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WOMEN UNDERGOING BREAST MRI:
THE EFFECTIVENESS OF STATE ANXIETY
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WOMEN UNDERGOING BREAST MRI: THE EFFECTIVENESS OF STATE ANXIETY INTERVENTIONS

By

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ABSTRACT

WOMEN UNDERGOING BREAST MRI:
THE EFFECTIVENESS OF STATE ANXIETY INTERVENTIONS

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The purpose of this experimental study was to compare the effectiveness of three educational interventions in reducing state-anxiety levels for women undergoing breast MRI screenings. The primary independent variable for this study was an educational intervention PowerPoint tool. Other variables included perceived social support network, claustrophobia, baseline level of knowledge about MRI, marital status, highest level of education and previous history of breast cancer. The study sample consisted of 128 women scheduled to undergo Breast MRI exams. Data were gathered in a single Midwest clinic using questionnaires and an inventory over a period of nine months. Kendall tau-b correlations, One-way and Two-way ANOVA tests and a multivariate regression analysis were used to identify relationships between variables.

The study showed no significant relationship between methods of intervention and state anxiety levels. However, the study did show significant reductions in state-anxiety levels following intervention within all three groups. Results further indicated significant relationships between pre-intervention state anxiety and trait anxiety, post-intervention state anxiety and claustrophobia and also between trait anxiety and claustrophobia. Several interaction effects were also shown between the study variables and the three intervention groups.

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CHAPTER 1

INTRODUCTION

A new trend in healthcare is emerging: an approach to healthcare which involves increased focus on patients' emotional and mental well-being with greater emphasis on social support networks. As a result, patients often realize greater benefits from treatment with fewer problems while in rehabilitation. One area of healthcare that has not been adequately explored from this approach, however, is screening of the breast with Magnetic Resonance Imaging (MRI). MRI uses radiofrequency waves and a strong magnetic field to provide clear and detailed pictures of internal organs and tissues within the body. Breast MRI is a particularly complex specialty because women who have this procedure often face the possibility of being diagnosed with cancer.

Identification of the Problem

Approximately three million women in the U.S. today are living with breast cancer. "Two million have been diagnosed with the disease and one million have the disease but do not know it yet" (National Breast Cancer Coalition, 2005, p. 3). Breast cancer is the leading cause of cancer-related death among women in the U.S., aged 20-59, and strikes more women in the world than any other type of cancer (International Agency for Research on Cancer, 2001; National Cancer Institute, 2005; National Breast Cancer Coalition, 2005). Furthermore, the prevalence of breast cancer is increasing. Since 1986, rates have increased by 0.6 percent each year in the U.S. (Weir et al., 2003).

Given these statistics, the focus on breast-cancer screening is increasing in the medical world. While breast self-exams and routine mammograms are basic preventative

measures that have been in use for decades, some of the newer screening methods include breast thermography, breast tomo-mammography, and ultrasound.

One of the most recent methods of breast imaging is Magnetic Resonance Imaging (MRI). This modality offers improved sensitivity for breast cancer detection with greater definition of local tumor extent (National Cancer Institute, 2005). Results of MRI trials reveal a 1-4% cancer yield on initial screening with one-third to one-half of these lesions being occult on physical exams and mammographies (Hylton, 2005). MRI is also useful for screening women under the age of 40 who are at high risk for developing breast cancer (Breast MRI, 2004).

In addition to its use as a diagnostic tool, MRI helps determine the size and extent of cancerous lesions when exams are positive. Surgery is usually recommended with two options available depending on the extent of the cancer. In most cases, the surgeon performs a lumpectomy, in which only part of the breast, containing the tumor and some of the normal tissue surrounding it, is removed. However, in more advanced cases, a mastectomy is performed with removal of the entire breast along with any affected lymph nodes.

The risk of breast cancer often brings fear and anxiety to women. These emotions are frequently heightened at the time when the women have to undergo diagnostic tests to screen for the disease. A study conducted by Gram and Slenker (1992) revealed that one in three women in the general population has anxiety about breast cancer. A more recent survey conducted with 1,005 U.S. women further showed that breast cancer is now the single most feared disease among women in the United States (International Communications Research of Media, Pa., 2005). Those who are the most anxious before

screening are more likely to remain so after the procedure has been completed (Gram & Slenker, 1992; Meystre-Agustoni, Paccaud, Jeannin, & Dubois-Arber, 2001). This finding calls attention to potential adverse effects of mammography screening and reveals the need for intervention to reduce levels of anxiety in women undergoing breast-cancer screening procedures.

Other factors that are associated with overall quality of life for breast cancer patients are social support networks. This is especially true for younger women under the age of 50. Avis, Crawford and Manuel (2005) conducted research on 202 women in this age-group who were diagnosed with breast cancer. Results of the study revealed that women who are in poor relationships experience a lower overall sense of well-being following the diagnosis of breast cancer than do women in good relationships, or women without partners. Problems for women in poor relationships were related to almost all quality-of-life domains. This study suggests the need for more research aimed toward understanding how social support networks affect outcomes for women who are diagnosed with breast cancer.

Purpose of the Study

The purpose of this research is twofold: the first is to compare the effectiveness of three different methods of educational intervention in reducing state anxiety levels for women who are scheduled to undergo breast MRI (which occurs through experimental research using an educational intervention tool that provides information about the MRI procedure), and the second is to describe the relationship between several moderator variables and the effectiveness of the interventions. The primary moderator variable for

this study is perceived social support. Additional moderator variables include claustrophobia, previous knowledge about MRI, marital status, highest level of education and previous history of breast cancer.

Significance of the Study

Research, which compares various methods of educational intervention with state anxiety levels in patients undergoing diagnostic exams, is limited. Information provided by this study may be used to understand how computer-based interventions differ in effectiveness from verbal interventions for women who are scheduled to undergo breast screening procedures in Midwest clinics. In addition, results from this study may be used to determine the most effective type of intervention for each individual based on his or her personal characteristics.

Overview of Conceptual Model, Data Analysis, Results and Implications

The conceptual model for this research is presented in Chapter Three, which introduces the experimental design along with conceptual definitions for the study. Chapter Three also describes the study participants, who are women scheduled to undergo breast MRI exams in a Midwest clinic. This section further introduces research methodology used for this study and presents operational definitions for independent variables, the dependent variable, moderator variables and control variables. In addition, Chapter Three also details the development and application of the educational intervention tool, and provides information about methods of data collection and measurement.

Results of the study are presented in Chapter Four with a summary of the comparison between the three educational interventions and a discussion about the effects of the other moderator variables. The analysis also considers the relationships between pre-intervention state anxiety, post-intervention state anxiety, and trait anxiety and discusses how they relate to the moderator variables and control variables.

Several new research questions were uncovered during the course of this study. Chapter Five describes these findings and discusses their implications for future research. This section also includes a summary of research findings and benefits afforded by the study. As an extension of this research, the women who participated in this study will be invited to continue in an ancillary longitudinal study. Permission to contact these women for future research was obtained through informed consent on the original consent form. The ancillary research will explore the long-term effects of the moderator variables on the progress and well-being of the patients. Results from the current study will form the foundation for a longitudinal study.

CHAPTER 2

LITERATURE REVIEW

Recent shifts in healthcare focus include the psychosocial well-being of patients and their families. This approach adds an important dimension to patient care: namely, social support. Several studies involving cancer patients and their families reveal strong correlations between perceived levels of social support and levels of psychosocial distress for both patients and family members (or other caregivers) (Kurtz M., Given B., Kurtz J. & Given C., 1994; Cano et al., 2003; Northouse, Dorris & Charron-Moore, 1995; Northouse, Mood, Templin, Mellon & George, 2000). This bi-directional influence between patients and their families demonstrates the need for further research to identify factors that are associated with anxiety among women who are scheduled for clinical studies, including breast MRI. These findings also emphasize the need for the development of educational intervention tools to reduce patient and family anxiety and distress.

Human Ecological Theory

This study is organized around human ecological theory because it provides a holistic view of the interdependent relationships between individuals, their social systems, and the physical and biological environments around them (Bubolz & Sontag, 1993). It is also applicable when assessing the effectiveness of educational intervention in the clinical setting. A basic premise of the theory is that individuals and groups are both biological and social in nature (White & Klein, 2002). Humans depend upon their

environments to provide basic elements for survival. As social beings, humans also depend upon other human beings for care and support. Families carry out psychosocial and nurturing functions for the good of themselves, as well as for the good of society. Severe illness in the family necessitates careful allocation and management of resources in a manner that meets both the needs of the ill family member and the family as a group.

Human ecological theory is multifaceted and considers interactions from a system's perspective (Human Ecology Theory, 2002). Urie Bronfenbrenner's Bioecological System's Theory defines multiple ecological levels that comprise the structure of the environment: microsystem, mesosystem, exosystem, macrosystem and chronosystem (Bronfenbrenner, 1990) (See Figure 1 on page 9). Bronfenbrenner's model provides a way of looking at interactions between patients and their environments while, at the same time, considering the natural world or reality as constructed by the patient, and the social and cultural setting in which the patient exists (McLaren & Hawe, 2005).

In the clinical context, Bronfenbrenner's microsystem encompasses relationships and interactions that occur in the patient's immediate surroundings. This level includes interactions with the patient's family, close friends, neighborhood and workplace. Most social support networks occur at this level. The next level, the mesosystem, represents interactions among the patient's different microsystems. Healthcare workers are often part of a patient's mesosystem. Physicians and patients rely on other healthcare professionals to provide necessary medical services. The exosystem encompasses the larger social system that indirectly affects the patient. This level includes the spouse's workplace schedule, healthcare clinic staffing and available resources for medical information. The outermost level in Bronfenbrenner's model is the macrosystem. This

level encompasses cultural values, customs and laws (Berk, 2000). The macrosystem includes government regulations and public policies that provide guidelines for patient care. Although patients do not interact directly with the macrosystem, guidelines determined at this level have a cascading effect on patient care. The chronosystem describes change that occurs over time for the patient, the patient's social support network and the environment.

Human ecological theory states that as the distance between the patient and the external system increases, the influence of the system on the patient's behavior decreases. Systems that influence patient behavior in this study include the the patient's perception of the disease and her interactions with family, friends, neighbors, co-workers, healthcare workers, and other community support services. As a general rule, the microsystem has the greatest influence on patient behavior and the macrosystem has the least influence on patient behavior.

In situations of severe illness, patients and their families may experience high levels of stress as the demands for care increase. In order to prevent excessive stress, the patient's treatment plan should include provisions for health care, transportation, personal assistance, and support groups. Effective patient care and treatment must include coordination of efforts at multiple ecological levels.

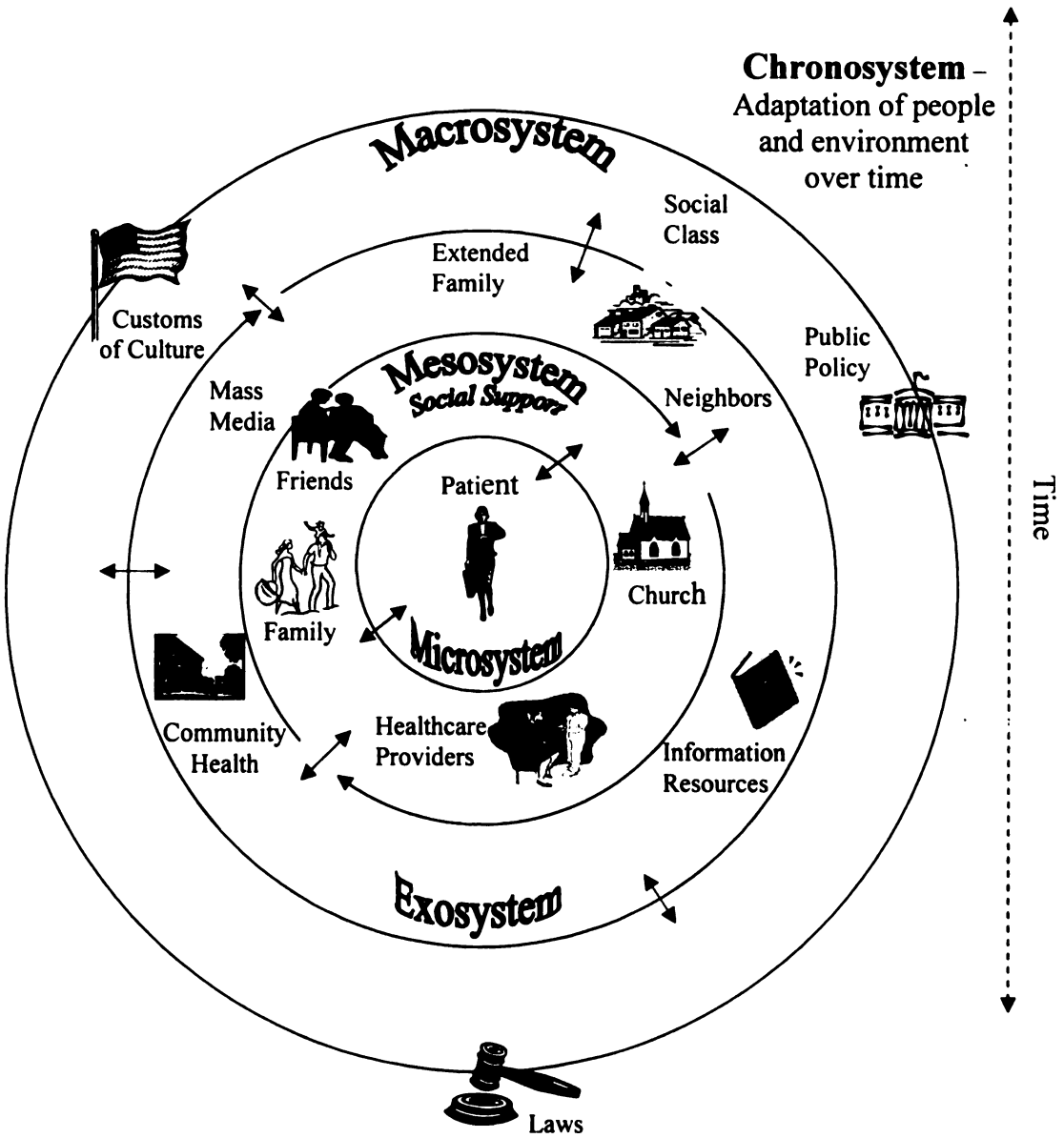


Figure 1. Healthcare Model (based on Bronfenbrenner's Ecological Theory)

Anxiety and Distress

Healthcare research findings identify several factors related to anxiety and distress in patients undergoing diagnosis and treatment for cancer. Variables associated with anxiety include gender, positive test results, poor self-rated health, and dissatisfying family support. These factors impact successful diagnosis of disease and patient response

to treatment. Greater understanding of this effect will allow for the development of more effective treatment.

Interestingly, studies show that women generally report feeling greater levels of distress than men. Northouse, Mood, Templin, Mellon & George in their study, *Couples' Patterns of Adjustment to Colon Cancer* (2000), examined the relationship between gender and distress. The authors concluded that women experience more stress than men regardless of whether they are the patient or the wife of the patient.

Another strong predictor of anxiety in women undergoing breast-cancer screening is a positive test result. Ironically, most positive test results are false. Patients frequently misinterpret positive results as proof of a serious disease and experience potentially disabling anxiety until additional testing is completed to reconfirm good health (Neher, 1999). Patients suffer anxiety even in the absence of definitive tests. In his study, *Reducing Anxiety about Positive Tests* (1999), Neher stresses the importance of informing patients before testing begins that most positive results are errors. The author also describes the importance of informing patients face-to-face when positive results are confirmed and performing follow-up testing as soon as possible. Regardless of whether test results are confirmed or refuted, there is a need for further research to develop educational intervention tools for reducing anxiety in patients undergoing breast MRI.

Other studies reveal relationships among self-rated health, family support, and psychological distress. Cano, Scaturo, Sprafkin, Lantinga, Fiese & Brand (2003) describe a negative relationship between combined family support and self-rated health and psychological symptoms or disorders. Dissatisfying family support is positively correlated with higher incidences of mood disorders and poor self-rated health is

positively correlated with higher incidences of mood and anxiety disorders." (Cano et al., 2003, p. 115). The study demonstrates the greatest elevation of psychological symptoms in participants who report dissatisfying family support combined with poor self-rated health. Findings suggest that assessment of family support may be used to increase understanding of psychosocial risk factors in primary care and provide more comprehensive health care.

Social Support

The importance of psychosocial support extends beyond its relationship with self-rated health and anxiety disorders. Additional correlations are evident between patients' perceived levels of social support and their levels of psychological and emotional distress, as well as in their ability to adjust to disease.

Cano et al. (2003) describe a relationship between patients' perceived levels of family social support and their levels of psychological distress. Their study applies three independent psychological distress measures to show how "quantity and quality of family support are inversely related to psychological symptoms" (p. 112). The authors report that patient perception of dissatisfying family social support is significantly related to elevated psychological distress.

Other studies reveal correlations between perceived levels of social support and the ability to cope with disease-related changes. Northouse et al. (2000) describe this relationship for both patients and their spouses. According to the authors, family functioning, marital satisfaction, and social support are primary social resources that can affect adjustment. Northouse et al. report that a patient's early response to disease is an

indicator of his or her ability to adjust to disease-related symptoms at a later time. In addition, the authors identify the strongest predictors of patient role-adjustment problems as a sense of hopelessness and spousal role problems. Northouse et al. further report that patient spouses report less social support than the patients themselves.

Patients and their families also experience psychological dysfunction and depression as they attempt to cope with disease-related changes. Rawl, Given, Given, et al. (2002) describe these observations in their study, *Intervention to Improve Psychological Functioning for Newly Diagnosed Patients with Cancer*. It includes a computer-based nursing intervention program that provides educational information about disease and treatment, along with emotional support. Patients in the study who received the nursing intervention experienced significantly less depression than patients who did not receive it.

These findings reveal a need for the development of assessment tools to accurately identify patients and family members at risk for poorer adjustment to illness (Rawl, et al. 2002, p. 283). Early identification of individuals with a high number of adjustment problems is essential. Without intervention, the problems are likely to persist for patients and their families, and cause difficulty with role adjustment at a later time.

Educational Intervention

The current trend to include the family in treatment for disease draws attention to the need for family-focused intervention. Neher's 1999 study about positive screening tests reveals the value of using informational intervention to minimize anxiety for patients who encounter false-positive test results. The study describes the benefit of

educating patients before medical testing begins. Other studies describe the benefits of including family members in this type of intervention.

Northouse, Dorrin, & Charron-Moore (1995) report on the interrelationship between patient and spousal adjustment to recurrent breast cancer. Recurrent breast cancer is defined as one or more new primary breast lesions. Northouse et al.'s (1995) research is based on findings that indicate both patients and family members experience excessive stress during the recurrent phase of cancer. The study identifies social support as a key factor affecting the adjustment of women and their partners to recurrent breast cancer and identifies a bi-directional relationship in their ability to adjust. "Each partner, in some way, influences the adjustment of the other" (p. 76). Educational intervention should be designed to reduce anxiety for not only the patient, but for other family members as well. Results of Northouse et al.'s study (1995) highlights the need for family-focused intervention in the treatment of disease.

Northouse, Mood, Templin, Mellon & George (2000) described the importance of identifying couples at risk for adjustment problems early in the course of illness. Their study further described increased adjustment problems and emotional distress for patients and their families during the first year following surgery for colon cancer. These findings add additional support for development of planned programs of care that include family caregivers.

While family-focused intervention offers promise for improved healthcare, educational interventions should also be "culturally sensitive and appropriate for the target audience" (Miller & Champion, 1997, p. 41). The design of interventional

programs should take into consideration variations between patients and address individual needs.

Rawl et al.'s study (2002) employed a menu-driven, computer-based nursing intervention program for clinical assessment, problem identification, selection of intervention, and measurement of outcome for cancer patients and their families. Patients were assigned on a random basis to participate in the intervention program or receive standard health care. The program provided patients and family caregivers with information on symptom management, disease and treatment, and medical resources, as well as emotional support and counseling. The information was tailored to specific needs of the patient and family through the use of a menu-driven program that guided clinical assessment, problem identification, selection of interventions, and measurement of outcomes (Rawl et al., 2002, p. 970). Results of the study revealed the benefits of tailored intervention. Patients who received the experimental intervention reported significantly less depression than patients in the standard care group.

Educational intervention has progressed over the years from a single-patient focus to a more collective focus that considers other individuals in the patient's social support network. As the scope of educational intervention has increased, the technology that drives it has also become more advanced. Current trends include multimedia technologies that raise educational intervention to a new level.

Multimedia Intervention

Existing research demonstrates the effectiveness of various multimedia technologies in reducing anxiety for women undergoing breast-cancer screening.

Research by Street, Van Order, Bramson, and Manning (1998) compared the effectiveness of interactive multimedia intervention versus brochures in reducing anxiety and increasing breast cancer knowledge. The study revealed that women who received educational intervention reported less anxiety about cancer screening regardless of the method employed (p. 152). However, individuals differed in their preferred method of intervention, with younger women preferring interactive multimedia methods.

Another study by Champion, Skinner, Menon, et al. (2002) described the benefits of tailored intervention for increasing mammography usage. The study tested three types of interventions: a mailed letter containing information tailored to breast cancer concerns and beliefs, a phone call delivering the same information and a combination of the mailed and phoned information. Results of the study showed that all three groups of women who received intervention demonstrated improved compliance for mammography usage compared to women who received just the usual care. Women who received both forms of intervention demonstrated the highest improvement in their levels of compliance for mammography usage.

Devine and Westlake (1995) reported similar findings. They conducted a meta-analysis of 116 intervention studies that evaluated the effectiveness of various types of psychoeducational care in reducing anxiety and depression for adults with cancer. Results showed that cancer patients who received psychoeducational care experienced less anxiety and depression compared to patients who received standard medical care. However, the meta-analysis did not adequately differentiate between the different types of psychoeducational care. "Additional research is needed to evaluate the relative effectiveness of different types of psychoeducational care" (p.1369). Devine and

Westlake's study calls attention to the need for additional research which could provide a better understanding of the interplay between media, message, and audience characteristics in promoting healthcare objectives.

In summary, trends in healthcare continue to change as new technology develops and the focus on treatment planning broadens to include the patient's social support network. Although quality care directed toward the individual patient is valuable, the benefits of tailored and multimedia intervention directed toward the patient, family members, and other caregivers are now apparent. Information gained through research underscores the value of early identification of anxiety and adjustment problems and reinforces the value of considering the patient's social support network in the treatment plan. As research continues to build on this foundation of knowledge, patients and their families, along with other caregivers will realize greater success in adjustment to disease and improved treatment outcomes.

CHAPTER 3

METHODOLOGY

Participants

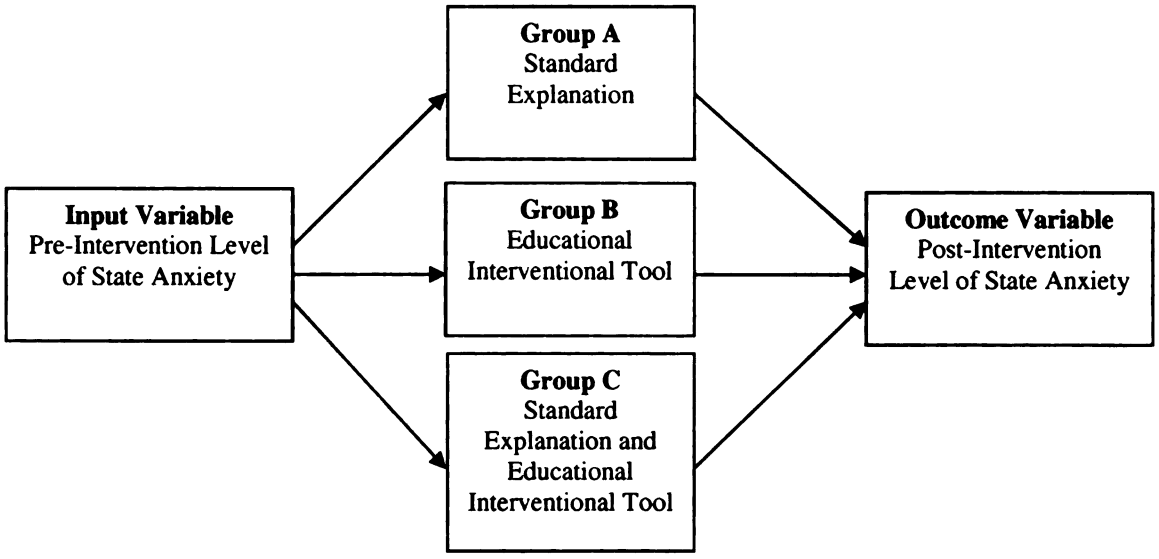
One-hundred-thirty-three women who were scheduled for breast MRI exams at a Midwest clinic were asked to participate in this study. The researcher, or study representative, explained the study to the women and requested consent for participation and release of medical records. Of those women, 128 (96.2%) participated throughout the study, three declined to participate and one withdrew from the study after completing the survey and questionnaires. Demographics for participants included 122 Caucasians (95.3%), two African Americans (1.6%), one Asian (.8%) and three Hispanics (2.3%). The women ranged in age from 32 years to 86 years with a mean age of 51 years.

The marital status of participants included five "single-never married" (3.9%), seven "single, living with a significant other" (5.5%), 81 "married" (63.3%), three "married but separated" (2.3%), 17 "divorced" (13.3%), six "remarried" (4.7%) and nine "widowed" (7%).The highest level of education achieved by the participants included one "General Education Development" (GED) (.8%), 24 "high school" (18.9%), 25 "attended college" (19.7%), 25 "college two-year degree" (19.7%), 21 "college four-year degree" (16.5%), 24 "graduate/professional degree" (18.9%) and seven "other" (5.5%). Eighty-eight (68.8%) of the women who participated were employed at the time of the study and 21 (19.4%) were retired. Additional demographics for the study are recorded in Appendix A and descriptive statistics are recorded in Table 2 and Table 3 (pages 32 and 33).

Design

A single-site clinical, survey-based study was conducted using an experimental design with an educational intervention tool. The major dependent variable for this research was *level of state anxiety.* Independent variables included the *standard verbal explanation* (See Table 1 on p. 23) and an *educational intervention tool* (See Appendix J). Based on the literature review for this study, along with additional research findings, the following moderator variables were included: *perceived level of social support, marital status, previous history of breast cancer, claustrophobia (*Murphy & Brunberg, 1997, p. 51) and *previous knowledge about MRI* (Gollub & Shellock, 2001, p. 198). The latter describes participants who previously underwent an MRI exam or whose healthcare provider explained the procedure to them before they arrived for their exam. Control variables *age, race* and *gender* were also included in this study based on the literature review.

The study consisted of three experimental groups of subjects. Subjects in Group A received information about breast MRI through standard verbal explanation. Subjects in Group B received information about breast MRI by viewing the educational intervention tool, and subjects in Group C received information by viewing the educational intervention tool and then receiving the standard verbal explanation afterwards. This three-group study design ensured correct interpretation of results in case the standard verbal explanation, rather than the educational intervention tool, was responsible for changes in state-anxiety levels. The conceptual model for the intervention is depicted in Figure 2 on the next page.



Control: *gender, race, & age*

Figure 2. Intervention model

Procedure

The researcher approached women who were scheduled for breast MRI exams at a Midwest clinic. After explaining the study to the women, the researcher requested their consent to participate and to allow the release of their medical records for the study. Women who agreed to participate completed the State Trait Anxiety Inventory (STAI), the Short Form Social Support Questionnaire (SSQ-6), and a demographic survey. Each participant was randomly assigned to one of three intervention groups described in the *design* section based on a random number table generated by www.random.org (Haahr, 2004). Participants followed the intervention protocol defined by their group.

Conceptual Definitions

This study included several variables that required conceptual definitions in order to fully understand the relationship between the interventions, the moderator variables, the control variables, and state anxiety levels. These definitions are provided in the list that follows.

Dependent variable

State Anxiety. State anxiety is conceptually defined as the "transitory emotional state or condition of the human organism that is characterized by subjective, consciously-perceived feelings of tension and apprehension, and heightened autonomic nervous system activity" (Spielberger et al., 1983, p. 2).

Independent variables

Educational intervention tool. The educational intervention tool is defined as a computer-based PowerPoint tool that provides information about breast MRI (See Appendix J). The tool includes 13 informational points that comprise the *MRI Standard Verbal Explanation* (See Table 1 on p. 23).

Standard explanation. The standard explanation is the routine explanation provided to the respondent about the MRI exam by the researcher or study representative before the exam begins (See Table 1 on p. 23).

Moderator variables

Perceived social support. The primary moderator variable for this study is perceived social support (See Appendices C & I). This variable describes the number of people the respondent can count on for support (on a scale of 1 to 9) in six situations and the respondent's overall satisfaction with that network (on a scale of 1 to 6).

Additional moderator variables .Additional moderator variables for the study include *marital status, previous knowledge about MRI, claustrophobia, highest level of education* and *previous history of breast cancer.* Conceptual and operational definitions for these variables are included in Appendix A.

Control variables.

Control variables for the study include *age, race* and *gender.* Conceptual and operational definitions for these variables are included in Appendix A.

Inclusion Criteria

Inclusion criteria for this study were women, 18 years of age or older who were scheduled to undergo a breast MRI exam. Additional inclusion criteria were mental competency and the ability to read and write in the English language.

Exclusion Criteria

Exclusion criteria were women who were less than 18 years of age, or who were mentally incompetent. Also excluded were women who had previously participated in this study, women who previously underwent breast MRI, and women who previously viewed the educational intervention tool.

Development of the Educational Intervention Tool

The objective of the educational intervention tool was to reduce state anxiety in women who were scheduled for breast MRI procedures. Information used to create the tool was collected in a professional clinical environment over a period of six months

during routine patient interviews. During this time, researchers and study representatives asked women who were scheduled for a breast MRI to describe factors related to the exam that made them feel nervous or uneasy. As information was gathered, a pattern of factors developed. The factors most commonly referenced by these women included: fear of breast cancer, concern about the IV contrast agent , claustrophobia, concern over the amount of time that would pass before they would know the results of their exam, apprehension about the safety of MRI, and concern about their physical position on the table during the exam. The educational intervention tool was designed to provide information addressing these concerns, and by doing so, the intervention was expected to reduce state-anxiety levels. As an added measure to ensure quality of care, the educational intervention tool also contained the 13 informational points that were included in the standard verbal explanation. The tool consisted of a computer-based PowerPoint presentation comprised of 15 slides (See Appendix J).

MRI Standard Verbal Explanation

Standard care for patients who are scheduled to undergo breast MRI includes an explanation of the MRI procedure before the scan begins. This explanation describes 13 informational points about the exam (see Table 1 on the next page).

Table 1.

Information Included in the Standard Verbal Explanation of MRI

1.	MRI uses a strong magnetic field to acquire information for the images
2.	All non-implanted metal objects must be removed from the patient prior to the exam
3.	The patient must change into a gown before entering the scan room
4.	A locker is provided to secure valuables
5.	The MRI breast exam involves an intravenous injection of contrast material that enhances abnormal tissue
6.	The contrast does not impair the patient's ability to drive or participate in normal activity
7.	The MRI exam is very loud and, therefore, ear protection and/or headphones are provided to protect hearing
8.	The patient is positioned on her stomach atop a device known as a "coil" that acquires information about the breast tissue
9.	The coil is contoured to fit the chest area and minimize discomfort
10.	The patient enters the magnet feet-first for the exam
11.	The bore of the magnet remains open throughout the procedure
12.	The patient must remain perfectly still during the exam
13.	The technologist can see and hear the patient throughout the exam

Hypotheses

Clinical research that compares the effectiveness of multimedia interventions in reducing state-anxiety levels is limited. However, other research suggests that patients who receive multiple forms of intervention demonstrate the highest improvement in outcome measurements (Champion et al., 2002). Based on these findings, the primary alternative hypothesis (H_{11}) being tested by this research is *among women undergoing Breast MRI, there is a relationship between combined verbal and computer-based educational intervention and the effectiveness of the interventions.* The study further considers the relationship between moderator variables and the efficacy of the interventions. The conceptual model used to test hypotheses for this study is illustrated in Figure 3 on the next page. This model addresses the following null hypotheses: and further considers the following null hypotheses:

H_{01} *Among women undergoing Breast MRI, there is no relationship between combined verbal and computer-based educational intervention and the effectiveness of the interventions*

H_{02} *Among women undergoing Breast MRI, there is no relationship between participants' perceived levels of social support and the effectiveness of the interventions*

H_{03} *Among women undergoing Breast MRI, there is no relationship between claustrophobia and the effectiveness of the interventions*

H_{04} *Among women undergoing Breast MRI, there is no relationship between previous knowledge about MRI and the effectiveness of the interventions*

H_{05} *Among women undergoing Breast MRI, there is no relationship between marital status and the effectiveness of the interventions*

H_{06} *Among women undergoing Breast MRI, there is no relationship between education and the effectiveness of the interventions*

H_{07} *Among women undergoing Breast MRI, there is no relationship between previous history of breast cancer and the effectiveness of the interventions*

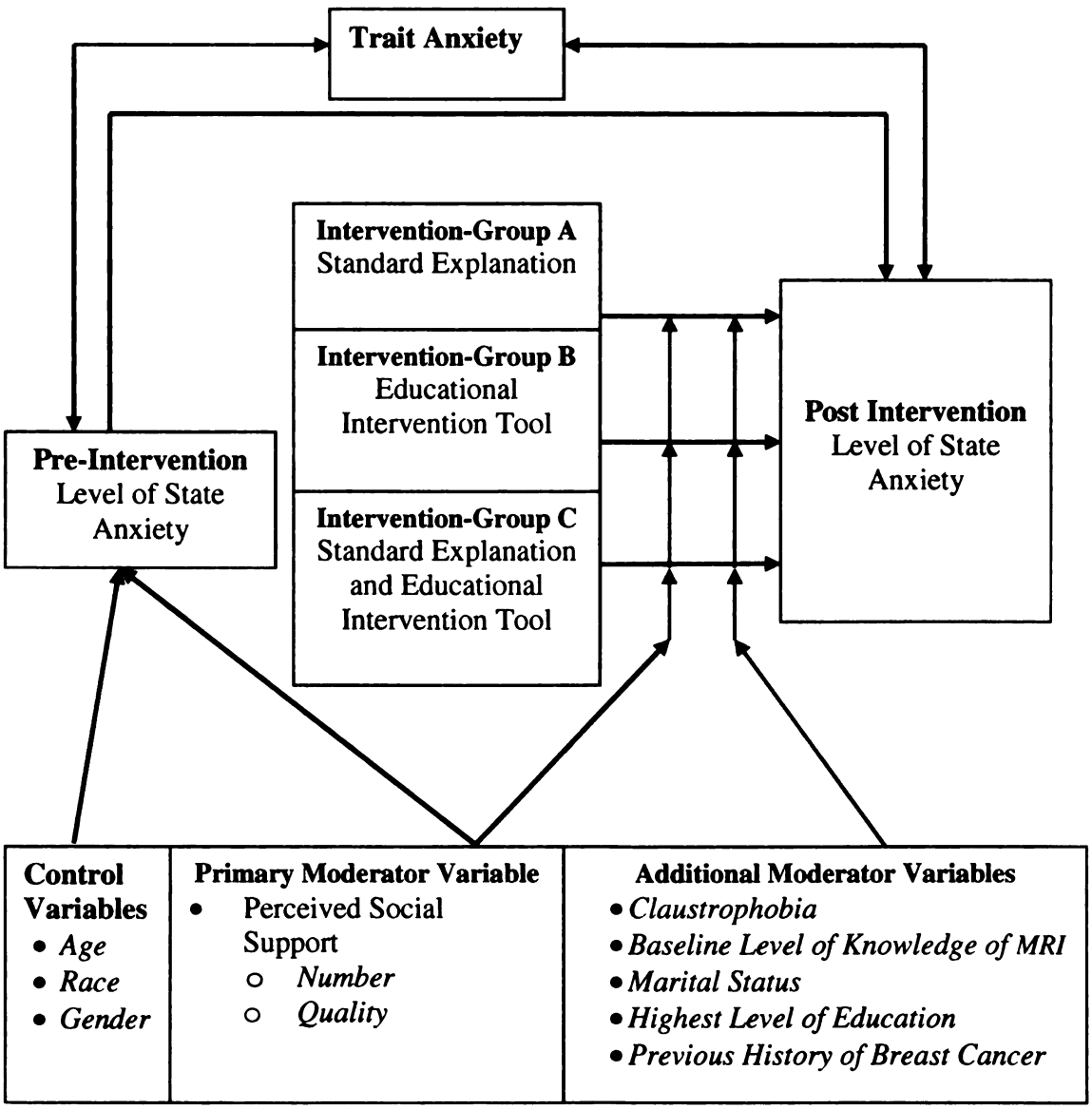


Figure 3. Conceptual model of intervention with test variables

In order to better understand and predict characteristics that are associated with elevated state-anxiety levels, the relationship between the study variables and pre-intervention state-anxiety levels was also examined during data analysis. Chapter Four

includes a summary of the relationship between pre-intervention state-anxiety levels and independent variables, moderator variables and control variables

Measurement

Variables for this study were measured with three routine patient history forms: a single survey and two questionnaires. A complete list of operational definitions for variables is included in Appendix A.

The variables *state anxiety* and *trait anxiety* were measured with the State Trait Anxiety Inventory (STAI) (See Appendix H). The STAI is a 40-item, 4-point Likert-type questionnaire (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983). The Inventory includes twenty questions that measure the participant's transitory emotional state (state anxiety) and twenty questions that measure "relatively stable individual differences in anxiety proneness..." (trait anxiety) (Spielberger et al., 1983, p.2).

State anxiety is based on the assumption that individuals experience differential levels of state anxiety as a function of their level of trait anxiety depending on conditions surrounding the stimulus. The Trait Anxiety Inventory establishes a baseline for comparing state anxiety levels.

Test-retest correlations for the state anxiety scale range from .16 to .62 and correlations for the trait anxiety scale range from .65 to .86. Test - retest reliability on the State Anxiety Inventory is expected to be low since the measures on this scale are thought to reflect transient situational factors that are present at the time of testing. Internal consistency for both scales is high. The median Chronbach alpha coefficient for the state anxiety scale is 0.92 and for the trait anxiety scale, the median alpha is 0.90

(Spielberger et al., 1983, p. 29). Similarly, Chronbach's alpha coefficients for the research presented in this study were 0.94 for the pre-intervention state anxiety scale, 0.95 for the post-intervention state anxiety scale and 0.93 for the trait anxiety scale.

Correlations between the state-anxiety scale and trait anxiety scale are reported by Spielberger et al. as 0.65 to 0.75 for males and 0.59 to 0.70 for females. Correlations tend to be higher in situations that pose a threat to self-esteem or when personal adequacy is evaluated, and scores tend to be lower in situations characterized by physical danger (Spielberger et al., p. 31). For the research presented in this study, correlation between trait anxiety and pre-intervention state anxiety was 0.59 and correlation between trait anxiety and post-intervention state anxiety was 0.57.

The State Trait anxiety inventory has been used extensively for assessing clinical anxiety in medical, surgical psychosomatic and psychiatric patients (Spielberger et al., 1983, p. 4). The scale is cited in more than 2,000 research studies "including research in medicine, dentistry, education, psychology and other social sciences" (Spielberger et al., 1983, p. 5).

The moderator variable, *perceived social support* was measured with the Short Form Social Support Questionnaire (SSQ-6) (See Appendix I). The SSQ-6 provides information about people the respondent can count on for support in six situations. Participants in this study described their network size, *social support number,* based on a scale of 1 to 9 and satisfaction with the network, *social support quality,* based on a scale of 1 to 6. The scores in each category were then added together and divided by nine (for social support number) and six (for social support quality) to achieve overall average ratings for each dimension of perceived social support.

With this instrument, higher scores indicate higher numbers of supporters and higher satisfaction with that support. Both dimensions of social support have good internal reliability ranging from 0.90 to 0.93 (Sarason, Levine, Basham & Sarason, 1987). Alpha coefficients for the current study were 0.94 for social support number and 0.55 for social support quality. However, with Question 5, *who can you really count on?* omitted from the analysis, alpha coefficients were 0.92 for social support number and 0.98 for social support quality. Internal reliability for social support is discussed in greater detail in Chapter Four.

The majority of the remaining moderator variables for this study were self-reported by respondents on the demographic survey (See Appendix D). These include *claustrophobia, marital status, previous knowledge about MRI* and *highest level of education.* Information about *age, gender, race* and *previous history of breast cancer* was collected by the healthcare personnel during the routine intake interview and recorded on Mammography Medical History Forms (See Appendices E & G). Conceptual and operational definitions for these variables are included in Appendix A.

The educational intervention tool was designed to reduce state anxiety for women undergoing breast MRI. The success of the tool was determined by calculating the difference between pre-intervention vs. post-intervention state anxiety scores. Greater changes in pre-intervention vs. post-intervention state-anxiety scores indicated greater success of the tool.

Coding

In preparation for data analysis, data for the study were coded according to the scales of measurement used during data acquisition. Variables measured at the nominal level were coded with dummy variables indicating whether the variables were present (0 = no, 1 = yes). Variables measured at this level included *claustrophobia, previous history of breast cancer,* and *previous knowledge about MRI* (measured as either *previous MRI* or *MRI explained* on the demographic survey [See Appendix D]). The categorical variables *race, marital status* and *highest level of education* were also measured at the nominal level. However, these variables were first categorized with unique codes for each categorical level and annotated with unique value labels and then recoded with dummy variables for analysis.

Variables measured at the interval level were coded with the values reported by the respondents during data acquisition. Variables measured at this level included *state anxiety, trait anxiety, age* and *perceived social support* (reported as either *social support number* or *social support quality*).

Data Analysis

Data analysis for the study was divided into three stages. The first stage consisted of univariate analysis. Data for each variable were analyzed with frequency tables and then graphically plotted using histograms (for interval data) and bar charts (for categorical data) to assess for shape, frequency distribution, central tendency, and variability. Data were also analyzed for skewness, kurtosis, outliers, gaps and peaks. In

addition, interval data were tested for normal distribution using the Shapiro-Wilk normality test

The next stage of data analysis consisted of bivariate analysis. During this stage, analyses were performed to examine relationships between test variables. For interval data, Kendall's tau_b was performed to test for significant correlations and for categorical data, the Kruskall Wallis One-way ANOVA test was used to test for significant differences between means.

Research hypotheses were tested using One-Way ANOVA, repeated-measures ANOVA and Kendall's tau_b. A probability of $p \leq 0.05$ was established as the required value to reject null hypotheses.

The final stage of data analysis consisted of multivariate analysis using ordinary least squares regression. During this stage of analysis, a model was created to explain the variance of post-intervention anxiety levels between groups (See Table 17 on page 59).

CHAPTER 4

RESULTS

The primary purpose of this study was to compare the effectiveness of three interventions in reducing state anxiety levels. The research was based on the H_{01} hypothesis *among women undergoing Breast MRI, there is no relationship between combined verbal and computer-based educational intervention and state-anxiety levels.* Additional hypotheses were also included in the study:

H_{02} *Among women undergoing Breast MRI, there is no relationship between participants' perceived levels of social support and the effectiveness of the interventions*

H_{03} *Among women undergoing Breast MRI, there is no relationship between claustrophobia and the effectiveness of the interventions*

H_{04} *Among women undergoing Breast MRI, there is no relationship between previous knowledge about MRI and the effectiveness of the interventions*

H_{05} *Among women undergoing Breast MRI, there is no relationship between marital status and the effectiveness of the interventions*

H_{06} *Among women undergoing Breast MRI, there is no relationship between education and the effectiveness of the interventions*

H_{07} *Among women undergoing Breast MRI, there is no relationship between previous history of breast cancer and the effectiveness of the interventions*

To ensure consistency in the study, participants were randomly assigned to one of three groups with approximately equal numbers of participants in each ($N = 43$ for Group A and Group C, and $N = 42$ for Group B). Descriptive statistics for variables are included in Tables 2 and 3 on the next two pages.

Univariate Analysis

Analysis of data for this study was conducted using Mac OS X version 11.0 SPSS statistical analysis software (SPSS Inc, Chicago, IL). The first stage consisted of univariate analysis with descriptive statistics. Frequency distributions and percentages for categorical variables were described using cross tabulations (See Table 2 below). Categorical variables in this analysis included marital status, race, education, previous history of breast cancer, previous knowledge about MRI and claustrophobia. In addition, bar charts were generated to graphically display and analyze frequency counts for these variables.

Table 2

Descriptive Statistics for Categorical Data: Group A, Group B and Group C

	Category	*A*	*B*	*C*	*Total*	*%A*	*%B*	*%C*
Race	Caucasian	39	41	42	122	32.00	33.60	34.40
	African American	1	0	1	2	50.00	0	50.00
	Asian	1	0	0	1	100.00	0	0
	Hispanic	2	1	0	3	66.70	33.30	0
Marital Status	Single – Never Married	1	3	1	5	20.00	60.00	20.00
	Single – Living with Significant Other	1	1	5	7	14.30	14.30	71.40
	Married	29	22	30	81	35.80	27.20	37.00
	Married / Separated	1	1	1	3	33.30	33.30	33.30
	Divorced	5	10	2	17	29.40	58.80	11.80
	Remarried	3	2	1	6	50.00	33.30	16.70
	Widowed	3	3	3	9	33.30	33.30	33.30
Highest Level - Education	GED	1	0	0	1	100.00	0	0
	High School	8	9	7	24	33.30	37.50	29.20

	Attended College	9	9	7	25	36.00	36.00	28.00
	College 2-Year Degree	9	5	11	25	36.00	20.00	44.00
	College 4-Year Degree	6	7	8	21	28.60	33.30	38.10
	Graduate/Prof. Degree	6	10	8	24	25.00	41.70	33.30
	Other	4	1	2	7	57.10	14.30	28.60
Previous History - Breast Cancer	No	26	27	15	78	33.30	34.60	32.10
	Yes	17	15	18	50	34.00	30.00	36.00
Previous Knowledge about MRI	No	9	16	12	37	24.30	43.20	32.40
	Yes	34	26	31	91	37.40	28.60	34.10
Claustrophobia	No	30	25	24	79	38.00	31.60	30.40
	Yes	13	17	19	49	26.50	34.70	38.80

Descriptive statistics for continuous variables were calculated and reported as mean, standard deviation, minimum value and maximum value (See Table 3 below). Continuous variables for the study included pre-intervention and post-intervention state anxiety, pre/post intervention % change, trait anxiety, social support number, social support quality and age.

Table 3.

Descriptive Statistics for Interval Data: Group A, Group B and Group C

Groups A B C		*N*	*Min.*	*Max.*	*Mean*	*Std. Dev.*
A	Pre State Anxiety	43	20	80	38.74	15.39
	Trait Anxiety	43	20	73	37.05	12.67
	Post-Intervention State Anxiety	43	20	74	36.00	14.15
	Pre/Post Intervention % Change	43	-0.46	0.41	-0.06	0.15
	Social Support Number	43	0.83	9.00	4.53	2.67
	Social Support Quality	43	1.00	6.00	5.17	1.38
	Age	43	35	86	50.51	10.55

B	Pre State Anxiety	42	20	70	39.14	11.76
	Trait Anxiety	42	20	52	33.37	7.25
	Post-Intervention State Anxiety	42	21	67	36.57	11.28
	Pre/Post Intervention % Change	42	-0.37	0.32	-0.05	0.15
	Social Support Number	42	1.17	9.00	4.15	1.98
	Social Support Quality	42	1.00	6.00	5.20	1.47
	Age	42	32	78	51.62	11.25
C	Pre State Anxiety	43	20	60	37.54	12.00
	Trait Anxiety	43	20	52	33.93	8.28
	Post-Intervention State Anxiety	43	20	58	35.14	11.77
	Pre/Post Intervention % Change	43	-0.31	0.29	-0.06	0.13
	Social Support Number	43	0.67	9.00	4.36	2.43
	Social Support Quality	43	1.00	6.00	5.03	1.71
	Age	43	32	77	50.98	10.21

Normalcy of distribution for continuous variables was assessed using the Shapiro-Wilk test and each dataset was analyzed for kurtosis and skewness. Data for pre/pos-intervention % change passed the normality test at the 95% confidence interval. However, data for pre-intervention state anxiety, post-intervention state-anxiety, trait anxiety, social support number, social support quality, and age failed the normality test at this confidence interval. These data were further analyzed with box and whisker plots to identify outliers. Questionable values were checked against responses from original surveys and questionnaires for accuracy. Data sets that failed tests for normality or produced skewness or kurtosis values ≤ -1 or ≥ 1 were transformed using the natural log to improve symmetry.

Two variables, trait anxiety and social support quality, produced data sets with positive kurtosis values ≥ 1. In addition, social support quality produced a negative

skewness value ≤ -1 and trait anxiety produced a positive skewness value ≥ 1. While natural log transformation of trait-anxiety data effectively reduced skewness and kurtosis, transformation of social support quality data was not successful in compensating for the skew or kurtos. Analysis of data for social support quality indicated that a high number of respondents (111 out of 128) reported average scores ≥ 5. The resulting bias rendered the data invalid for use as a moderator variable for this study. Data from social support quality were omitted from further analysis based on these results. Furthermore, the H_{02} hypothesis which reads, *among women undergoing Breast MRI, there is no relationship between participants' perceived levels of social support and the effectiveness of the interventions,* was modified to reflect exclusion of social support quality. The new H_{02} hypothesis used for further analyses was stated, *among women undergoing Breast MRI, there is no relationship between patients' social support number and the effectiveness of the interventions.*

Following log transformation, data sets for trait anxiety and age passed normality tests while data sets for pre-intervention state anxiety, post-intervention state-anxiety, social support number, and social support quality failed to achieve normalcy. In order to analyze data comprised of both normal and non-normal distribution, the Kruskal-Wallis One-way Analysis of Variance (KW One-Way ANOVA) test was used to compare means within Group A, Group B and Group C for these variables. *P* values of less than 0.05 were considered significant.

Sample Characteristics

Table 3 (on pages 33 - 34) provides descriptive statistics for continuous variables in the study. Pre-intervention state-anxiety values ranged from 20 to 80 (M = 38.47, SD =

13.08), post-intervention state anxiety values ranged from 20 to 74 (M = 35.90, SD = 12.39) and trait anxiety values ranged from 20 to 73 (M = 34.79, SD = 9.76). Further analysis using a KW One-way ANOVA revealed no significant difference in the means for these variables between Group A, Group B and Group C (See Table 4 below).

Table 4.

Comparison of Continuous Variables between Group A, Group B and Group C using KW One-way ANOVA

	Group A		*Group B*		*Group C*				
Variable	*N*	*Mean Rank*	*N*	*Mean Rank*	*N*	*Mean Rank*	*Chi Square*	*df*	*p*
Pre-Intervention State Anxiety	43	62.99	42	67.30	43	63.28	0.36	2	0.84
Post-Intervention State Anxiety	43	62.62	42	68.04	43	62.93	0.57	2	0.75
Trait Anxiety	43	69.58	42	60.62	43	63.21	1.32	2	0.52
Social Support Number	43	65.91	42	62.71	43	64.84	0.16	2	0.92
Social Support Quality	43	62.71	42	65.77	43	65.05	0.19	2	0.91
Age	43	62.19	42	66.57	43	64.79	0.30	2	0.86

Descriptive Statistics for Group A

Additional descriptive statistics were computed to examine the distribution of variables within Group A, Group B and Group C and determine demographic characteristics for each group. Pre-intervention state-anxiety scores for Group A ranged from 20 to 80 (M=38.74, SD = 15.39) and post-intervention scores ranged from 20 to 74 (M = 36.00, SD = 14.15) indicating a change of -2.74 (-7.1%). Trait anxiety scores for this group ranged from 20 to 73 (M=37.05, SD = *12.67).* In addition, 91% of Group A participants were Caucasian, 67.4% were married and 79.1% had some level of college education. The average social support number for the group was 4.53. Claustrophobic tendencies were reported by 13 respondents (30.2%) and 34 (79.1%) reported having previous knowledge about MRI. In addition, 39.6% of Group A respondents reported a previous history of breast cancer.

Descriptive Statistics for Group B

Group B pre-intervention state-anxiety scores ranged from 20 to 70 (M = 39.14, SD = 11.76) and post intervention scores ranged from 21 to 67 (M = 36.57, SD = 11.28) which indicated a change of -2.57 (-6.57%). Trait anxiety scores for this group ranged from 20 to 52 (M = 33.37, SD = 7.25). In addition, 41 (97.6%) participants were Caucasian and 22 (52.4%) were married. The ages of Group B participants ranged from 32 to 78 years (M = 51.62, SD=11.25) and their average social support number was 4.15. Additionally, 33 (78.57%) participants reported some level of college education and 17 (40.5%) indicated claustrophobic tendencies. Furthermore, 22 (61.90%) participants in Group B reported having previous knowledge about MRI and 15 (35.7%) reported a previous history of breast cancer.

Descriptive Statistics for Group C

Pre-intervention state-anxiety scores for Group C ranged from 20 to 60 (M = 37.54, SD = 12.00) and post-intervention scores ranged from 20 to 58 (M = 35.14, SD = 11.77). Trait anxiety scores for this group ranged from 20 to 52 (M = 33.93, SD = 8.28). Participants' ages in Group C ranged from 32 to 77 years (M = 50.98, SD = 10.21). In addition, 42 (97.7%) respondents in this group were Caucasian, 30 (69.77%) were married and 36 (83.4%) reported some level of college education. The average social support number for Group C respondents was 4.36. Furthermore, 19 (44.2%) participants in this group reported claustrophobic tendencies and 31 (72.10%) reported previous knowledge about MRI.

Bivariate Analysis

Bivariate analysis was conducted to test for significant relationships between variables in the study. Specifically, analyses were performed using Kendall's tau_b correlation and Kruskal-Wallis One-way Analysis of Variance (KW ANOVA) to examine the relationships between state anxiety and trait anxiety and between pre-intervention state anxiety and the other test variables. Additional analyses were performed using Repeated-Measures Analysis of Variance (Repeated-Measures ANOVA), One-way Analysis of Variance (One-way ANOVA), Two-way Analysis of Variance (Two-way ANOVA), Analysis of covariance (ANCOVA) and Two-way Analysis of covariance (Two-way ANCOVA) to test research hypotheses H_{01} through H_{013}.

Correlates for State Anxiety and Trait Anxiety

State anxiety is based on the assumption that individuals experience different levels of state anxiety as a function of their level of trait anxiety. This relationship depends on conditions surrounding the stimulus such that individuals with high trait-anxiety scores more often exhibit high state anxiety scores because "they interpret a wider range of situations as dangerous or threatening" (Spielberger, 1983, p. 3). Kendall's tau-b (nonparametric) rank correlations were performed to examine relationships between pre-intervention state anxiety, post-intervention state anxiety and trait anxiety for this study. Table 5 presents findings from these analyses.

Results of the analyses show significant positive correlation between pre-intervention state anxiety and post-intervention state anxiety. This finding indicates that individuals who experienced higher levels of state anxiety before intervention in response to their impending breast MRI exam also experienced proportionally higher levels of state anxiety after the intervention compared to individuals who experienced lower levels of state anxiety in response to their impending exams. This means that participants who were more apprehensive, tense, nervous, and worried when they arrived for their breast MRI exam continued to be proportionally more apprehensive, tense, nervous and worried after intervention compared to individuals who were less apprehensive, tense, nervous and worried when they arrived for their exam.

Results also indicate significant positive correlation between pre-intervention state anxiety and trait anxiety. In other words, individuals who reported general tendencies toward higher levels of trait anxiety also experienced higher levels of state

anxiety in response to their impending breast MRI compared to individuals who reported general tendencies toward lower trait anxiety.

Table 5

Correlation Between State Anxiety and Trait Anxiety Using Kendall's Tau_b (N = 128)

Correlations			*Pre St-Anx.*	*Post State-Anx.*	*Trait Anx.*
Kendall's tau_b	Pre State Anx.	Corr. Coeff.	1.00	0.74**	0.45**
		Sig. (2-tailed)	.	0.00	0.00
	Post State Anx.	Corr. Coeff.	0.74**	1.00	0.48**
		Sig. (2-tailed)	0.00	.	0.00
	Trait Anx.	Corr. Coeff.	0.45**	0.48**	1.00
		Sig. (2-tailed)	0.00	0.00	.
**	Correlation is significant at the .01 level (2-tailed).				
*	Correlation is significant at the .05 level (2-tailed).				

Correlates and Comparisons for State Anxiety, Trait Anxiety, and Other Test Variables

When assessing the effectiveness of anxiety-reducing interventions, a basic understanding of the relationship between pre-intervention state-anxiety levels, trait-anxiety levels, and other demographic characteristics of the sample is helpful. Additional bivariate analyses were performed to describe relationships between pre-intervention state-anxiety levels and the following test variables: age, race, social support number, claustrophobia, previous knowledge about MRI, and highest level of education and previous history of breast cancer. Correlations were also computed to describe the relationship between trait anxiety levels and these test variables.

Correlates for Other Continuous Variables

Kendall's tau_b (non-parametric) correlations were performed to describe relationships between pre-intervention state anxiety, trait anxiety and the variables measured at the interval level, age and social support number. Results from these analyses are presented in Table 6.

In addition to the relationship between pre-intervention state anxiety and trait anxiety previously described, Kendall's tau-b correlations also showed significant negative correlation between social support number and trait anxiety. This means that participants with higher social support numbers reported lower overall general tendencies toward anxiety. In other words, participants who indicated that they could count on more people to provide support when they needed it tended to experience less anxiety.

Table 6

Correlations Between Pre-Intervention State Anxiety, Trait Anxiety, and Variables Measured at the Interval Level Using Kendall's Tau b (N = 128)

Correlations			Pre State Anxiety.	Trait Anxiety	SS Num	Age
Kendall's tau_b	Pre St-Anx.	Corr. Coeff.	1.00	0.45**	-0.09	-0.04
		Sig. (2-tailed)	.	0.00	0.13	0.54
	Trait Anx.	Corr. Coeff.	0.45**	1.00	-0.13*	-0.04
		Sig. (2-tailed)	0.00	.	0.04	0.52
	SS Num	Corr. Coeff.	-0.09	-0.13*	1.00	-0.07
		Sig. (2-tailed)	0.13	0.04	.	0.27
	Age	Corr. Coeff.	-0.05	-0.04	-0.10	1.00
		Sig. (2-tailed)	0.57	0.52	0.26	.

** Correlation is significant at the .01 level (2-tailed).

* Correlation is significant at the .05 level (2-tailed).

Comparisons for Categorical Variables

Additional analyses were performed using a KW One-way ANOVA to examine relationships between pre-intervention state anxiety and trait anxiety and the remaining categorical variables race, claustrophobia, previous knowledge about MRI, marital status, highest level of education, and previous history of breast cancer. Table 7 and Table 8 summarize the results from these analyses.

Findings show a significant difference between mean pre-intervention state-anxiety scores for participants who were claustrophobia compared to mean pre-intervention state-anxiety scores for participants who were not claustrophobic. This means that participants who reported claustrophobic tendencies were more anxious when they arrived for their Breast MRI exams compared to participants who were not claustrophobic.

In addition, results also suggest a difference in mean pre-intervention state-anxiety scores for participants with a previous history of breast cancer compared to corresponding scores for participants without a previous history of breast cancer ($X^2 = 2.84$, $p = 0.09$). Although the relationship did not reach the .05 level of significance, participants who experienced breast cancer in the past tended to be more anxious when they arrived for their breast MRI exam compared to participants with no previous history of breast cancer.

Results from analyses that compared trait anxiety and other categorical variables reveal no significant relationships at the ≤ 0.05 level. However, research findings do suggest a difference in mean trait-anxiety scores for participants who were claustrophobic compared to mean trait-anxiety scores for participants who were not claustrophobic.

Participants who were claustrophobic tended to be more generally prone to higher levels of anxiety ($X^2 = 3.15$, $p = 0.08$).

Table 7.

Comparison of Pre-Intervention State Anxiety Scores and Categorical Variables Using KW One-Way ANOVA

Pre-Intervention State Anxiety						
Variable	*Category*	*N*	*Mean Rank*	*Chi Square*	*df*	*p*
Marital Status				8.03	6	0.23
	Single Never Married	5	47.50			
	Living with Sig. Other	7	59.71			
	Married	81	65.85			
	Married but Separated	3	50.83			
	Divorced	17	65.79			
	Remarried	6	37.00			
	Widowed	9	86.00			
	Total	128				
Race				5.73	3	0.13
	Caucasian	122	63.61			
	African American	2	81.25			
	Asian	1	17.00			
	Hispanic	3	105.17			
	Total	128				
Highest Level of Education				5.98	6	0.43
	Grade School or Less	0				
	GED	1	117.00			
	High School	24	71.31			
	Attended College	25	70.64			
	College 2-Year Degree	25	62.48			

	College 4-Year Degree	21	64.55			
	Graduate/Professional	25	53.54			
	Other	7	57.93			
	Total	128				
Claustrophobia				11.29	1	.001
	No	79	55.83			
	Yes	49	78.48			
	Total	128				
Previous Knowledge about MRI				0.11	1	0.74
	No	37	66.19			
	Yes	91	63.81			
		128				
Previous History of Breast Cancer				2.84	1	0.09
	No	78	60.08			
	Yes	50	71.40			
		128				

Table 8.

Comparison of Trait Anxiety Scores and Categorical Variables Using KW One-Way ANOVA

Pre-Intervention State Anxiety

Variable	*Category*	*N*	*Mean Rank*	*Chi Square*	*df*	*p*
Marital Status				6.35	6	0.39
	Single Never Married	5	83.20			
	Living with Sig. Other	7	57.43			
	Married	81	63.27			
	Married but Separated	3	74.33			

	Divorced	17	68.26			
	Remarried	6	37.75			
	Widowed	9	78.17			
	Total	128				
Race				4.09	3	0.25
	Caucasian	122	63.73			
	African American	2	68.75			
	Asian	1	33.00			
	Hispanic	3	103.33			
	Total	128				
Highest Level of Education				6.59	6	0.36
	Grade School or Less	0				
	GED	1	108.50			
	High School	24	76.31			
	Attended College	25	69.44			
	College 2-Year Degree	25	61.90			
	College 4-Year Degree	21	58.76			
	Graduate/Professional	25	57.10			
	Other	7	53.00			
	Total	128				
Claustrophobia				3.15	1	0.08
	No	79	59.92			
	Yes	49	71.88			
	Total	128				
Previous Knowledge about MRI				0.38	1	0.54
	No	37	61.35			
	Yes	91	65.78			
		128				

Previous History of Breast Cancer				0.02	1	0.88
	No	78	64.10			
	Yes	50	65.13			
		128				

In summary, results of Kendall's tau_b (nonparametric) correlations and the KW One-way ANOVA test show several significant relationships between pre-intervention state anxiety, trait anxiety, and other test variables. Pre-intervention state anxiety positively related to trait anxiety and post-intervention state anxiety at a significant level.

Furthermore, findings show a significant difference in mean pre-intervention state-anxiety scores for claustrophobic participants compared to corresponding scores for non-claustrophobic participants indicating that claustrophobic participants were more anxious at the time of their breast MRI exams. In addition, although not at a significant level, results further suggest that participants who reported a previous history of breast cancer tended to experience higher levels of state anxiety when they arrived for their breast exams compared to participants who reported no history of breast cancer.

Finally, analysis for trait-anxiety shows significant negative correlation between social support numbers and trait anxiety scores meaning participants with more individuals in their social support networks reported overall lower tendencies toward anxiety compared to participants with fewer individuals in their social support networks. Additional analysis also suggests that participants who were claustrophobic tended toward higher levels of trait anxiety compared to participants who were not claustrophobic, but the relationship did not reach a level of significance.

Research Hypotheses

Primary Hypothesis

The H_{01} null hypothesis for this study states, *among women undergoing Breast MRI, there is no relationship between combined verbal and computer-based educational intervention and state-anxiety levels,* was tested using a One-way Analysis of Variance (ANOVA). In preparation for this comparison, mean post-intervention state-anxiety scores were subtracted from mean pre-intervention state-anxiety scores for each participant and the differences between the two sets of scores were converted to percentages. Mean percentages for Group A, Group B and Group C were then compared using a One-way ANOVA to test for significant differences in state anxiety change between the three groups. Table 9 presents the results of this analysis. Findings indicate no significant difference in mean state-anxiety change scores between Group A, Group B and Group C. Therefore, the null hypothesis is not rejected for this study.

Table 9

Comparison of Interventions Between Groups A, B and C using a One-way ANOVA

	Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
Between Groups	.001	2	.000	0.02	0.99
Within Groups	2.58	125	.021		
Total	2.58	127			

df indicates *degrees of freedom*

In order to better understand the effectiveness of interventions, further analyses were performed to examine relationships between the interventions and state-anxiety levels within each group. The sample data set was split into Groups A, B and C prior to

analysis to enable comparison between subjects within each group. A Repeated-Measures (3 x 2) ANOVA was conducted on the log-transformed data for pre-intervention state anxiety and post-intervention state anxiety to examine this relationship. Table 10 presents the results of this analysis.

Findings show a significant difference in mean pre-intervention state-anxiety scores compared to mean post-intervention state-anxiety scores within Group A, Group B and Group C. The profile plot presented in Figure 4 shows decreased state-anxiety scores following intervention within all three groups with no interaction effect between Group A, Group B and Group C.

Table 10.

Analysis of the Effectiveness of Interventions within Group A, Group B and Group C using a 3 x 2 Repeated-measures ANOVA

Tests of Within-Subjects Contrasts

Measure: GROUPS

Group A B C	*Source*	*Anxiety*	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Anxiety	Linear	0.02	1	0.02	7.71	0.008
	Anxiety * Group	Linear	0.00	0			
	Error(Anxiety)	Linear	0.11	42	0.00		
B	Anxiety	Linear	0.02	1	0.02	7.59	0.009
	Anxiety * Group	Linear	0.00	0	.	.	.
	Error(Anxiety)	Linear	0.10	41	0.00		
C	Anxiety	Linear	0.02	1	0.02	11.07	0.002
	Anxiety* Group	Linear	0.00	0			
	Error(Anxiety)	Linear	0.07	42	0.00		

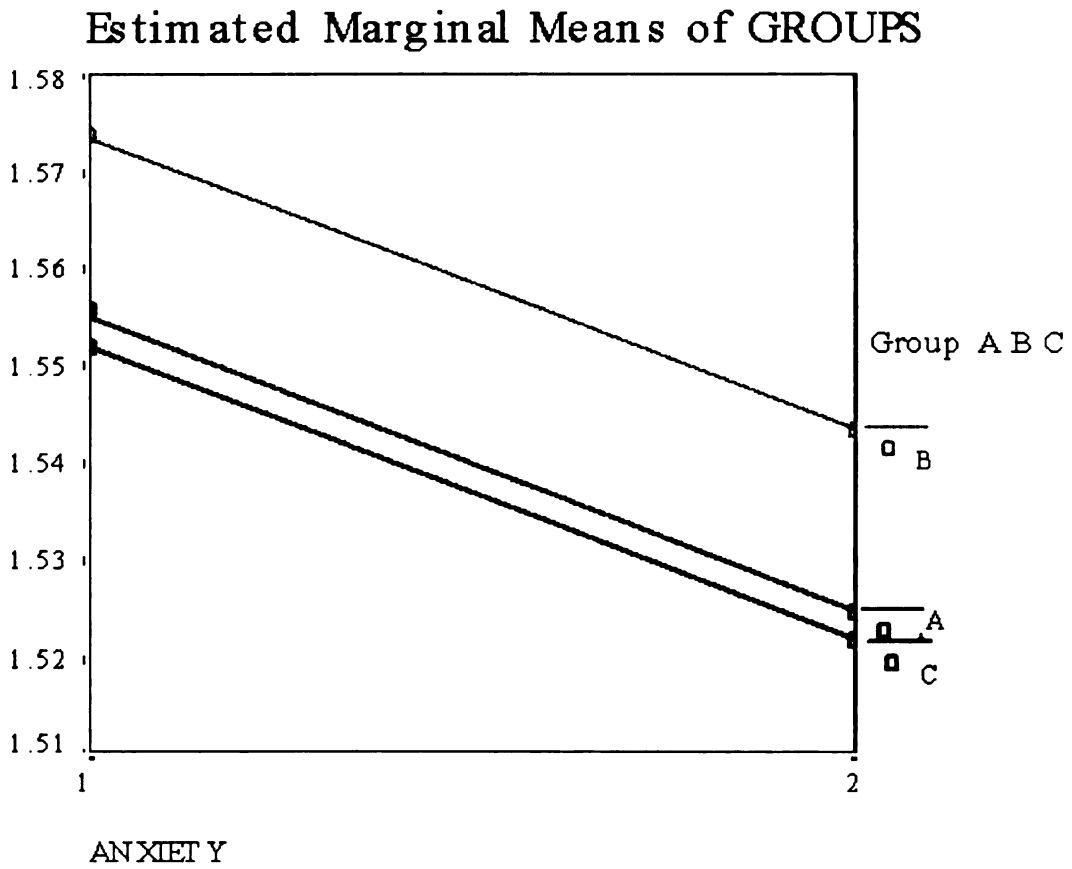


Figure 4. Profile plot comparing pre-intervention[1] vs. post-intervention[2] state-anxiety change for Group A, Group B and Group C

Secondary Hypotheses

In order to better understand relationships between moderator variables, control variables, and the efficacy of interventions, several additional hypotheses were tested in this study. Hypotheses H_{02} through H_{07} examined relationships between perceived levels of social support, claustrophobia, previous knowledge about MRI, marital status, highest level of education, and previous history of breast cancer while controlling for variables age, race and gender.

[1 & 2] analysis used transformed log for these variables

Since only women were included in this study, as outlined in the inclusion criteria, further analyses will assume control for gender. In addition, based on descriptive statistics in Table 2, the study was comprised of 122 Caucasians, two African Americans, one Asian and three Hispanic participants. The large ratio of Caucasians to African Americans, Asians and Hispanics precludes the use of race as a moderator variable for this study. Therefore, further analyses will be conducted using age as the single control variable.

H_{02} hypothesis. The second hypothesis for this study was, *among women undergoing Breast MRI, there is no relationship between patients' social support numbers and the effectiveness of interventions.* This hypothesis was tested using a One-way Analysis of Covariance (One-way ANCOVA).This analysis used social support number as the moderator variable and age as a control variable. Results presented in Table 11 show no significant difference in mean pre/post intervention % change between Groups A, B or C.

In this analysis, social support number, or age or the combination of social support number and age did not significantly change the relationship between the interventions and state-anxiety levels. There were no significant differences between the three interventions in effectiveness.

Table 11.

Analysis of Social Support Number and Effectiveness of Interventions Using a One-Way ANCOVA

Tests of Between-Subjects Effects					
Dependent Variable: Pre/Post Intervention % Change					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.13	6	0.02	1.05	0.40
Intercept	0.02	1	0.02	1.18	0.28
Group	0.07	2	0.03	1.60	0.21
Age	0.01	1	0.01	0.44	0.51
Social Supp Num	0.08	1	0.08	3.77	0.06
Group * Social Supp Num	0.08	2	0.04	1.95	0.15
Error	2.45	121	0.02		
Total	2.98	128			
Corrected Total	2.58	127			
a.... R Squared = .050 (Adjusted R Squared = .003)					

H_{03} hypothesis. The third hypothesis for this study was, *among women undergoing Breast MRI, there is no relationship between claustrophobia and the effectiveness of interventions.* This hypothesis was tested using a Two-way ANCOVA and results are presented in Table 12. This analysis used claustrophobia as the moderating variable and age as a control variable.

Findings show no significant difference in mean pre/post intervention % change scores between Groups A, B and C. In other words, claustrophobia, or age or the

combination of claustrophobia and age did not significantly change the relationship between the interventions and state anxiety levels.

Table 12.

Analysis of Claustrophobia and the Effectiveness of Interventions Using a Two-way ANCOVA

Tests of Between-Subjects Effects					
Dependent Variable: Pre/Post Intervention % Change					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.11	6	0.02	0.87	0.52
Intercept	0.02	1	0.02	0.76	0.38
Group	0.01	2	0.01	0.26	0.77
Age	0.01	1	0.01	0.41	0.52
Claustro	0.00	1	0.00	0.00	0.95
Group * Claustro	0.10	2	0.05	2.49	0.09
Error	2.47	121	0.02		
Total	2.98	128			
Corrected Total	2.58	127			
a...R Squared = .041 (Adjusted R Squared = -.006)					

H_{04} hypothesis. The fourth hypothesis for the study was *among women undergoing Breast MRI, there is no relationship between previous knowledge about MRI and the effectiveness of interventions.* A Two-way ANCOVA was used to test this hypothesis. This analysis used previous knowledge about MRI as the moderator variable and age as a control variable.

Table 13 presents the results showing no significant difference in mean pre/post intervention % change scores between Groups A, B and C. In other words, previous knowledge about MRI, or age, or the combination of previous knowledge about MRI and

age did not significantly change the relationship between the interventions and state-anxiety levels.

Table 13.

Analysis of Previous Knowledge about MRI and the Effectiveness of Interventions Using a Two-way ANCOVA

Tests of Between-Subjects Effects

Dependent Variable: Pre/Post Intervention % Change

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.06	6	0.01	0.50	0.81
Intercept	0.01	1	0.01	0.60	0.44
Group	0.00	2	0.00	0.12	0.89
Age	0.01	1	0.01	0.31	0.58
Basic Know MRI	0.00	1	0.00	0.00	0.95
Group * Basic Know MRI	0.06	2	0.03	1.38	0.26
Error	2.52	121	0.02		
Total	2.98	128			
Corrected Total	2.58	127			

a..R Squared = .024 (Adjusted R Squared = -.024)

H_{05} hypothesis. The fifth hypothesis for this study, *among women undergoing Breast MRI, there is no relationship between marital status and the effectiveness of interventions,* was also tested using a Two-way ANCOVA. This analysis used marital status as the moderator variable and age as a control variable.

Table 14 presents the results which show no significant difference in mean pre/post intervention % change scores between Groups A, B and C. In this analysis,

marital status, or age or the combination of marital status and age did not significantly change the relationship between the interventions and state anxiety levels.

Table 14

Analysis of Marital Status and the Effectiveness of Interventions using a Two-way ANCOVA

Tests of Between-Subjects Effects

Dependent Variable: Pre/Post Intervention % Change

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.49	21	0.02	1.19	0.28
Intercept	0.02	1	0.02	0.95	0.33
Group	0.07	2	0.03	1.77	0.18
Age	0.02	1	0.02	0.83	0.37
Marital	0.15	6	0.03	1.29	0.27
Group * Marital	0.43	12	0.04	1.83	0.05
Error	2.09	106	0.02		
Total	2.98	128			
Corrected Total	2.58	127			

a..R-Squared = .190 (Adjusted R-Squared = .030

H_{06} hypothesis. The sixth hypothesis for this study was *among women undergoing Breast MRI, there is no relationship between highest level of education and the effectiveness of interventions.* This hypothesis was tested using a Two-way ANCOVA. This analysis used highest level of education as the moderating variable and age as a control variable. Findings indicate no significant difference in mean pre/post intervention % change scores between Groups A, B and C.

Table 15 presents the results which show that in this analysis, the highest level of education, or age or the combination of highest level of education and age did not significantly change the relationship between the interventions and state anxiety levels. The relationship between mean scores for the three groups remained about the same.

Table 15

Analysis of Highest Level of Education and the Effectiveness of Interventions Using a Two-way ANCOVA

Tests of Between-Subjects Effects

Dependent Variable: Pre/Post Intervention % Change

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.28	19	0.01	0.69	0.82
Intercept	0.01	1	0.01	0.28	0.60
Group	0.01	2	0.00	0.16	0.85
Age	0.00	1	0.00	0.14	0.71
Education	0.16	6	0.03	1.27	0.28
Group * Education	0.12	10	0.01	0.54	0.86
Error	2.30	108	0.02		
Total	2.98	128			
Corrected Total	2.58	127			

a...R Squared = .108 (Adjusted R Squared = -.049)

H_{07} hypothesis. Two-way ANCOVA was further used to test the seventh hypothesis for this study, *among women undergoing Breast MRI, there is no relationship between previous history of breast cancer and the effectiveness of interventions.* This analysis used previous history of breast cancer as the moderator variable and age as a control variable. Results from the analysis are presented in Table 16.

Findings indicate no significant difference in mean pre/post intervention % change scores between Groups A, B and C. In other words, previous history of breast cancer, or age or the combination of previous history of breast cancer and age did not significantly change the relationships between the interventions and anxiety levels.

Table 16

Analysis of Previous Breast Cancer and the Effectiveness of Interventions Using a Two-way ANCOVA

Tests of Between-Subjects Effects

Dependent Variable: Pre/Post Intervention % Change

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.01	6	0.00	0.10	1.00
Intercept	0.01	1	0.01	0.52	0.47
Group	0.00	2	0.00	0.02	0.98
Age	0.01	1	0.01	0.25	0.62
Group* Breast Ca Hx	0.00	2	0.00	0.09	0.92
Breast Ca Hx	0.00	1	0.00	0.15	0.70
Error	2.57	121	0.02		
Total	2.98	128			
Corrected Total	2.58	127			

a...R Squared = .005 (Adjusted R Squared = -.045)

In summary, results of analyses testing hypotheses H_{01} through H_{07} indicate no significant relationship between effectiveness in intervention and moderator variables social support number, claustrophobia, previous knowledge about MRI, marital status, highest level of education and previous history of breast cancer. However, analyses do show significant differences between means for pre/post intervention % change and effectiveness of intervention within Group A, Group B and Group C. This means all three

methods of intervention significantly reduced anxiety levels. Analyses further show that the significance level for intervention was highest in Group C (0.002) compared to Group A (0.008) and Group B (0.009).

Post-hoc Analyses

The conceptual model for this study was used to examine relationships between three types of educational intervention and changes in state-anxiety levels following intervention. Additionally, the model was used to identify significant relationships between moderator variables and the efficacy of the three interventions. Based on findings from these analyses, additional questions were developed to gain a better understanding about the relationship between moderator variables and the effectiveness of interventions within each group. Figure 5 illustrates the post-hoc conceptual model for secondary hypotheses developed in response to these questions:

H_{08} *Among women undergoing Breast MRI, there is no relationship between participants' perceived social support numbers and the effectiveness of intervention within Group A, Group B or Group C*

H_{09} *Among women undergoing Breast MRI, there is no relationship between claustrophobia and the effectiveness of intervention within Group A, Group B or Group C*

H_{010} *Among women undergoing Breast MRI, there is no relationship between previous knowledge about MRI and the effectiveness of intervention within Group A, Group B or Group C*

H_{011} *Among women undergoing Breast MRI, there is no relationship between marital status and the effectiveness of intervention within Group A, Group B or Group C*

H_{012} *Among women undergoing Breast MRI, there is no relationship between education and the effectiveness of intervention within Group A, Group B or Group C*

H_{013} *Among women undergoing Breast MRI, there is no relationship between previous history of breast cancer and the effectiveness of intervention within Group A, Group B or Group C*

Figure 5 below illustrates the post-hoc conceptual model.

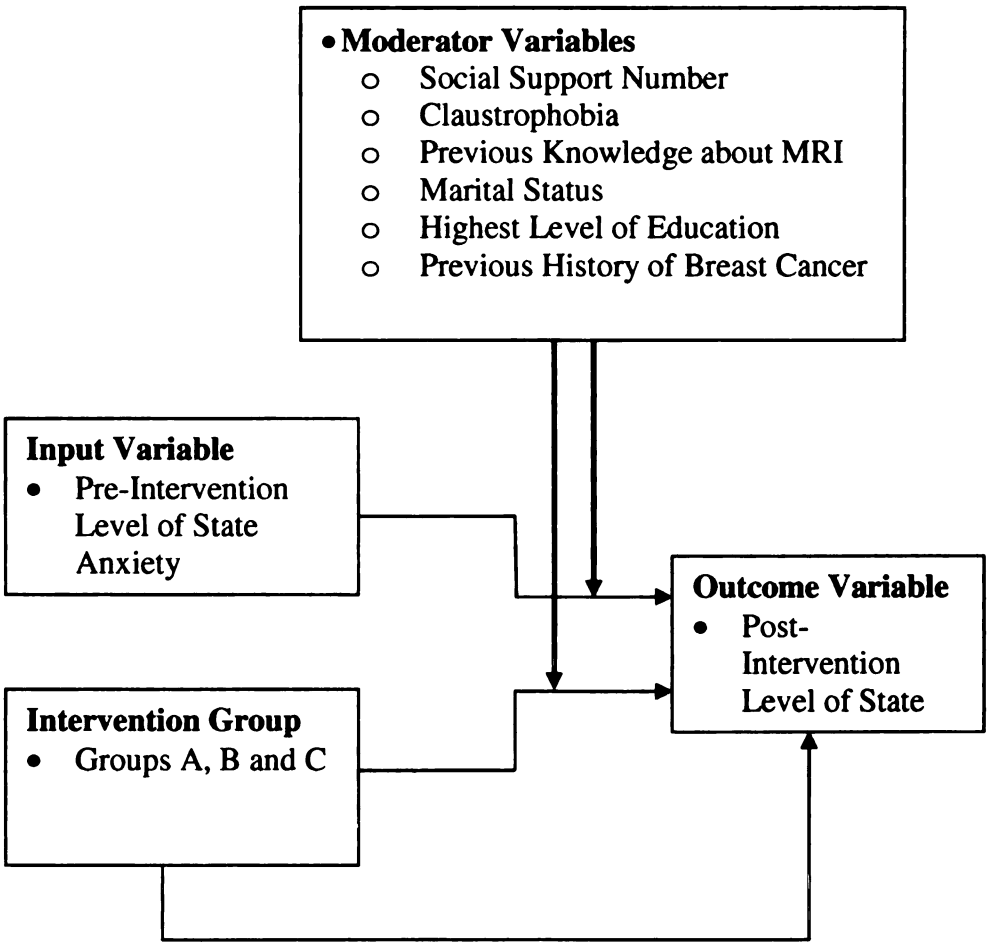


Figure 5. Post-hoc model for analysis of the relationship between moderator variables and the effectiveness of interventions within Group A, Group B and Group C

In preparation for analyses to examine relationships between the moderator variables and the effectiveness of interventions within Group A, Group B and Group C, data for the study were split based on the three groups. Results of data analyses were

further sorted according to groups to enable comparison of mean levels of state-anxiety change within each group.

Based on results of the Shapiro-Wilk test for normality showing normal distribution for pre/pos-intervention % change and non-normal distribution for social support number, Kendall's tau_b correlation was used to analyze the relationship between pre/post intervention % change and social support number (hypothesis H_{08}). In addition, One-way ANOVA and Two-way ANOVA tests were used to analyze relationships between pre/post intervention % change and other moderator variables included in hypotheses $H_{09} - H_{013}$.

H_{08} hypothesis. The hypothesis *among women undergoing Breast MRI, there is no relationship between participants' social support numbers and the effectiveness of intervention within Group A, Group B or Group C* was tested using Kendall's tau_b correlation. Data for pre/post intervention % change was obtained by subtracting post-intervention scores from pre-intervention scores for each participant and then transforming the resulting values into percentages. Therefore, lower values for this variable indicate greater effectiveness in intervention. Table 17 presents the results of this analysis.

Findings indicate a modest, negative correlation between participants' social support numbers and the effectiveness of intervention within Group B, $r(40) = 0.26$, $p = 0.02$). In other words, participants in Group B who indicated that they could rely on more individuals to provide support when they needed it experienced less reduction in anxiety compared to participants who indicated that they could rely on fewer individuals to

provide support when they needed it. Group B intervention was more effective for participants with fewer individuals in their social support networks.

Table 17

Correlations Between Pre/Post Intervention % Change and Social Support Number Using Kendall's Tau b.

Correlations					
			Group A.	*Group B.*	*Group C*
Kendall's tau_b	SS Num	Correlation Coeff.	-0.002	0.26*	0.03
		Sig. (2-tailed)	0.98	0.02	0.80
		N	43	42	43

*Correlation is significant at the .05 level (2-tailed).

H_{09} hypothesis. The hypothesis *among women undergoing Breast MRI, there is no relationship between claustrophobia and the effectiveness of intervention within Group A, Group B or Group C* was tested using a One-way ANOVA with the sample data split into groups for comparison. Findings from this analysis revealed no significant difference in mean pre/post intervention % change scores for participants who were claustrophobic compared to corresponding scores for participants who were not claustrophobic within Group A, Group B or Group C (See Table 18).

Table 18

Analysis of Claustrophobia and Pre/Pos Intervention % Change Within Group A, Group B and Group C using a One-way ANOVA

Group A B C		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Between Groups	0.06	1	0.06	2.60	0.16
	Within Groups	0.92	41	0.02		
	Total	0.98	42			
B	Between Groups	0.03	1	0.03	1.39	0.25
	Within Groups	0.89	40	0.02		
	Total	0.92	41			
C	Between Groups	0.01	1	0.01	0.51	0.48
	Within Groups	0.67	41	0.02		
	Total	0.68	42			

Although results of the analysis do not show a significant difference between claustrophobic participants compared to non-claustrophobic participants, additional analysis using a One-way ANOVA does show a trend suggesting an interaction-by-group effect for claustrophobia at a significance level of $p = 0.10$. (See Table 19). This means the relationship for claustrophobia and efficacy of interventions differs across the three groups.

Specifically, results suggest a positive relationship between claustrophobia and efficacy of intervention for Group A and a negative relationship between claustrophobia and efficacy of intervention for Group B, and to a lesser extent, for Group C. Group A

intervention was more effective in reducing anxiety for claustrophobic participants compared to either Group B or Group C interventions. Figure 6 shows this interaction effect.

Table 19.

Interaction-by-group Effect for Claustrophobia and Pre/Post Intervention % Change Between Group A, Group B and Group C using a Two-way ANOVA

Tests of Between-Subjects Effects					
Dependent Variable: Pre/Post Intervention % Change					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.10	5	0.02	0.97	0.44
Intercept	0.41	1	0.41	20.28	0.00
Group	0.01	2	0.01	0.26	0.78
Group * Claustro	0.10	2	0.05	2.39	0.10
Claustro	0.00	1	0.00	0.00	0.97
Error	2.48	122	0.02		
Total	2.98	128			
Corrected Total	2.58	127			
a R Squared = .038 (Adjusted R Squared = -.001)					

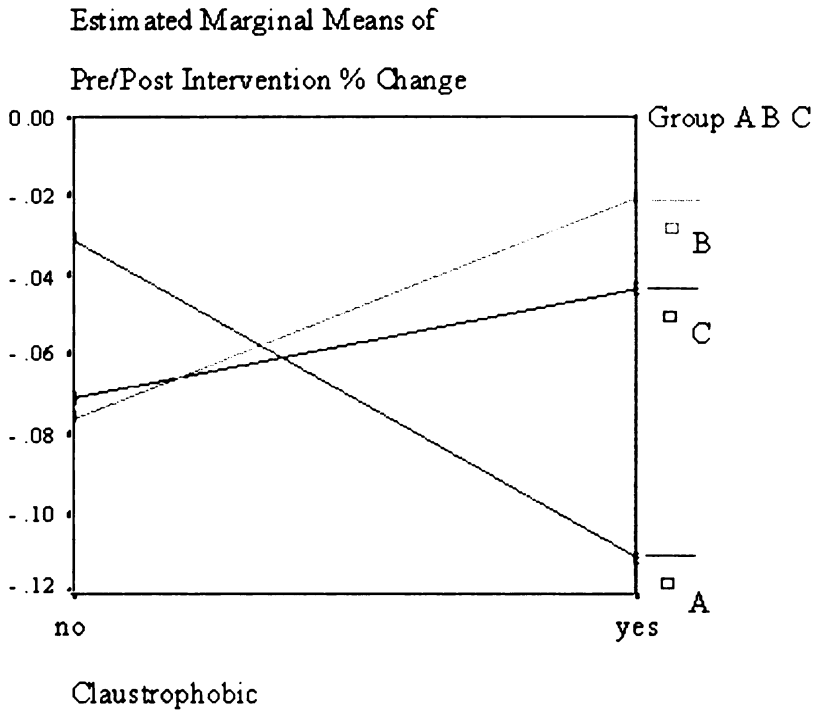


Figure 6. Interaction-by-group effect for claustrophobia between Group A, Group B and Group C

H_{010} hypothesis. The hypothesis, *among women undergoing Breast MRI, there is no relationship between previous knowledge about MRI and the effectiveness of intervention within Group A, Group B or Group C* was tested using a One-way ANOVA. Table 20 presents the results of this analysis. Findings reveal no significant difference between mean pre/post intervention % change scores for participants with previous knowledge about MRI compared to corresponding scores for participants without previous knowledge about MRI within Group A, Group B or Group C.

Table 20.

Analysis of Previous Knowledge about MRI and Pre/Post Intervention % Change Within Group A, Group B and Group C using a One-way ANOVA

Group A B C		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Between Groups	0.002	1	0.002	0.085	0.773
	Within Groups	0.977	41	0.024		
	Total	0.979	42			
B	Between Groups	0.019	1	0.019	0.836	0.366
	Within Groups	0.905	40	0.023		
	Total	0.924	41			
C	Between Groups	0.034	1	0.034	2.199	0.146
	Within Groups	0.643	41	0.016		
	Total	0.677	42			

Additional analysis was performed using a Two-way ANOVA to test for interaction effects of pre/post-intervention % change and previous knowledge about MRI between the three groups. Results of this analysis show no significant interaction effect between knowledge about MRI and intervention group (See Table 21 on the next page).

Table 21.

Interaction-by-group Effect for Previous Knowledge about MRI and Pre/Post Intervention % Change Between Group A, Group B and Group C using a Two-way ANOVA

Tests of Between-Subjects Effects

Dependent Variable: Pre/Post Intervention % Change

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.06	5	0.01	0.54	0.75
Intercept	0.30	1	0.30	14.58	0.00
Group	0.00	2	0.00	0.12	0.89
Prev Know MR	0.00	1	0.00	0.00	0.98
Group * Previous Know MR	0.06	2	0.03	1.34	0.27
Error	2.53	122	0.02		
Total	2.98	128			
Corrected Total	2.58	127			

a R Squared = .022 (Adjusted R Squared = -.018)

H_{011} hypothesis. The hypothesis *among women undergoing Breast MRI, there is no relationship between marital status and the effectiveness of intervention within Group A, Group B or Group C* was tested using a One-way ANOVA. Results of this analysis are presented in Table 22. Findings show a significant difference between mean pre/post intervention % scores among marital categories within Group A.

Table 22.

Analysis of Marital Status and Pre/Post Intervention % Change within Group A, Group B and Group C using a One-way ANOVA

Group A B C		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Between Groups	0.303	6	0.050	2.69	0.03
	Within Groups	0.677	36	0.019		
	Total	0.979	42			
B	Between Groups	0.104	6	0.017	0.74	0.62
	Within Groups	0.820	35	0.023		
	Total	0.924	41			
C	Between Groups	0.067	6	0.011	0.66	0.68
	Within Groups	0.610	36	0.017		
	Total	0.677	42			

Further analysis was performed to determine which categories of marital status within Group A showed significant pre-intervention vs. post-intervention state-anxiety change. Descriptive statistics were calculated for each marital category within Group A to provide this information. Table 23 presents the results of this analysis.

Table 23.

Analysis of Marital Status within Group A Showing Significant Pre-Intervention vs. Post-Intervention State-Anxiety Change

Descriptive Statistics

Marital Status		*N*	*Min*	*Max.*	*Mean*	*Std. Dev*
Single Never Married	Pre/Post Int. % Change	1	0.15	0.15	0.15	.
	Valid N (listwise)	1				
Living with Sig Other	Pre/Post Int. % Change	1	0.41	0.41	0.41	.
	Valid N (listwise)	1				
Married	Pre/Post Int. % Change	28	-0.46	0.26	-0.07[a]	0.14
	Valid N (listwise)	28				
Married but Separated	Pre/Post Int. % Change	1	-0.15	-0.15	-0.15	.
	Valid N (listwise)	1				
Divorced	Pre/Post Int. % Change	5	-0.25	0.10	-0.02	0.14
	Valid N (listwise)	5				
Remarried	Pre/Post Int. % Change	3	-0.13	0.00	-0.04	0.08
	Valid N (listwise)	3				
Widowed	Pre/Post Int. % Change	3	-0.33	0.03	-0.12[b]	0.19

[a] indicates a significant difference between the married category and the non-married category

[b] indicates a significant difference between the widowed category and the non-widowed category

Results of this analysis indicate a significant difference between mean state-anxiety outcome scores for participants in Group A who were married compared to participants who were not married. Results also show near-significant differences between mean state-anxiety outcome scores for participants in Group A who were widowed compared to participants who were not widowed. In other words, Group A intervention was more effective in reducing anxiety for participants who were married or widowed compared to participants who were divorced or remarried.

H_{012} Hypothesis. This hypothesis states: *among women undergoing Breast MRI, there is no relationship between highest level of education and the effectiveness of intervention within Group A, Group B or Group C* and was tested using a One-way ANOVA. Table 24 presents the results of this analysis.

Findings indicate no significant difference between mean pre/post intervention % change scores for any category of highest level of education within Group A, Group B or Group C. In other words, there was no significant difference in the amount of state-anxiety change for individuals with higher levels of education compared to individuals with lower levels of education following intervention within Group A, Group B or Group C. Participants experienced similar levels of anxiety reduction regardless of their educational backgrounds.

Table 24.

Analysis of Highest Level of Education and Pre/Post Intervention % Change within Group A, Group B and Group C using a One-way ANOVA

Group A B C		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Between Groups	0.07	1	0.07	2.91	0.10
	Within Groups	0.91	41	0.02		
	Total	0.98	42			
B	Between Groups	0.01	1	0.01	0.32	0.58
	Within Groups	0.91	40	0.02		
	Total	0.92	41			
C	Between Groups	0.02	1	0.02	1.22	0.28
	Within Groups	0.66	41	0.02		
	Total	0.68	42			

H_{13} Hypothesis. The hypothesis *among women undergoing Breast MRI, there is no relationship between previous history of breast cancer and the effectiveness of intervention within Group A, Group B or Group C* was also tested using a One-way ANOVA. Table 25 presents the results of this analysis. Findings show no significant difference between mean pre/post intervention % change scores for participants with a previous history of breast cancer compared to corresponding scores for participants without a previous history of breast cancer within Group A, Group B or Group C.

Table 25

Analysis of Previous History of Breast Cancer and Pre/Post Intervention % Change within Group A, Group B and Group C using a One-way ANOVA

Group A B C		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
A	Between Groups	0.01	1	0.01	0.21	0.65
	Within Groups	0.97	41	0.02		
	Total	0.98	42			
B	Between Groups	0.001	1	0.001	0.02	0.88
	Within Groups	0.92	40	0.02		
	Total	0.92	41			
C	Between Groups	0.001	1	0.001	0.04	0.85
	Within Groups	0.68	41	0.02		
	Total	0.68	42			

Additional analysis was performed using a Two-way ANOVA to determine whether the relationship between previous history of breast cancer and pre/post intervention % change varied between Group A, Group B and Group C. Table 26 presents results from this analysis showing no significant interaction effect for previous history of breast cancer and pre/post intervention % change between the three groups.

Table 26

Interaction-by-group Effect for Previous History of Breast Cancer and Pre/Post Intervention % Change between Group A, Group B and Group C using a Two-way ANOVA

Tests of Between-Subjects Effects					
Dependent Variable: Pre/Post Intervention % Change					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	0.01	5	0.00	0.06	1.00
Intercept	0.39	1	0.39	18.44	0.00
Group	0.00	2	0.00	0.03	0.98
Group * Br_Ca_Hx	0.00	2	0.00	0.10	0.90
Br_Ca_Hx	0.00	1	0.00	0.08	0.78
Error	2.57	122	0.02		
Total	2.98	128			
Corrected Total	2.58	127			
a R Squared = .003 (Adjusted R Squared = -.038)					

To summarize, analyses for hypotheses H_{08} through H_{013} reveal several relationships between moderator variables and intervention groups in this study. Analysis of social support shows moderate, negative correlation within Group B such that participants with higher social support numbers experience lower effectiveness in intervention compared to participants with lower social support numbers. Additionally, analysis of claustrophobia shows an interaction-by-group effect. This means Group A intervention is more effective for claustrophobic participants compared to non-claustrophobic participants, and Group B and Group C interventions are less effective for claustrophobic participants compared to non-claustrophobic participants.

Analysis further shows that the effectiveness of Group A intervention varied as a function of marital status. Specifically, results show that married and, to a lesser extent, widowed participants experience greater reductions in anxiety following intervention compared to remarried and divorced participant

Multivariate Analysis

Based on findings of univariate and bivariate analyses along with additional theoretical considerations, multivariate analysis was employed using ordinary least squares regression to create a model that explains variance of post-intervention state-anxiety levels. Results of this comparison are listed in Table 27.

Results of this analysis show an overall model that is statistically significant, *R-Squared* = 83%, $F(9, 118) = 63.66$, $p = 0.00$. The R-squared value indicates that trait anxiety (log), social support number (log), marital status (widowed and married), highest level of education (high school, attended college, college 4-year degree and graduate/professional degree) and pre-intervention state-anxiety levels (log) explain approximately 83% of the variance of post-intervention state anxiety levels, leaving only about 17% unexplained.

There does seem to be an overall effect for highest level of education as participants who attended college but did not earn a degree scored lower average post-intervention state anxiety scores. Specifically, participants who attended college reported an estimated average four-point decrease in post-intervention state-anxiety scores compared to participants with a GED, a 2-year college degree or other, non-collegiate education. Interestingly there seems to be a similar trend for high school education.

Participants who earned a high school education scored an estimated average three points lower for post-intervention state-anxiety compared to participants with a GED, a 2-year college degree or other, non-collegiate education. Although this relationship suggests a trend toward lower scores for high school education, the relationship did not reach a significance level of $p = 0.05$.

In addition, analyses show that pre-intervention state-anxiety scores and trait-anxiety scores are strong predictors of post-intervention state-anxiety scores. Findings presented in Table 27 indicate that pre-intervention state-anxiety is the strongest predictor of post-intervention state-anxiety ($t = 16.71$, $p \leq 0.05$), whereas trait anxiety is the second-most significant predictor ($t = 2.75$, $p \leq 0.05$). The latter finding supports results presented in Table 6 (on page 41) indicating significant correlation between pre-intervention state-anxiety scores and trait-anxiety scores.

Table 27.

Analysis of Moderator Variables and Post-Intervention State Anxiety using Multivariate Analysis

Model Summary							
R	*R Square*	*Adj. R Square*	*Std. Err. of the Estimate*	*Change Statistics*			
				R Square Change	*F Change*	*df1*	*df2*
0.91[a]	0.83	0.82	0.06	0.83	63.66	9	118
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	2.31	9	0.252	63.66	0.00		
Residual	0.48	118	0.004				
Total	2.79	127					

a. Predictors: (Constant), married, Graduate/Professional Degree, Trait Anxiety, Attended College, Social Support Number, College 4-Year Degree, Widowed, High School, Pre-Intervention State Anxiety

b. Dependent Variable: Post-intervention State Anxiety

Coefficients

		Unstand. Coef.		*Stand. Coef.*	*t*	*Sig.*	*95% Confidence Interval for B*	
Model		*B*	*Std. Error*	*Beta*			*Lower Bound*	*Upper Bound*
1.00	(Constant)	-0.03	0.08		-0.42	0.68	-0.20	0.13
	Attended College**	-0.04	0.02	-0.12	-2.53	0.01	-0.08	-0.01
	Trait Anx.	0.18	0.06	0.14	2.75	0.01	0.05	0.30
	Social Supp.	0.03	0.02	0.06	1.51	0.13	-0.01	0.08
	Widowed*	-0.01	0.03	-0.02	-0.37	0.71	-0.06	0.04
	College 4-Year Degree**	-0.02	0.02	-0.06	-1.38	0.17	-0.06	0.01
	Pre State Anx.	0.84	0.05	0.84	16.71	0.00	0.74	0.93
	High School**	-0.03	0.02	-0.08	-1.70	0.09	-0.07	0.01
	Graduate/Prof. Degree**	-0.01	0.02	-0.03	-0.62	0.54	-0.05	0.02
	Married*	-0.01	0.01	-0.03	-0.63	0.53	-0.03	0.02

* Control group for marital (married and widowed) was divorced and remarried

** Control group for highest level of education (high school, attended college, college 4-year degree and graduate/professional degree) was GED, College 2-year degree and *other* non-collegiate degrees.

In summary, findings from this analysis show lower post-intervention state-anxiety scores for participants with a non-degree college education and a trend toward lower scores for participants with a high-school education compared to participants with a GED, a 2-year college degree or other, non-collegiate education. In addition,

multivariate regression analysis also shows that pre-intervention state-anxiety scores and trait-anxiety scores are strong predictors of post-intervention state-anxiety scores.

CHAPTER 5

DISCUSSION

The purpose of this study was to compare the effectiveness of three different methods of educational intervention in reducing state anxiety levels for women who are scheduled to undergo breast MRI. The study defined three types of intervention with an experimental design and randomly assigned participants into groups for this comparison. The main independent variable for this study was an educational intervention tool and the main outcome variable was the level of state-anxiety change following intervention.

In order to gain a better understanding about relationships between pre-intervention state anxiety, post-intervention state anxiety, and trait anxiety, analyses were conducted to examine relationships between these variables. Results from these analyses reveal significant correlation between pre-intervention state anxiety and post-intervention state anxiety and also between pre-intervention state anxiety and trait anxiety. In other words, participants who reported higher levels of anxiety before intervention also reported higher levels of anxiety after intervention. Furthermore, participants who reported higher levels of state anxiety in response to their impending breast MRI exam also reported greater general tendencies toward anxiety (trait anxiety). These results support findings by Spielberger et al. (1983) indicating "state-trait correlations tend to be slightly higher when the STAI scales are given in the same testing session" (p. 31). The Trait-Anxiety Inventory was administered immediately following the State-Anxiety Inventory in this study.

Additional analyses were conducted to examine the relationship between pre-intervention state anxiety and other variables in the study. Results show a significant relationship between pre-intervention state anxiety and claustrophobia and also a near-significant relationship between pre-intervention state anxiety and previous history of breast cancer. This means participants who were claustrophobic, and, to a lesser extent, participants with a previous history of breast cancer, were more anxious when they arrived for their breast MRI exams compared to participants who were not claustrophobic or participants without a previous history of breast cancer.

Interestingly, results also show a general trend in the relationship between claustrophobia and trait anxiety. Participants who were claustrophobic seemed to have higher general tendencies toward anxiety. These correlations may prove useful in the healthcare setting when tailoring methods of intervention to specific needs of the patient. Interventions that are most effective in reducing anxiety for claustrophobic patients, or patients with a previous history of breast cancer, should be considered for patients having these characteristics. Further discussion will focus on this topic as the strengths and weakness of each type of intervention are revealed.

The primary working hypothesis for this research was *among women undergoing Breast MRI, there is a relationship between combined verbal and computer-based educational intervention and state-anxiety levels.* Analysis used to test this hypothesis revealed no significant relationship between the three methods of intervention and levels of state-anxiety change following intervention. Therefore, the null hypothesis for this study, *among women undergoing Breast MRI, there is no relationship between combined*

verbal and computer-based educational intervention and state-anxiety levels, was not rejected.

Although the efficacy of interventions did not significantly differ between groups, further analysis did indicate that each intervention resulted in significantly lower levels of state anxiety within its group (Group A = -7.1%, F (1, 42) = 7.71, p = 0.008; Group B = -6.6%, F (1, 41) = 7.59, p = 0.009; Group C = -6.5%, F (1, 42) = 11.07, p = 0.002). Interventions for Group A, Group B and Group C were all effective in reducing state-anxiety levels for participants. This finding supports Street et al.'s study, *Preconsultation Education Promoting Breast Cancer Screening* (1998) which showed that women who received educational intervention experienced less anxiety about cancer screening regardless of the method employed.

Additional consideration was given to the question of whether the reductions in state anxiety levels for each group represented clinically-significant reductions. A literature review was conducted in order to answer this question. However the research did not produce relevant information. According to Charles Spielberger, author of the STAI, designation of clinical significance is "completely arbitrary" (personal communication, 2006). While all three interventions significantly reduced state-anxiety levels, measurements of clinical significance for anxiety change do not appear to be standardized, and therefore, are not measurable.

The second purpose of this study was to determine whether a relationship existed between perceived social support networks (number and quality) and the effectiveness of interventions. Because data for social support quality was excessively skewed and

transformation of data failed to reduce the skew, this variable was omitted from additional bivariate or multivariate analyses.

Further analysis for social support number and efficacy of intervention revealed moderate negative correlation within Group B. In other words, participants in this group who reported higher social support numbers also reported less reduction in state-anxiety levels following intervention. Interestingly, analysis also showed significant negative correlation between social support number and trait anxiety meaning that participants who reported a higher number of individuals in their social support networks also reported lower general tendencies toward anxiety.

Questions arise about the relationship between social support number and effectiveness of intervention within Group B. Because this intervention provided computer-based intervention without verbal contact, these participants may have perceived lower levels of social support during intervention compared to participants within Group A and Group C who received verbal intervention. If so, this perception would explain the negative correlation between social support number and efficacy of intervention within this group. Further research is needed to test this hypothesis.

Interestingly, analyses also reveal an interaction effect for claustrophobia between Group A, Group B and Group C. Specifically, intervention was most effective for claustrophobic participants within Group A and least effective for claustrophobic participants within Group B (and, to a lesser extent, within Group C). This means participants in Group B who were claustrophobic, experienced less reduction in anxiety following intervention compared to participants who were not claustrophobic. This is an interesting finding in lieu of results indicating lower effectiveness within this group for

participants with higher social support numbers. These results draw attention to a possible relationship between social support number, claustrophobia and verbal vs. non-verbal intervention. However, the interaction of these variables was not adequately examined in this study to make inferences about their relationship and further research is needed to form relevant conclusions.

Additional analyses examined relationships between other moderator variables and efficacy of interventions within each group. Findings show a relationship between marital status and efficacy of intervention within Group A. Specifically, participants in this group who were married experienced significantly greater reductions in anxiety levels following intervention compared to participants who were divorced or remarried. Furthermore, participants within Group A who were widowed experienced near-significant reductions in anxiety levels compared to participants who were divorced or remarried. This finding suggests a possible relationship between successful marriage and effectiveness of verbal intervention. Additional research focused on marital status and intervention is needed to further explain this finding.

Lastly, multivariate regression analysis for this study identifies predictor variables that explain approximately 83% of the variance in post-intervention state anxiety levels. Results indicate that pre-intervention state anxiety levels as well as trait anxiety levels are strong predictors of post-intervention state-anxiety levels. In addition, multivariate analysis also indicates an overall effect for highest level of education. Specifically, results indicate that participants with a non-degree college education and, to a lesser extent, participants with a high-school education, experience greater reductions in anxiety compared to participants with a GED, a two-year college degree or another non-

collegiate education. These results suggest a curvilinear relationship between education and intervention such that intervention is most effective for individuals with a moderate level of education and less effective for individuals with either lower or higher levels of education.

Limitations of the Study

This study had limitations related to the sample group and the geographic location. Participants in this study were predominantly Caucasian (95.3%), college-educated (74%) women who were married (63%). In addition, the study was limited to a single clinical site and included only women who resided in the Midwest and were able to read and write in the English language. These factors limited the generalizability of the results to populations with similar demographics.

One additional limitation of the study warrants notation. A high number of participants expressed fear of needles when they saw the slide depicting the use of intravenous (IV) fluid in the PowerPoint educational intervention tool. The extent of this fear factor was not anticipated in the study design and, therefore, not measured during the study.

Conclusion

This study was designed and carried out with the primary purpose of comparing the effectiveness of three different educational interventions in reducing state anxiety levels and a secondary purpose of examining how perceived social support networks interact with the interventions. Although results of the study reveal no significant difference in efficacy between the three interventions, results do indicate that all three methods of intervention were effective in reducing state anxiety levels for participants

within their groups. Participants in all three groups reported significantly lower post-intervention vs. pre-intervention state anxiety scores on the State Trait Anxiety Inventory.

Results of the study also indicate a relationship between social support number and efficacy of intervention for participants in Group B and also suggest a relationship between claustrophobia and effectiveness of intervention for this group. Participants in Group B with higher social support numbers and, to a lesser extent, participants who were claustrophobic, experienced less reduction in anxiety following intervention compared to participants with lower social support numbers or participants who were not claustrophobic. These findings suggest a possible relationship between social support number, claustrophobia, and efficacy of intervention. Further research is needed to explain how these variables interact with verbal vs. non-verbal intervention.

Research findings further indicate lower post-intervention state anxiety scores for select groups of participants. In general, participants with a high-school or non-degree college education scored lower state anxiety scores overall following intervention, compared to participants with a GED, a two-year college degree or other, non-collegiate education.

In summary, this study provides results that lead to valuable conclusions about interventions in the clinical setting. The research herein not only addresses the question of efficacy of intervention, but it also exposes new research questions that were previously unstated. With this focus, future research can continue to build upon this study and improve the long-term outlook for patients and families who face the possibility of being diagnosed with cancer.

Implications for Future Research

Results from this study generate new questions related to perceived levels of family and social support, claustrophobia, needle phobia, and tailored intervention. For perceived levels of social support, questions arise about the significance of the relationship between higher social support numbers and the efficacy of intervention within Group B. The interaction effect of claustrophobia must also be considered for this group as individuals who are claustrophobic report less reduction in state anxiety levels following intervention compared to non-claustrophobic participants.

Interestingly, participants within this group viewed the educational intervention tool but did not receive the standard verbal explanation about the MRI procedure before completing the STAI for the second time. This raises the question of whether verbal intervention is necessary in order to counterbalance the effects of claustrophobia on state anxiety levels. Furthermore, this finding also raises a question about possible interaction of social support number and claustrophobia in relation to non-verbal intervention. Additional research is needed to explore the relationship between verbal vs. visual educational intervention and the interactive effects of claustrophobia and social support number on state anxiety levels. Research focused on the relationship between claustrophobia and state anxiety levels with social support number as a control should provide the foundation for this type of study.

Another factor related to the efficacy of verbal intervention in this study is the researcher's and study representatives' levels of professional experience in delivering verbal explanations in a clinical setting. The researcher and study representatives for this study had a minimum of ten years' experience in delivering verbal explanations about

screening exams to clinical patients. Verbal intervention in this study may have been more effective compared to other Midwest clinics with less-experienced technologists. Additional research is needed to determine the relationship between researcher experience and efficacy of verbal interventions.

Findings from this research also reveal a need for measurement of state anxiety levels at an additional time point. The current study design provided for measurements of state anxiety levels at two time points. The first measurement occurred when participants arrived at the MRI department and the second measurement occurred after the participants received intervention. However, this design did not measure state anxiety levels for claustrophobic individuals in Group A after they viewed the magnet for the first time. In order to measure this effect, the study design should have included administration of the STAI for all three groups at a third time point after participants entered the MRI exam room and viewed the magnet for the first time. In consideration of the need to maintain patient throughput in the clinical environment, this procedure could be simulated in future research by using a non-clinical MRI exam room.

Another consideration related to administration of the STAI includes a possible learned effect from repeated testing. A question arises from this study about whether the results of the post-intervention state anxiety inventory would have been the same if the participants had not just completed the identical inventory twenty minutes before. In order to test this hypothesis, future research should include a control group that completes the post-intervention state-anxiety inventory, but does not complete the pre-intervention state anxiety inventory.

The limitation of this study, related to race, also draws attention to the need for additional research. Miller and Champion addressed tailored intervention in their research of *Attitudes about Breast Cancer* (1997) and called for further research that is culturally sensitive and appropriate for the target audience. While this study attempted to make advances toward that goal, it contained too few minority participants to draw conclusions about the efficacy of racially-tailored intervention. Additional research in this area should include a higher ratio of minorities-to-Caucasians.

Another factor that may influence the results of future educational intervention relates to the mean age of participants in this study. The average age of participants in this research sample was 51 years. As medical technology improves, the human lifespan will undoubtedly continue to increase and will result in a higher mean age with greater variance for women who undergo breast-cancer screening exams. This increase in average age for breast-cancer screening will most likely affect the relationship between interventions and anxiety levels and should be considered in future research designs.

One additional factor that became apparent during the course of the study was needle phobia. Several participants expressed a fear of needles when they viewed the image of the IV setup in the educational interventional PowerPoint tool. The extent of this condition was not anticipated during the design phase of the study and consequently, its effect was not measured during data acquisition. Future research that is based in a clinical setting should include measurements of this factor if IVs or injections are included as a standard part of the procedure.

Finally, in preparation for future research, participants in this study were invited to participate in a future ancillary longitudinal study that will explore the long-term

effects of the moderator variables on their progress and well being. Results from the current study will form the foundation for the longitudinal study. Participants who consented will be contacted for continued follow-up based on the ancillary study design.

APPENDICES

APPENDIX A

CONCEPTUAL AND OPERATIONAL DEFINITIONS

VARIABLE	CONCEPTUAL DEFINITION	OPERATIONAL DEFINITION
Age	Number of years since birth	Measured by respondent during intake interview and recorded by healthcare personnel on Mammography History forms #1, #2 & #3 (See Appendices E, F & G)
Race	Culturally distinctive group	Measured by healthcare personnel and recorded on Mammography history forms as either "C" (Caucasian), "B" (African-American), "H" (Hispanic) or "O" (Other) (See Appendices E & G). Coded with indicator variables for analysis.
Gender	The sex of an individual based on reproductive anatomy	Measured by healthcare personnel and recorded on Mammography history forms as either "M" (male) or "F" (female).
Marital Status	Current status in terms of being legally married to another individual of the opposite gender.	Measured by respondent on demographic survey (See Appendix D) and coded as "1"- *Single, never married,* "2" *Living with Significant Other* "3" – *Married,* "4" – *Married but Divorced,* "5" – *Separated,* "6" – *Remarried* or "7" – Widowed. Marital status is coded with indicator variables for analysis.
Claustrophobia	Abnormal fear of narrow or enclosed spaces.	Measured by respondent on Demographic Survey (See Appendix D) and coded with indicator variables for analysis.
Social Support	The number of individual the participant can count on for support in six distinct situations and the participants overall satisfaction with that support	Measured by respondent on the Short Form Social Support Questionnaire (See Appendices C & I) and coded for analysis as the average number (on a scale from 1-9) and average quality (on a scale from 1-6) of support for each participant.

Previous History of Breast Cancer	Prior episode of breast cancer characterized by a primary lesion that is different from the current primary lesion if present.	Measured by researcher on Mammography history forms (See Appendices E & G) and coded as indicator variables for analysis
Previous Knowledge about MRI	Either of two conditions: 1. participant has previously undergone an MRI exam. 2. Participant's healthcare provider explained the MRI procedure to participant prior to arrival in MRI department.	Measured by respondent on Demographic survey (See Appendix D) and coded with indicator variables for analysis. A response of "yes" to either question indicates a previous knowledge about MRI
Highest Education	Highest level of education achieved by the respondent.	Measured by respondent on demographic survey (see Appendix D) and coded as "1" *Grade School or Less,* "2" - *General Educational Development,* "3" - *High School,* "4" – *Attended College,* "5" – *2-Year Degree,* "6" – *4-Year Degree,* "7" – *Graduate/Professional Degree,* or "8" – *Other (Please Describe).*Measured by respondent on
Educational Intervention Tool	PowerPoint tool that provides information about breast.	Measured by researcher or representative as respondent's viewing of educational intervention PowerPoint tool.
State Anxiety	"Transitory emotional state or condition of the human organism that is characterized by subjective, consciously-perceived feelings of tension and apprehension, and heightened autonomic nervous system activity" (Spielberger et al., 1979).	Measured with 20-question, 4-point Likert-type State Anxiety Inventory – Form Y and recorded as average number for analysis.
Trait Anxiety	"Relatively stable individual difference in anxiety proneness..." (Spielberger et al., 1979).	Measured with 20-question 4-point Likert-type Trait Anxiety Inventory – Form Y and recorded as average number for analysis.

APPENDIX B

INSTRUMENT REVIEW
STATE-TRAIT ANXIETY INVENTORY FOR ADULTS (FORM Y)

Title:	State-Trait Anxiety Inventory for Adults (Form Y)
Authors:	Charles D. Spielberger, Richard L. Gorusch, and Robert E. Lushene.
Population:	Grades 9-16 and adults.
Score:	2 Scores: State Anxiety and Trait Anxiety.
Time:	10-20 minutes.
Publisher:	Mind Garden, Inc.
Date:	1983
Concept or Variable:	*State Anxiety Level* - Conceptual definition – "Transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity." (Spielberger et al., 1979) *Trait Anxiety Level* - Conceptual definition – "relatively stable individual differences in anxiety proneness..." (Spielberger et al., 1979)
Description of Items:	The State-Trait Anxiety Inventory (STAI) is a self-report assessment which consists of two separate subscales that contain 20 questions each. These two subscales (S-Anxiety and T-Anxiety) both use a 4 point Likert scale to allow the subject to show how often or how much each question applies to them in both situations. The instrument differentiates between the temporary condition of "state anxiety" and the more general and long-standing quality of "trait anxiety". The essential qualities evaluated by the scale are feelings of apprehension, tension, nervousness, and worry. Scores on the scale increase in response to physical danger and psychological stress, and decrease as a result of relaxation training. This instrument was originally designed as a research tool for measuring anxiety levels in adults and is useful in both research and clinical contexts.
Adequacy of Sample Tested:	Samples used to test the SSQ6 are adequate.

Normative Data:	Normative data are provided for working adults, military recruits, college and high school students, male neuropsychiatric patients, male medical patients, and male prison inmates. Mean scores for the State-Anxiety Inventory include 35.72 for working men and 35.20 for working women. The mean scores for the Trait-Anxiety Inventory include 34.89 for working men and 34.79 for working women.
Level of Measurement:	Ordinal level of measurement.
Discriminability:	The State-Trait Anxiety Inventory uses a Likert-type scale with four categories.
Reliability:	Reliability of the instrument has been widely reported (Tanaka, Sakamoto, Kijima, & Kitamura, 1998; Goldenberg & Waddell, 1990; Barnes, Harp & Jung, 2002). *Test-Retest Reliability* - STAI scale stability was assessed on male and female college students for test-retest intervals ranging from one hour to 104 days. The magnitude of the reliability coefficients decreased as a function of interval length. For the Trait-anxiety scale the coefficients ranged from .65 to .86, whereas the range for the State-anxiety scale was .16 to .62. The STAI shows that it is very reliable by it's two headed approach to measuring anxiety; the tests high coefficients for the trait anxiety scales shows that it does indeed measure consistently the trait anxiety levels among subjects. This low level of stability for the State-anxiety scale is expected since responses to the items on this scale are thought to reflect the influence of whatever transient situational factors exist at the time of testing.
Validity:	Validity of the instrument has been widely reported (Tanaka, Sakamoto, Kijima, & Kitamura, 1998; Goldenberg & Waddell, 1990). Correlations are presented in the manual between this scale and other measures of trait-anxiety: the Taylor Manifest Anxiety Scale, the IPAT Anxiety Scale, and the Multiple Affect Adjective Check List. These correlations are .80, 75 and .52, respectively.

Construction Validity: Each item was required to have a higher mean in a number of stressful situations, and a lower mean in relaxed situations than in non-stressful (neutral) situations.

Internal Consistency: Internal consistency of the four subscales was as follows: State Anxiety Absent (0.91), State Anxiety Present (0.82), Trait Anxiety Absent (0.80), and Trait Anxiety Present (0.78).

Ease and Brevity: The test was designed with only two, twenty point scales that can easily be answered in less than 20 minutes. This design helps to reduce the amount of change that can occur in the subject's state anxiety level during the actual time of the test.

Administration and Scoring:

The State-Trait Anxiety Inventory is self-administered. Scores have a direct interpretation: high scores on their respective scales mean more trait or state anxiety and low scores mean less. Both percentile ranks and standard (T) scores are available for male and female working adults in three age groups (19-39, 40-49, and 50-69), male and female high school and college students, male military recruits, male neuropsychiatric patients, male medical patients, and male prison inmates. Administration times for the STAI are 10-20 minutes.

Desirable Features:

The State-Trait Anxiety Inventory is efficient and cost-effective. The inventory is very easy to administer and score. The STAI is also portable allowing for administration in various settings. The availability of the inventory enables use in both clinical and research settings.

Undesirable Features:

One of the disadvantages of this instrument is its low level of stability for state-anxiety scale. However, this instability should be expected since the outcome of the scale is influenced by the immediate environmental state.

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APPENDIX C

INSTRUMENT REVIEW
SHORT FORM SOCIAL SUPPORT QUESTIONNAIRE (SSQ-6)

Title:	Social Support Questionnaire 6 (SSQ-6).
Authors:	Sarason, Sarason, Shearin, and Pierce (1987).
Population:	Adults.
Score:	2 Scores: Number of Supports and Satisfaction with Support.
Time:	5 minutes.
Publisher:	Consulting Psychologists Press, Inc.
Date:	1987
Concept or Variable:	Social Support – Conceptual definition - Perceived availability of others to whom one can turn for support and satisfaction with this perceived available support.
Description of Items:	The Short Form Social Support Questionnaire (SSQ-6) is a six -item self-report questionnaire designed to measure the number and quality of social supports. Participants list the initials and relationship of people they can rely on for support in specific situations. They receive a score based on the number of individuals in their support network. Participants then rate their overall satisfaction with support in each situation using a 6-point Likert scale (from 1 = 'very dissatisfied' to 6 = 'very satisfied') and a mean satisfaction score is calculated. The Short Form Social Support Questionnaire is an abbreviated instrument derived from the 27-item Social Support Questionnaire developed by Sarason, Levine, & Sarason (1983) as part of their work in the area of social support.
Adequacy of Sample Tested:	Samples used to test the SSQ-6 are adequate.
Normative Data:	Normative data are provided for adults.
Level of Measurement:	Ordinal level of measurement is used
Discriminability:	The Short Form Social Support Questionnaire uses a Likert-type scale with six categories.

Reliability & Validity:	Internal consistency reliability coefficients for the SSQ-6 span from .90 to .93 for both the number of supportive individuals and satisfaction with support (Sarason et al., 1987). Sarason et al. reported the alpha coefficient of internal reliability for 'perceived availability of support' at .97 and a test-retest reliability of .90; the alpha coefficient of internal reliability for 'satisfaction with support' was reported at .94 with test-retest reliability at .83; a modest correlation of .34 was found between 'perceived availability of support' and 'satisfaction with support'.
Administration and Scoring:	The Short Form Social Support Questionnaire is self-administered. Given the two-part approach to the SSQ-6, each item is rated as follows: The first part, perceived availability of support, is calculated by summing the total number of support persons listed and dividing it by six (the total number of items) with a possible range of 0-9, where a higher score indicates a higher perceived availability of support; the second part, satisfaction with support, is calculated by summing the total score and dividing it by six (the total number of items) with a possible range of 1-6, where a higher score indicates a higher satisfaction with support.
Desirable Features:	The Short Form Social Support Questionnaire is easy to administer and score. The SSQ-6 is also portable allowing for administration in various settings. The availability of the inventory enables use in both clinical and research settings.
Undesirable Features:	One of the disadvantages of this instrument is its modest correlation between perceived availability of support and satisfaction of support.

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APPENDIX D

DEMOGRAPHIC SURVEY

A1 Case ID Number _ _ _

We would like you to tell us about you and your family to help us develop educational tools for women with breast disease. Please circle the best answer for each question or fill in the blanks with your answer.

A2 Did your doctor or healthcare provider explain the MRI procedure to you?

1 No
2 Yes

A3 Have you ever had an MRI exam before?

1 No
2 Yes

A4 Do small spaces make you feel uncomfortable?

1 No
2 Yes

A5 What is the highest level of education you've completed?

1 Grade School or less
2 General Educational Development (GED)
3 High School
4 Attended College
5 College 2-year degree
6 College 4-year degree
7 Graduate/Professional degree
8 Other (please describe)_____

A6 How do you describe your marital status?

1 Single (never married)
2 Living with a significant other, not married
3 Married
4 Married but Separated
5 Divorced
6 Remarried
7 Widowed

A7 Do you live alone?

1 No

2 Yes

A8 If you do not live alone, how many individuals live in your home besides you?

Number	Relationship
1	one _____
2	two _____
3	three_____
4	four_____
5	five or more _____

In this section, we'd like you to describe your occupation

A9 Are you currently employed?

1 No

2 Yes

A10 If yes, do you work part time or full time?

1 Part time (29 hrs/week or less

2 Full time (30 or more hrs/week)

A11 Are you the primary financial supporter for your family?

1 No

2 Yes

A12 What is the name of your employer?

1 _____

A13 What type of industry do you work in (education, health, etc)?

1 _____

9 Not sure

A14 What is your job in this occupation?

1 _____

9 Not sure

Please skip to question A18

A15 Are you a housewife?
1 No
2 Yes

A16 Are you retired?
1 No
2 Yes

A17 Are you on currently on disability?
1 No
2 Yes

In this section, we'd like you to describe your healthcare coverage

A18 Do you currently have healthcare coverage?
1 No
2 Yes

A19 If yes, please describe your coverage
1 Private
2 Paid by Employer
3 Medicare
4 Medicaid

A20 Does your insurance limit coverage for your condition?
1 No
2 Yes

Thank you for participating in this study; we appreciate your input.

APPENDIX E

PATIENT HISTORY – MAMMOGRAPHY #1

PATIENT HISTORY

ID#: SS#: Xray#:
Last: First: MI: DOB:

Estrogen : Lump : Tenderness :
Birth Ctrl : Pain : Caffeine :
Thyroid : Discharge : Outside Films :

Race :
Height : ft: inches :

FAMILY BREAST CANCER HX
Who : pre/pst: Age :

PREGNANCY HISTORY
Pregncy : Live Births :
Age @ 1st :
Last : Ever Nursed?

MENSTRUAL HISTORY
Age @ Menarche yrs
Last :
Irreg Menses :

OTHER CANCERS
Description :
Date Diag:

SURGERIES Side : Ext : Age : Date :
Mastectomy :

Oophorectomy :

Bx : Mal : Description :

Breast Surgery :

HORMONE HISTORY Date Began : Date Ceased :
Estrogen :
Birth Control :

APPENDIX F

PATIENT HISTORY – MAMMOGRAPHY #2

MAMMOGRAPHY HISTORY

ID#:		SS#:	Xray#:	
Last:		First:	MI:	DOB:
Time :		Exam :	Symptomatic :	
				Weight :
Powder/Deoderant :		[H]igh, [M]od, or [L]?		Pregnant Now :
Caffeine User :				Date Last Period :
Self Referred :	Baseline :	Screening :	Follow-up :	Diagnostic :
Outside Films :	Exam Date :		Location :	Avail.

HORMONE HISTORY

Birth Ctrl :	yrs :	Pain :	Estrogen :	yrs	Now :
Began/Ceased					

SYMPTOMS

		Ext :	Age :	Date :	
Discharge :	Color :				
	Side :	Frequency :	Length :	Loc'n :	Comments :
Lumps :					
Pain :					

FEATURES

Comment :

APPENDIX G

PATIENT HISTORY – MRI MAMMOGRAPHY

MRI PATIENT HISTORY

ID# :				Exam Date :
XRay# :				Chart #
Name :				Exam Time :
	Sex :	Wt :		Insurance :
	BD :			S. Security :
	Ph :			
Exam :				
Diagnosis :				
Symptoms :				
Prev Here :				
Physician :				
Specialty :				
Phone :				
Pvt Line :				
Comments :				

MEDICAL HISTORY

Diabetes :	Trauma :	Cancer :	Hypertension :	Arthritis :
Kidney Dis. :	Pacemaker :	AIDS :	CT Alrgy :	M. Implants :

PREVIOUS EXAMS

CT Scan :
X-Ray :
Myelogram :
Angiogram :
Ultrasound :
Nuclear Med :
MRI :
Other :
Brought Films :

PROBLEMS LIST

Pain :
Vision :
Hearing :
Headaches :
Balance/Vertigo :
Memory Loss :
Seizures :
Muscle Weakness :
Tingling/Numb. :
Stroke :
Sedation :

Surgeries :
Medications :
Comments :

APPENDIX H

STATE-TRAIT ANXIETY INVENTORY

(SAMPLE)

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-1

Please provide the following information:

Name_____ **Date**_____ **S**_____

Age_____ **Gender** ***(Circle)*** **M F** **T**_____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate value to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm.....	1	2	3	4
2. I feel secure.....	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained.....	1	2	3	4
5. I feel at ease.....	1	2	3	4

(SAMPLE)

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name_____ **Date**_____

DIRECTIONS:
A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate value to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I with I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4

APPENDIX I

SHORT FORM SOCIAL SUPPORT QUESTIONNAIRE (SSQ-6)

Short Form Social Support Questionnaire (SSQ-6)

Please think about people in your life who provide you with help or support. You will read about some situations, and for each situation you read, tell us all of the people you know, besides yourself, who you can depend upon / go to for help or support. Please write each person's initials plus their relationship to you and whether they are male or female. Do not list more than nine people per question. After you list the people you count on for help and support in each situation, then describe your overall level of satisfaction/ happiness with the help or support you are currently receiving as a whole from all these people. For any given situation you may tell us that you have no support. If so, please circle "0", but still rate your level of satisfaction.

1a. *Whom can you really count on to distract you from your worries when you are worried?* (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

1b. *How satisfied / happy are you with the support / help these people provide, that is with their helping you when you need help?* (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

2a. *Whom can you really count on to help you feel more relaxed when under pressure or tense?* (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

2b. *How satisfied / happy are you overall with the support/help these people provide, that is with their helping you when you need help*? (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

3a. *Who accepts you totally, including your worst and best points?* (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

3b. *How satisfied / happy are you overall with the support/help these people provide, that is with their helping you when you need help?* (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

4a. *Whom can you really count on to care about you, regardless of what is happening to you*? (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

4b. *How satisfied / happy are you overall with the support/help these people provide, that is with their helping you when you need help?* (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

5a. *Whom can you really count on to help you feel better when you are feeling generally sad or down in the dumps?* (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

5b. *How satisfied / happy are you overall with the support/help these people provide, that is with their helping you when you need help?* (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

6a. *Whom can you count on to console you / make you feel better when you are very upset?* (If no one, circle "0" and rate your level of satisfaction) Please list each person's initials, his/her relationship to you and whether the person is male or female.

Person's Initials	**Relationship to you**	**Male or Female**
0. (No one)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

6b. *How satisfied / happy are you overall with the support/help these people provide, that is with their helping you when you need help?* (Please circle one of the following)

1 very dissatisfied
2 fairly dissatisfied
3 a little dissatisfied
4 a little satisfied
5 fairly satisfied
6 very satisfied

APPENDIX J

POWERPOINT EDUCATIONAL INTERVENTION TOOL

Breast MRI

Understanding Your Exam

Your Exam

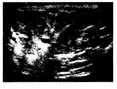
Your doctor has scheduled a breast exam for you using Magnetic Resonance Imaging (MRI). MRI is a highly sensitive technique that can detect breast abnormalities that other procedures sometimes miss. The MRI exam lasts approximately one hour.

How is Breast MRI Different from other Exams?

MRI is a non-invasive procedure that uses a magnetic field and radio waves to produce cross-sectional images of the breast. Unlike standard Mammography, MRI does not use X-Rays.

X-Ray

Ultrasound



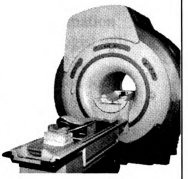
MRI

When you arrive at the clinic for your exam, you will be asked to complete a brief medical history questionnaire. This information is necessary to aid in the interpretation of your MRI exam. It is important that you record this information as accurately as possible

The technologist who performs the MRI exam will review your medical history with you and explain the procedure. She will answer any questions you might have about the exam. Please inform the technologist if you are pregnant or nursing

Before entering the exam room, you must first change into a gown and remove all metallic objects including jewelry, watches and hairpins. MRI uses a very strong magnet, so you are not permitted to bring metal articles into the scan room. A locker is provided in the dressing area to secure you valuables

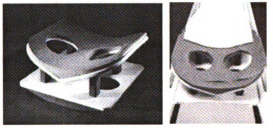
The MRI magnet is cylinder-shaped with a bore through the center. During the procedure, the examination table slides into the middle of the bore



As part of the Breast MRI exam, the technologist will insert an IV tube into the vein of your arm. This is usually done just prior to the exam. The IV allows the technologist to administer a clear contrast fluid into your vein at a precise time during the procedure. The contrast is necessary to help identify small lesions and determine the type of tissue they are made of.

The contrast agent used in MRI will not affect your ability to drive or perform any other activity. You can carry on with your normal routine after the exam.

Breast MRI uses a special device called a "coil" to receive information about your body. The technologist will place the padded coil on the examination table in preparation for your exam.



The technologist will help you onto the table and position you correctly for the exam. Because MRI produces loud sounds, you must wear ear protection during the procedure. You may listen to music through the headphones if you'd like. You will still hear the technologist talk to you through the headphones.

The technologist will raise the table and slide it into the center of the magnet. Because MRI is extremely sensitive to motion, you must remain as still as possible throughout the exam.

After you are comfortably positioned in the magnet, the technologist will proceed to the scanning workstation to operate the system.

The technologist will continue to communicate with you through an intercom and observe you through a large window.

Your exam will be monitored and interpreted by a radiologist to ensure that all necessary images are obtained before you leave.

After the exam is complete, you are free to collect your belongings and leave. The radiologist will forward a report to your referring physician within a few days. You will review the test results with your doctor.

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