group. This finding demonstrates that a didactic presentation can impart knowledge on a group of nursing students. This finding is especially promising given the relatively short length of this presentation compared to those programs previously evaluated in the literature. Previously evaluated programs ranged in length from 2 hours (Pederson, 1996) to 2 weeks (Breitbart et al., 1998), whereas the current program demonstrated favorable results within just 20 minutes. The ability to demonstrate increased knowledge after just 20 minutes was likely because of the relatively focused information covered in the current program compared to

broader information covered in other programs (i.e., more behavioral techniques, inclusion of physical and pharmacological techniques). Although the current program did not cover as wide a breadth of material as other studies in the literature, its short duration allows for it to be more easily incorporated into nursing student curricula.

The third aim of this study was to determine whether changes evidenced after the training program were still evident at a three-month follow-up. Unfortunately, evaluation of this aim was significantly hindered by the low return rate of follow-up measures. Attempts were made to contact participants via email and phone. Despite these attempts, more than 60% of participants did not return measures. This was particularly evident in the control group in which only 5 of 24 participants returned measures. More participants from the training group, 11 of 26, returned measures and this may have been because of a higher degree of contact between participants and the experimenter resulting in a higher sense of obligation among these participants. Attrition may have been less if participants were met in person at follow-up. Possibly due to the small sample size, the results of analyses of follow-up data were not significant. However, qualitative examination of the data is promising, suggesting that, of those participants who returned questionnaires, attitudes and knowledge were more favorable in the training group at follow-up assessment than in the control group. In addition to low sample size, these results must be viewed with caution however, due to the potential for bias in return rates. It is possible that those participants with better attitudes or higher knowledge were more likely to return questionnaires than participants with less favorable attitudes or lower knowledge. Closer examination of the data reveals that this may have been the case. Although not statistically significant, participants who returned questionnaires evidenced slightly higher knowledge than those who did not return questionnaires at baseline (M = 12.0 and 10.8 respectively) and post program evaluation (M =

12.8 and 11.6 respectively). In terms of attitudes, participants who returned and did not return follow-up measures were similar at baseline (M = 3.63 and 3.64 respectively) and post program (M = 4.06 and 3.77 respectively)

The fourth aim of this study was to determine whether training resulted in better abilities to implement behavioral strategies in a clinical role-play setting. Again, despite the lack of amelioration in attitude, training resulted in significantly better implementation of behavioral pain management strategies in a clinical role-play. Although role-play findings indicated that there was no effect of training on the absolute number of behavioral strategies used, the training group used higher quality strategies and a higher ratio of behavioral to total strategies. These findings are supported by anecdotal observations of participants completing the role-play scenario. Participants in the Control group would often offer suggestions for behavioral strategies (i.e., "You could use imagery"), but would not offer instructions to the parent or child on how to do so. Further, on several instances, participants in the Control group suggested behavioral strategies within a list of alternatives that often included medication referrals despite the clear indication that the child had already received their maximum dose. Participants in the Training group rarely referred to medications, presumably because their use of behavioral interventions was more advanced. Taken together, the findings of the first four aims of this study indicated that attitude change was not necessary to improve knowledge, and, more importantly, behavior. This finding is especially promising given the difficulties that are inherent in attempting to change attitudes (Petty, 1995). Further, the evidenced changes in behavior are important as this is one of the first studies to use multiple modes of data collection to evaluate program efficacy. Although many previous studies assessed several outcomes (e.g., knowledge

and attitude), most relied on self-report. In fact, other than Pederson et al. (1997), this is the only study to incorporate direct observations of participants' behavior following a training program.

The final aim of this study was to explore whether nursing students' attitudes toward, and knowledge of, nonpharmacological pain strategies predicted their ability to implement these strategies in a clinical role-play setting. Neither attitude nor knowledge was found to predict either Quality or Ratio of Behavioral Strategies implemented. Number of Behavioral Strategies was predicted by these variables however, most specifically by Knowledge. It is not surprising that those individuals who had a higher knowledge of nonpharmacological strategies would implement more of these strategies in a role-play setting.

The lack of predictive power for knowledge on the other two variables (i.e., ratio or quality of strategy use) is interesting. The ratio findings suggest that although more knowledge may lead to the use of more behavioral strategies, it does not necessarily decrease the number of non-behavioral strategies used. In other words, individuals with more knowledge of behavioral strategies may use more of these strategies, but may also use more non-behavioral strategies as well. The quality findings are also interesting and suggest that, although participants with more knowledge administer more of these strategies, they may not administer these strategies in a higher quality manner. This suggests that knowledge may not be sufficient in order to implement strategies in the most effective way. This finding is interesting in light of the findings of the effectiveness of the training program in producing higher quality strategy implementation. Taking these finding together may suggest that knowledge may not be the sole mechanism by which the treatment program exerted its effects. It is also important to acknowledge that failure of knowledge to predict ratio or quality of strategy use may also have been a result of the methods used to assess each variable. Assessment of knowledge was based on familiarity with

didactic material about the means by which behavioral strategies exert their effects. It is possible that another dimension of knowledge (i.e., knowledge of how to implement behavioral strategies) would have been more predictive of quality or ratio of behavioral strategy used.

Several limitations of this study should be noted. First, complications with data collection lead to a disproportionate distribution of conditions across role-play locations, resulting in location being a confounding variable in the assessment of behavioral skill. In fact, results of preliminary analyses indicated that participants performed significantly better in the nursing lab than they did in the conference room. This may have been because the nursing lab was a more realistic context than the conference room, despite attempts to make these settings equivalent. It is also possible, however, that this difference was due to the high proportion of Training participants who completed role-plays in the nursing lab. Statistical analyses support this hypothesis. When analyses of only those participants who participated in role-plays in the conference room were conducted, significant differences between conditions persisted, suggesting that treatment effects were not purely an artifact of location. Further, there were few differences between Training participants who completed the role-plays in the nursing lab versus the conference room.

The reliance on assessment measures developed for this study was another limitation of the current study. Unfortunately, the literature in knowledge and attitudes of behavioral pain management is sparse and therefore, there were no currently validated or widely used measures to use in this study. Although the creation of an instrument that was specific to the information covered in the training program is consistent with most previous studies (e.g., Lasch et al., 2000), it may have limited application in other empirical work in this area. Future work should be done

to develop a knowledge inventory that assesses a broader range of behavioral techniques and rationales for their efficacy.

One of the most disappointing limitations of the current study was the high degree of attrition at follow-up assessment. More than 60% of participants did not complete follow-up analyses, making it difficult to draw conclusions based on this data. It is quite possible that participants who returned follow-up assessments were not representative of the entire sample. Participants who returned measures may have been more invested in the study when compared to the participants who did not return measures. This was apparently evident in the distribution of participants from each condition who returned follow-up questionnaires. More participants in the Training group returned follow-up assessments than participants in the Control group. This may have been due to the greater amount of time spent with the investigator, resulting in a higher degree of commitment to the study.

Future research should address the limitations and expand on the findings of this study. The development of validated measures of knowledge of and attitudes toward behavioral pain management will be an important first step in the further evaluation of training programs of the type used in this study. Including outcomes other than self-report and analog observations will also be important. Specifically, the effect of training programs on providers' behavior during actual patient care and on patient outcomes should be assessed. Larger samples will provide greater power in analyses and will allow more detailed evaluations of individual differences in responses to training.

In summary, pain is a common and potentially debilitating condition. Although several effective and developmentally appropriate behavioral techniques for pain management exist, results of curriculum evaluations and knowledge surveys reveal a lack of awareness of these

strategies in healthcare professionals. As a result, the development and evaluation of pain management training programs is an important endeavor. The current study adds to the existing literature by demonstrating the efficacy of a training program in evidence-based behavioral pain management strategies. The relatively short duration of the current program allows for its implementation with little additional time demand and with relatively little cost. In the current study, the training program was offered in a brief, 20 minute session and required only the cost of photocopying handouts for students to follow along. The findings that this didactic presentation resulted in increased knowledge and better implementation of behavioral strategies provide a solid foundation for the incorporation of such training in standard nursing curricula.

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Table 1

Summary of general (i.e., not child-specific) pain management training programs

First Author	Length	Behavioral Techniques	Program Details
Fisher	3 half-day seminars	Conditioning theory, acquisition and extinction of behavior, and reinforcement and punishment.	Each seminar was divided into two halves; the first half was in lecture format and the second half was in workshop format.
Wilson	6 hours	Biofeedback, progressive muscle relaxation	Lecture, demonstration, attendance at grand rounds and case-management conferences
Jones	4 hours	Environmental manipulation, positive reassurance, music	Lecture and quiz
Lasch	1 day	Relaxation, music	Group 1: Workshop Group 2: Workshop plus shadowing a pain nurse specialist
Ferrell	40 hours	Relaxation, distraction, imagery	Lecture, homework assignments, clinical practice sessions
Francke	24 hours	Giving information, emotional support, promotion of autonomy, relaxation, distraction, modification of environment	Lecture and discussion in small groups, audiovisual presentations, practical exercises, provision of relevant literature
Breitbart	2 weeks	Unspecified "psychological" interventions	"Observership" consisting of attendance at grand rounds, walking rounds, research seminars, and case conferences. Individual meeting with "mentors." Access to an education resource center.
Zaza	Unknown	Biofeedback, hypnosis	Lecture and demonstration

Table 2

Summary of child-specific pain management training programs

First Author	Length	Behavioral Techniques	Program Details
Brown	2 days	Unspecified "non-pharmacological"	"Action plan" consisting of distribution "No Pain" buttons, poster display of pain management techniques. Provision of two workshops.
Knoblauch	3 hours	Unspecified "non-pharmacological" interventions and parental involvement	Workshop
Solomon	16 hours	Deep breathing, relaxation, mental imagery. Strategies to increase children's use of these techniques (e.g., rapport building in an age-appropriate manner, collecting information on children's past experiences with procedures, and coaching children through the procedure).	Seminar including didactic and experiential components
Pederson	2 hours	Deep breathing, relaxation, distraction, imagery, cognitive restructuring	Lectures, videotaped modeling, discussion, and skill practice in response to case vignettes. Provision of distraction stimuli (e.g., bubbles) for participant use upon return to their unit.

Table 3

Summary of study design and statistics

First Author	Population	Sample Size	Control Group?	Follow-up?	Statistics
Fisher	Nurses	13	No	No	t-test
Wilson	Medical students	95	No	Yes (5 months)	Repeated measures ANOVA[a]
Jones	Medical residents	Not reported	No	No	Independent samples t-test
Lasch	Nurses	496	Yes	Yes (1 year)	Repeated measures ANOVA; Paired samples t-test
Ferrell	Nurses	26	No	No	Descriptives[b]
Francke	Nurses	106	Yes	Yes (6 months)	MANCOVA[c]
Breitbart	Various healthcare professionals	152	No	No	t-test
Zaza	Various healthcare professionals	89	No	Yes (3 months)	Chi-square
Brown	Hospital staff	Not reported	No	No	Unknown (only *p*-value reported)
Knoblauch	Nurses	52	No	No	ANOVA; t-test
Solomon	Various healthcare professionals	43	No	No	t-test; descriptive
Pederson	Nurses	54	Yes	No	Independent samples t-tests

[a] Analysis of variance
[b] Authors used descriptive statistics to *evaluate* (not simply to describe) the program
[c] Multiple analysis of covariance

Table 4

Summary of outcome measures and results of studies

First Author	Outcome measure	Method	Results of pre-test-post-test comparisons
Fisher	Knowledge of Behavioral Principles Questionnaire (O'Dell et al. 1964)	Self-report	Increased scores
	Attitudes Toward Disabled Persons Questionnaire (Yuker et al., 1966)	Self-report	Increased scores
	Responses to role-play task	Self-report	More adaptive responses
Wilson	Pain Attitudes (Author-designed measure)	Self-report	Increase in responses recognizing the "nonimaginary" nature of pain and the rewarding nature of working with patients with pain
	Accuracy of knowledge about pain (Author-designed measure)	Self-report	No change on overall accuracy; more accurate on narcotic addiction; less accurate on chronic pain index
Jones	Patient pain scores	Patient-report	Increased pain relief; more patients with clinically significant pain reduction
	Patient satisfaction with treatment	Patient-report	More patients reported that treatment was moderately or completely effective
Lasch	Pain management attitudes (Author-designed measure)	Self-report	Increased scores, maintained increases at follow-up

(table continues)

Table 4 (continued)

First Author	Outcome measure	Method	Results of pre-test-post-test comparisons
Lasch	Pain management knowledge (Author-designed measure)	Self-report	Increased scores, maintained at follow-up
	Application of pain management knowledge (Author-designed measure)	Self-report	Increased scores, maintained at follow-up
Ferrell	Pain and pain management knowledge and attitudes (Author-designed measure)	Self-report	Increased scores
Francke	Attitudes toward pain management strategies (Author-designed measure)	Self-report	Increased scores on relaxation, no change on other psychosocial interventions
	Number of psychosocial techniques used (Author-designed measure)	Self-report	More techniques used
	Quality of psychosocial techniques used (Author-designed measure)	Self-report	Higher quality reported
Breitbart	Pain and pain management knowledge (Author-designed measure)	Self-report	Increased scores
Zaza	Perceptions of pain management techniques (Author-designed measure)	Self-report	Most participants reported “no change” in perceptions
	Familiarity with pain management techniques (Author-designed measure)	Self-report	More familiar with massage therapy and therapeutic touch, no change on familiarity with acupuncture, hypnosis, and biofeedback

(table continues)

Table 4 (continued)

First Author	Outcome measure	Method	Results of pre-test-post-test comparisons
Brown	Pain and pain management knowledge and attitudes (Author-designed measure)	Self-report	Increased scores
	Pain documentation	Chart reviews	More documentation of: use of self-report pain assessment instrument, patient/family teaching about pain and pain control, and use of non-pharmacological strategies
Knoblauch	Analgesic administration	Chart reviews	Longer time before first patient analgesic does, longer time between doses of analgesic
Solomon	Knowledge acquisition (Author-designed measure)	Self-report	Increased scores
	Skill acquisition "Pain Control Technique Checklist" (Author-designed measure)	Analog observation	No pre-post comparisons conducted, 95.3% of participants demonstrated "high levels of skill"
Pederson	Knowledge of deep breathing, relaxation, distraction, imagery, and cognitive restructuring (Author-designed measure)	Self-report	Increased scores on all techniques
	Comfort with of deep breathing, relaxation, distraction, imagery, and cognitive restructuring (Author-designed measure)	Self-report	Increased scores on deep breating, relaxation, imagery, and cognitive restructuring, No change on distraction

Note: Wilson and Zaza did not include post-program assessment. As such, results described above summarize differences from pre-program to follow-up.

Table 5

Demographic characteristics by treatment condition and academic quarter

	Condition		Academic Quarter		
	Control (n = 24)	Treatment (n = 26)	Winter 2005 (n = 18)	Spring 2005 (n = 19)	Fall 2005 (n = 13)
Gender (% female)	95.8	88.5	100	89.5	84.6
Race (% Caucasian)	87.5	96.2	88.9	100	84.6
Planning to Specialize in Pediatrics (%)	54.2	61.5	61.1	52.6	61.5
Mean Age in yrs (SD)	21.8 (2.63)	22.2 (4.04)	22.1 (2.93)	22.8 (4.45)	20.8 (1.69)
Mean GPA Theory (SD)	3.35 (0.44)	3.34 (0.39)	3.41 (0.42)	3.35 (0.39)	3.26 (0.44)
Mean GPA Clinical (SD)	3.40 (0.50)	3.62 (0.37)	3.46 (0.51)	3.59 (0.31)	3.48 (0.51)
Familiarity with Behavioral Strategies (SD)	3.21 (0.72)	3.19 (0.85)	3.50 (0.71)	3.00 (0.94)	3.08 (0.49)

Note. No significant differences on any variable between Conditions or among Academic Quarters

Table 6

Means (and standard deviations) for measures of Attitude and Knowledge at Baseline and Post-Training for Training and Control participants

	Control (n = 24)		Training (n = 26)	
	Baseline	Post	Baseline	Post
Attitude[1]	3.65 (0.88)	3.65 (1.07)	3.72 (0.79)	4.04 (0.61)
Knowledge[2]	10.78 (2.29)[a]	11.00 (1.48)[a]	11.26 (2.51)[a]	13.00 (1.79)[b]

Note. Different superscripts indicate significant differences at $p < .05$

[1] Efficacy of behavioral strategies, range 0 (not at all) to 5 (very much)
[2] KPMQ scores, range 0 to 14

Table 7

Means (and standard deviations) for measures of Attitude and Knowledge at Baseline, Post-Training, and Follow Up for Training and Control participants

	Control (n = 5)			Training (n = 11)		
	Pre	Post	Follow-up	Pre	Post	Follow-up
Attitude[1]	3.80 (0.84)	4.20 (0.84)	3.80 (0.45)	3.54 (0.82)	4.00 (0.84)	3.91 (0.45)
Knowledge[2]	11.4 (1.67)	12.0 (2.00)	11.4 (1.67)	11.9 (2.90)	13.3 (1.83)	13.8 (2.01)

Note. No mean differences were statistically significant at the .05 level of confidence

[1] Efficacy of behavioral strategies, range 0 (not at all) to 5 (very much)
[2] KPMQ scores, range 0 to 14

Table 8

Means (and standard deviations) for measures of Behavioral Strategies observed during Role Play Assessments at Post-Training for Training and Control participants

	All Participants		Conference Room Only	
	Control (n = 23)	Training (n = 25)	Control (n = 22)	Training (n = 14)
Number of Behavioral Strategies	2.17 (1.47)	2.92 (1.22)	2.14 (1.49)	2.57 (1.16)
Ratio of Behavioral Strategies	0.63 (0.35) [a]	0.89 (0.16) [b]	0.61 (0.35) [a]	0.85 (0.18) [b]
Quality of Behavioral Strategies[1]	1.39 (0.74) [a]	2.22 (0.75) [b]	1.41 (0.75) [a]	2.12 (0.67) [b]

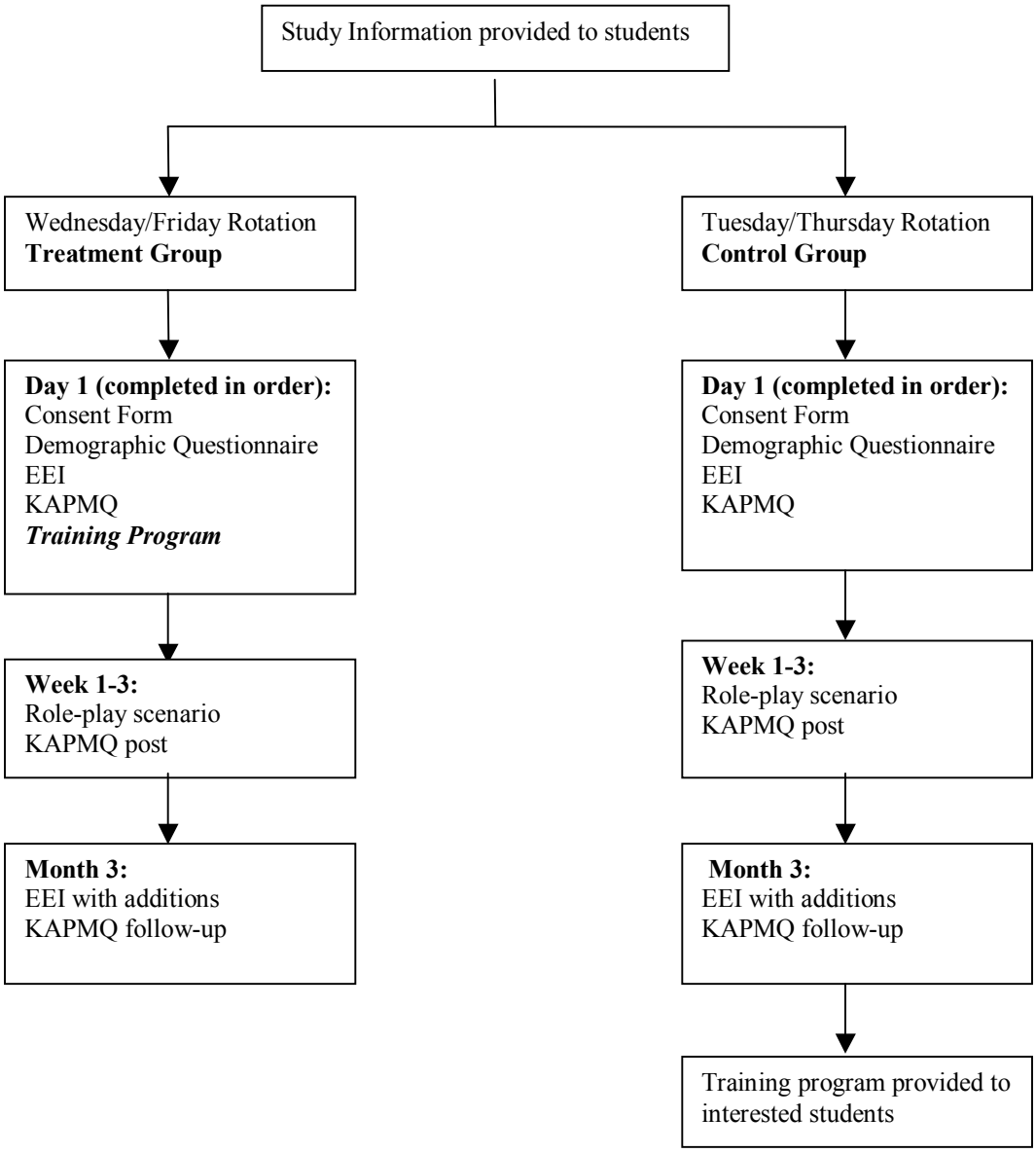
Note. Different superscripts indicate significant differences at $p < .016$

[1] Quality scores, range 0 (lowest quality) to 5 (highest quality)

Figure Caption

Figure 1. Procedural flow chart.

Note: This process was repeated for each academic quarter



Appendix A

Demographic Information Form

Please take a moment to complete the following forms making sure to answer every question. If you have any questions about the forms, please ask.

1. Your Gender: ___Male ___Female

2. Your Age: _____

3. Your Race: ___ Caucasian
   ___ African American
   ___ Asian American
   ___ Hispanic
   ___ Native American
   ___ Other, please describe: _____

4. Parent(s) Highest level of education:
   a. Mother: _____
   b. Father: _____

5. Parent(s) Occupation:
   a. Mother: _____
   b. Father: _____

6. Approximate grade point average (GPA) in Nursing Theory courses: _____

7. Approximate grade point average (GPA) in Nursing Clinical courses: _____

8. What areas have you considered specializing in? (check all that apply)
   ___ Critical Care
   ___ Emergency
   ___ Pediatrics
   ___ Maternal/Child
   ___ Geriatrics
   ___ Other, please describe: _____

Participant # _____

Appendix B

Education and Experience Inventory

Please answer the following questions by circling the appropriate number, where 1 = Not at all and 5 = Very Much.

		None at all				Very Much
1.	How much *education* have you had about issues related to **pain** (e.g., assessment, treatment)?	1	2	3	4	5
2.	How much *education* have you had about **children** (e.g., pediatric nursing, child development)?	1	2	3	4	5
3.	How much *education* have you had in **psychology** and **psychiatry?**	1	2	3	4	5
4.	How much *experience* do you have with issues related to **pain** (e.g., assessment, treatment)?	1	2	3	4	5
5.	How much *experience* do you have with **children** (e.g., pediatric nursing, babysitting)?	1	2	3	4	5
6.	How much *experience* do you have in **psychology** and **psychiatry**?	1	2	3	4	5
		Not at all				Very Much
7.	How *familiar* are you with **drug treatments** for pain (e.g., NSAIDs, Opiates)?	1	2	3	4	5
8.	How *familiar* are you with **physical treatments** for pain (e.g., massage, heat, cold)?	1	2	3	4	5
9.	How *familiar* are you with **psychological treatments** for pain (e.g., relaxation, distraction)?	1	2	3	4	5

Appendix C

Knowledge Questionnaire

This questionnaire is designed to assess your knowledge of pain and pain management techniques. Items are in different formats, so please read and respond to each item carefully. If you have any questions, please ask.

1. Case Study:
   S.B. is a 14-year-old with a history of malignant spinal tumor that has recurred and spread to his ribs and neck areas. The doctor has ordered pain medication via Intrathecal catheter, PRN Morphine, and a Fentanyl patch. When you come in to assess S.B., he is complaining of pain and seems tense and upset. He just had his PRN Morphine 1 hour ago. What would you do to treat this patient?

Please turn to the next page

2. The IASP defines pain as an “unpleasant emotional and sensory experience associated with _____
   a. actual tissue damage.”
   b. potential tissue damage.”
   c. actual or potential tissue damage.”
   d. no tissue damage.”

3. Experience with pain early in infancy has been associated with _____ sensitivity to painful stimuli later in life (circle one):
   a. increased
   b. decreased
   c. both increased and decreased
   d. no change in

4. In the gate control theory of pain, at what level does the “gate” act to modulate pain?
   a. Cerebral cortex
   b. Brainstem
   c. Spinal cord
   d. Site of injury

5. When using imagery with a child, it is important to involve as many _____ as possible
   a. senses
   b. imagery scenes
   c. other people
   d. all of the above

6. Distraction has received empirical support in the treatment of pain from _____:
   a. venipunctures
   b. bone marrow aspirations
   c. lumbar punctures
   d. all of the above

7. True or False? Psychological techniques have been shown to be as effective as drugs in the treatment of procedural pain. _____

8. List four non-pharmacological (non-drug) treatments for pain:
   a. _____
   b. _____
   c. _____
   d. _____

Please turn to the next page

9. ”Why does rubbing an injured area decrease pain in that area?

_____

_____

_____

_____

10. In the space provided, write a rationale (explanation) for how distraction can reduce pain

_____

_____

_____

_____

	Not at All				Very Much
11. How *effective* are **drug treatments** for pain (e.g., NSAIDs, Opiates)?	1	2	3	4	5
12. How *effective* are **physical treatments** for pain (e.g., massage, heat, cold)?	1	2	3	4	5
13. How *effective* are **psychological treatments** for pain (e.g., relaxation, distraction)?	1	2	3	4	5
14. How much did you know about what was offered to the other group in this study? ***(Note: included only on follow-up assessment)***	1	2	3	4	5

Thank you

Participant # _____

Knowledge Questionnaire: Answer Key

This questionnaire is designed to assess your knowledge of pain and pain management techniques. Items are in different formats, so please read and respond to each item carefully. If you have any questions, please ask.

2. IASP defines pain as an "unpleasant emotional and sensory experience associated with _____
    a. actual tissue damage."
    b. potential tissue damage."
    c. actual or potential tissue damage."
    d. no tissue damage."

3. Experience with pain early in infancy has been associated with _____ sensitivity to painful stimuli later in life (circle one):
    a. increased
    b. decreased
    c. both increased and decreased
    d. no change in

4. In the gate control theory of pain, at what level does the "gate" act to modulate pain?
    a. Cerebral cortex
    b. Brainstem
    c. Spinal cord
    d. Site of injury

5. When using imagery with a child, it is important to involve as many _____ as possible

    a. senses
    b. imagery scenes
    c. other people
    d. all of the above

6. Distraction has received empirical support in the treatment of pain from _____:

    a. venipunctures
    b. bone marrow aspirations
    c. lumbar punctures
    d. all of the above

7. True or False? Psychological techniques have been shown to be as effective as drugs in the treatment of procedural pain. ___**True**_____

8. List four non-pharmacological (non-drug) treatments for pain:

   ****Scoring Guidelines:**
   1 points for each non-pharmacological treatment identified. Maximum score 4 points.

9. ”Why does rubbing an injured area decrease pain in that area?

   ****Scoring Guidelines:**
   2 points: Reference to activation non-pain sensing fibers and delivery of competing messages to the brain.
   1 point: Reference to activation of non-pain sensing fibers without reference to the delivery of competing messages to the brain. Or reference to the delivery of competing messages to the brain without reference to these messages coming from non-pain sensing fibers.
   0 points: No reference to either of these two concepts

10. In the space provided, write a rationale (explanation) for how distraction can reduce pain

    **** Scoring Guidelines:**
    2 points: Reference to attention being diverted away from the pain and to the limited capacity of the brain to process information
    1 point: Reference to attention being diverted away from the pain without reference to the limited capacity of the brain.
    0 points: No reference to either of these two concepts

Maximum Score possible: 14 points.

Appendix D

Knowledge Questionnaire: Vignette Coding

On each questionnaire, begin by separating each pain management strategy identified by the participant. For example, a response: "*Give morphine, or Tylenol. Could also massage the area or teach deep breathing*" contains four independent pain management strategies. Write each strategy on a separate line on the coding sheet (transcribe the strategy word for word). Beside each strategy, check the box that corresponds to the appropriate category (pharmacological, physical, behavioral).

- **Pharmacological**: Any response that indicates use of a drug intervention. Note: If participant identifies more than one drug, count each as a separate instance of this category. For example, "*Administer Tylenol, administer morphine if needed*" would count as 2 separate pharmacological interventions. If participant identifies more than one dose of the same drug or the same drug twice, count only as one instance of this category. For example, *"Give Morphine 100 mg. If they do not respond, increase Morphine to 200 mg and increase as necessary up to 500 mg until pain is relieved"* would count only as 1 strategy.
- **Physical**: Any response that indicates the use of physical manipulation of the body by a person (can be the self) or machine. For example, acupuncture, massage, rubbing the area, heat, cold, TENS.
- **Behavioral**: Any response that indicates the use of cognitive or overt behavioral strategies. For example, deep breathing, distraction, relaxation, hypnosis, and imagery. Note: If participant identifies more than one type of distraction or relaxation, etc., count each as a separate instance of this category. For example, "*Have the child watch a movie, read a book, or listen to music*" would count as 3 behavioral interventions.

Vignette Scoring Sheet

Participant #: NT_____
Coder Initials: _____
Date of Coding: _____

Description of Strategy	Pharm	Phys	Beh
Example: Try to get the child's attention off of the pain			**x**

Appendix E

Role-play informational script

Introductory Statement: (Provided to the participant by the experimenter)

Now, you will be asked to participate in a clinical role-play scenario. In this room is an experimenter playing the part of a 9-year-old girl named Sarah who has undergone a tonsillectomy and adenoid removal. Sarah awoke from anesthesia approximately 2 hours ago and received a PRN dose of Tylenol with codeine approximately one hour ago. You are working on the pediatric ward when Sarah's mother, Beth, calls you into Sarah's room. She informs you that Sarah continues to complain of pain and, when asked, Sarah informs you that her pain is a 4 on a 0 to 5 Faces pain rating scale. Sarah's mother asks you for help in managing Sarah's pain.

As on a real pediatric ward, you do not have much time to spend with Sarah and her mother. You are limited to five minutes of interaction with the patient. We want you to behave as if this was a real patient, displaying all behaviors that you would if in an actual clinical setting.

Opening remark: (Provided to the participant by the "mother")

Mother: I pressed the call button because, even after her medication, Sarah is still in pain. Is there anything that you can do for her?

Information for Confederates

Personal information:

- 9-year-old girl in fourth grade.
- Lives with her mother and father and 10-year-old brother, Michael, in Morgantown, West Virginia.
- Pets: Labrador retriever named Bailey.
- Hobbies and interests: Enjoys playing with Barbie dolls, takes Jazz and Ballet dance lessons, likes to play baseball with her older brother.

Past medical experience:

- This is Sarah's first surgery and the first time she has been in the hospital

Procedural information:

- Ear tube placement.

Current status:

- Sarah has received a PRN dose of Tylenol with codeine approximately 1 hour ago
- She is fully awake and alert and can communicate with you
- She continues to report a moderate pain score and has asked for more medication.
- Sarah's mother is in the room with her. Sarah's mother is 35 years old. This is the first time either of her children have had surgery or been in the hospital.

Appendix F

Role-play Coding

Part 1.

Watch each role-play one time through to orient yourself. Watch the role-play again and identify each separate pain management strategy used. For example, a participant may begin by informing the child that they may have another dose of pain medication if desired. When the child refuses such medication, the participant may then begin to teach the child imagery. In this case two distinct strategies were used. Write a summary of each strategy on a separate line on the coding sheet. Beside each strategy, check the box that corresponds to the appropriate category (see below). The categories are identical to those categories identified for the vignette portion.

- **Pharmacological**: Any response that indicates use of a drug intervention. Note: If participant identifies more than one drug, count each as a separate instance of this category. For example, "*Administer Tylenol, administer morphine if needed*" would count as 2 separate pharmacological interventions.
- **Physical**: Any response that indicates the use of physical manipulation of the body by a person (can be the self) or machine. For example, acupuncture, massage, rubbing the area, heat, cold, TENS.
- **Behavioral**: Any response that indicates the use of cognitive or overt behavioral strategies. For example, deep breathing, distraction, relaxation, Note: If participant identifies more than one type of distraction or relaxation, etc., count each as a separate instance of this category. For example, "*Have the child watch a movie, read a book, or listen to music*" would count as 3 behavioral interventions.

Part 2.

Transfer each behavioral strategy to Part 2 of the coding sheet. For each strategy, code as present or absent the following components:

- **Rationale**: Code this component as present if the participant provides some explanation for why the behavioral technique is effective. This may be very simple, or more complex. For example: "*If you can relax your muscles, you'll have less pain*," or "*If you take your mind off of things, you won't feel your pain as much*."
- **Instructions**: Code this component as present if the participant provides verbal directions to the child and/or parent on how to administer the strategy. For example, "Now I want you to take a deep breath in, and as you breath out, repeat the word relax" or "I am going to tell you a story and I want you to close your eyes and imagine that you are in the story."
- **Modeling**: Code this component as present if the participant physically engages in the strategy in order to show the child and/or parent what to do. For example, the participant may show the child how to breathe deeply. Note: modeling can involve physical gestures (e.g., actual deep breathing), and continued "running commentary" of the behavior.
- **Coaching**: Code this component as present if the participant continues to provide guidance in completing the strategy beyond their initial instructions. For example, a participant may repeatedly direct the child to watch a movie, or may ask questions about the imagery scene. Note: this can also involve providing coaching to the parent. For example, a participant may remind the child to watch the movie, after finishing his/her initial instructions.
- **Parental Inclusion**: Code this component as present if the participant attempts to involve the parent in the behavioral strategy. This can involve providing directions to the parent, explaining to the parent why their involvement is important, or encouraging the parent to interact with their child.

Role-Play Scoring Sheet Part 1

Participant #: NT_____
Coder Initials: _____
Date of Coding: _____

Description of Strategy	Pharm	Phys	Beh
Example: Student massages the painful area		**x**	

Role-Play Scoring Sheet Part 2

Participant #: NT_____
Coder Initials: _____
Date of Coding: _____

Behavioral Strategy	Ration	Instruct	Model	Coach	Parent
Example: Teaches relaxation		**x**	**x**		**x**

Appendix G

Training Program Slides and Script

[See Attached]

Appendix H

ANOVA and Regression Summary Tables

[See Attached]

Preliminary Analyses: Treatment Condition

Age, GPA, Familiarity with Psychological Treatments

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Demo: your age	Equal variances assumed	1.012	.319	-.369	48	.714	-.3590	.9732	-2.3157	1.5978
	Equal variances not assumed			-.375	43.321	.709	-.3590	.9573	-2.2891	1.5712
Demo: GPA in Nursing Theory Courses	Equal variances assumed	.305	.584	.020	48	.984	2.372E-03	.1181	-.2351	.2398
	Equal variances not assumed			.020	46.249	.984	2.372E-03	.1187	-.2364	.2412
Demo: GPA in Nursing Clinical Courses	Equal variances assumed	.469	.497	-1.764	48	.084	-.2170	.1230	-.4643	3.029E-02
	Equal variances not assumed			-1.743	42.034	.089	-.2170	.1245	-.4682	3.424E-02
EEI pre: how familiar are you with psychological treatments for pain	Equal variances assumed	.098	.756	.072	48	.943	1.603E-02	.2238	-.4339	.4660
	Equal variances not assumed			.072	47.682	.943	1.603E-02	.2223	-.4310	.4631

Gender

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.921[b]	1	.337		
Continuity Correction[a]	.192	1	.661		
Likelihood Ratio	.966	1	.326		
Fisher's Exact Test				.611	.336
Linear-by-Linear Association	.903	1	.342		
N of Valid Cases	50				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.92.

Race

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.275[a]	4	.370
Likelihood Ratio	5.813	4	.214
Linear-by-Linear Association	.628	1	.428
N of Valid Cases	50		

a. 8 cells (80.0%) have expected count less than 5. The minimum expected count is .48.

Intent to Specialize in Pediatrics

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.278[b]	1	.598		
Continuity Correction[a]	.058	1	.810		
Likelihood Ratio	.279	1	.598		
Fisher's Exact Test				.775	.405
Linear-by-Linear Association	.273	1	.601		
N of Valid Cases	50				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.08.

Preliminary Analyses: Treatment Diffusion

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
KPMQ Fup: How aware were you of what was offered to the other group?	Equal variances assumed	.627	.443	-.874	13	.398	-.6000	.6861	-2.0823	.8823
	Equal variances not assumed			-.818	6.868	.441	-.6000	.7333	-2.3408	1.1408

Preliminary Analyses: Academic Quarter

Age, GPA, Familiarity with Psychological Treatments

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Demo: your age	Between Groups	31.737	2	15.868	1.388	.260
	Within Groups	537.243	47	11.431		
	Total	568.980	49			
Demo: GPA in Nursing Theory Courses	Between Groups	.178	2	8.890E-02	.511	.603
	Within Groups	8.179	47	.174		
	Total	8.356	49			
Demo: GPA in Nursing Clinical Courses	Between Groups	.164	2	8.210E-02	.407	.668
	Within Groups	9.484	47	.202		
	Total	9.648	49			
EEI pre: how familiar are you with psychological treatments for pain	Between Groups	2.577	2	1.288	2.208	.121
	Within Groups	27.423	47	.583		
	Total	30.000	49			

Gender

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.693[a]	2	.260
Likelihood Ratio	3.928	2	.140
Linear-by-Linear Association	2.515	1	.113
N of Valid Cases	50		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.04.

Race

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.476[a]	8	.304
Likelihood Ratio	9.702	8	.287
Linear-by-Linear Association	.098	1	.755
N of Valid Cases	50		

a. 12 cells (80.0%) have expected count less than 5. The minimum expected count is .26.

Intent to Specialize in Pediatrics

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.363[a]	2	.834
Likelihood Ratio	.362	2	.834
Linear-by-Linear Association	.001	1	.971
N of Valid Cases	50		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.46.

Preliminary Analyses: Differences between Vignettes

ANOVA

KPMQ pre: Number of behavioral strategies identified in vignette

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.762	2	.381	.144	.866
Within Groups	272.332	103	2.644		
Total	273.094	105			

Aim 1: Attitude

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Sphericity Assumed	.613	1	.613	2.632	.112
	Greenhouse-Geisser	.613	1.000	.613	2.632	.112
	Huynh-Feldt	.613	1.000	.613	2.632	.112
	Lower-bound	.613	1.000	.613	2.632	.112
TIME * COND	Sphericity Assumed	.613	1	.613	2.632	.112
	Greenhouse-Geisser	.613	1.000	.613	2.632	.112
	Huynh-Feldt	.613	1.000	.613	2.632	.112
	Lower-bound	.613	1.000	.613	2.632	.112
Error(TIME)	Sphericity Assumed	10.720	46	.233		
	Greenhouse-Geisser	10.720	46.000	.233		
	Huynh-Feldt	10.720	46.000	.233		
	Lower-bound	10.720	46.000	.233		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1359.244	1	1359.244	1122.237	.000
COND	1.244	1	1.244	1.027	.316
Error	55.715	46	1.211		

Aim 2: Knowledge

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Sphericity Assumed	23.159	1	23.159	11.049	.002
	Greenhouse-Geisser	23.159	1.000	23.159	11.049	.002
	Huynh-Feldt	23.159	1.000	23.159	11.049	.002
	Lower-bound	23.159	1.000	23.159	11.049	.002
TIME * COND	Sphericity Assumed	13.976	1	13.976	6.668	.013
	Greenhouse-Geisser	13.976	1.000	13.976	6.668	.013
	Huynh-Feldt	13.976	1.000	13.976	6.668	.013
	Lower-bound	13.976	1.000	13.976	6.668	.013
Error(TIME)	Sphericity Assumed	98.514	47	2.096		
	Greenhouse-Geisser	98.514	47.000	2.096		
	Huynh-Feldt	98.514	47.000	2.096		
	Lower-bound	98.514	47.000	2.096		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	12941.037	1	12941.037	2010.579	.000
COND	37.731	1	37.731	5.862	.019
Error	302.514	47	6.436		

Aim 3: Follow-up: Knowledge

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Sphericity Assumed	8.778	2	4.389	1.830	.178
	Greenhouse-Geisser	8.778	1.993	4.405	1.830	.178
	Huynh-Feldt	8.778	2.000	4.389	1.830	.178
	Lower-bound	8.778	1.000	8.778	1.830	.196
TIME * COND	Sphericity Assumed	5.955	2	2.977	1.241	.303
	Greenhouse-Geisser	5.955	1.993	2.988	1.241	.303
	Huynh-Feldt	5.955	2.000	2.977	1.241	.303
	Lower-bound	5.955	1.000	5.955	1.241	.283
Error(TIME)	Sphericity Assumed	71.967	30	2.399		
	Greenhouse-Geisser	71.967	29.890	2.408		
	Huynh-Feldt	71.967	30.000	2.399		
	Lower-bound	71.967	15.000	4.798		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6407.576	1	6407.576	685.221	.000
COND	20.753	1	20.753	2.219	.157
Error	140.267	15	9.351		

Aim 3: Follow-up: Attitude

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Sphericity Assumed	1.264	2	.632	2.160	.134
	Greenhouse-Geisser	1.264	1.461	.865	2.160	.151
	Huynh-Feldt	1.264	1.705	.742	2.160	.143
	Lower-bound	1.264	1.000	1.264	2.160	.164
TIME * COND	Sphericity Assumed	.264	2	.132	.452	.641
	Greenhouse-Geisser	.264	1.461	.181	.452	.582
	Huynh-Feldt	.264	1.705	.155	.452	.611
	Lower-bound	.264	1.000	.264	.452	.512
Error(TIME)	Sphericity Assumed	8.194	28	.293		
	Greenhouse-Geisser	8.194	20.455	.401		
	Huynh-Feldt	8.194	23.868	.343		
	Lower-bound	8.194	14.000	.585		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	619.637	1	619.637	626.690	.000
COND	.137	1	.137	.138	.716
Error	13.842	14	.989		

Aim 4: Effect of Location on Role-play Responses

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Role-play total number of behavioral strategies	Equal variances assumed	.208	.651	-2.334	46	.024	-1.0278	.4404	-1.9143	-.1412
	Equal variances not assumed			-2.544	22.199	.018	-1.0278	.4040	-1.8652	-.1904
Ratio of behavioral to total strategies used	Equal variances assumed	8.664	.005	-2.443	46	.018	-.2306	9.440E-02	-.4206	-4.06E-02
	Equal variances not assumed			-3.657	45.241	.001	-.2306	6.306E-02	-.3576	-.1036
Total Quality of behavioral strategies/number of behavioral strategies	Equal variances assumed	.258	.614	-1.991	46	.052	-.5454	.2740	-1.0969	6.128E-03
	Equal variances not assumed			-1.861	17.007	.080	-.5454	.2930	-1.1635	7.276E-02

Aim 4: Treatment Effect on Role-play Responses

All participants

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Role-play total number of behavioral strategies	Equal variances assumed	.037	.848	-1.921	46	.061	-.7461	.3884	-1.5280	3.580E-02
	Equal variances not assumed			-1.906	43.002	.063	-.7461	.3914	-1.5355	4.331E-02
Ratio of behavioral to total strategies used	Equal variances assumed	12.820	.001	-3.315	46	.002	-.2591	7.814E-02	-.4163	-.1018
	Equal variances not assumed			-3.224	30.268	.003	-.2591	8.034E-02	-.4231	-9.50E-02
Total Quality of behavioral strategies/number of behavioral strategies	Equal variances assumed	.018	.894	-3.834	46	.000	-.8260	.2155	-1.2597	-.3923
	Equal variances not assumed			-3.835	45.720	.000	-.8260	.2154	-1.2597	-.3924

Conference room participants only

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Role-play total number of behavioral strategies	Equal variances assumed	.061	.807	-.927	34	.360	-.4351	.4691	-1.3885	.5183
	Equal variances not assumed			-.981	32.491	.334	-.4351	.4434	-1.3377	.4676
Ratio of behavioral to total strategies used	Equal variances assumed	5.153	.030	-2.369	34	.024	-.2420	.1021	-.4495	-3.44E-02
	Equal variances not assumed			-2.701	33.062	.011	-.2420	8.961E-02	-.4243	-5.97E-02
Total Quality of behavioral strategies/number of behavioral strategies	Equal variances assumed	.023	.880	-2.874	34	.007	-.7100	.2470	-1.2119	-.2080
	Equal variances not assumed			-2.958	30.401	.006	-.7100	.2400	-1.1998	-.2201

Nursing lab versus Conference room in Training Participants

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Role-play total number of behavioral strategies	Equal variances assumed	.000	.990	-1.668	23	.109	-.7922	.4751	-1.7749	.1905
	Equal variances not assumed			-1.659	21.183	.112	-.7922	.4775	-1.7847	.2003
Ratio of behavioral to total strategies used	Equal variances assumed	6.625	.017	-1.195	23	.244	-7.706E-02	6.450E-02	-.2105	5.637E-02
	Equal variances not assumed			-1.254	22.508	.223	-7.706E-02	6.147E-02	-.2044	5.026E-02
Total Quality of behavioral strategies/number of behavioral strategies	Equal variances assumed	.261	.615	-.734	23	.470	-.2234	.3044	-.8531	.4063
	Equal variances not assumed			-.711	18.504	.486	-.2234	.3141	-.8819	.4352

Aim 5: Prediction of Attitudes and Knowledge

Role-play quality

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.185[a]	.034	-.009	.8511

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.157	2	.579	.799	.456[a]
	Residual	32.597	45	.724		
	Total	33.754	47			

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

b. Dependent Variable: Total Quality of behavioral strategies/number of behavioral strategies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.993	.783		1.269	.211
	KPMQ Post: How effective are psychological treatments for pain?	5.903E-03	.009	.096	.652	.518
	KPMQ post: total correct score plus behavioral strategies	6.595E-02	.064	.151	1.024	.311

a. Dependent Variable: Total Quality of behavioral strategies/number of behavioral strategies

Role-play number

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.382[a]	.146	.108	1.3055

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.123	2	6.562	3.850	.029[a]
	Residual	76.689	45	1.704		
	Total	89.813	47			

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

b. Dependent Variable: Role-play total number of behavioral strategies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.710	1.200		-.592	.557
	KPMQ Post: How effective are psychological treatments for pain?	3.263E-03	.014	.032	.235	.815
	KPMQ post: total correct score plus behavioral strategies	.270	.099	.378	2.735	.009

a. Dependent Variable: Role-play total number of behavioral strategies

Role-play ratio

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.286[a]	.082	.041	.2916

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.342	2	.171	2.008	.146[a]
	Residual	3.827	45	8.504E-02		
	Total	4.168	47			

a. Predictors: (Constant), KPMQ post: total correct score plus behavioral strategies, KPMQ Post: How effective are psychological treatments for pain?

b. Dependent Variable: Ratio of behavioral to total strategies used

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.277	.268		1.035	.306
	KPMQ Post: How effective are psychological treatments for pain?	2.374E-03	.003	.110	.765	.448
	KPMQ post: total correct score plus behavioral strategies	3.930E-02	.022	.255	1.781	.082

a. Dependent Variable: Ratio of behavioral to total strategies used