

The Effect of Mindfulness-Based Music Therapy on Attention and Mood in Women Receiving Adjuvant Chemotherapy for Breast Cancer: A Pilot Study

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Cancer treatments, such as chemotherapy and radiation therapy, are thought to damage normal cognitive functioning of women with breast cancer (Reuter-Lorenz & Cimprich, 2013; Von Ah & Tallman, 2014). Mindfulness, a type of contemplative practice, improves cognitive functions, including attention and working memory, in adults (Jha, Krompinger, & Baime, 2007; Jha, Stanley, & Baime, 2010; Tang et al., 2007). Music stimuli are an ideal source of focus for mindfulness practice (Graham, 2010). No study, to date, has used mindfulness-based music therapy (MBMT) to address the attention deficits and symptom distress reported by women who receive chemotherapy treatments. This pilot study explores the efficacy of MBMT to reduce attention problems and mood distress experienced by women receiving adjuvant chemotherapy for breast cancer.

Neurocognitive deficits in women with breast cancer have been associated with a phenomenon referred to as “chemobrain” (Hurria, Somlo, & Ahles, 2007; Reuter-Lorenz & Cimprich, 2013). Chemotherapy treatments are reported to negatively affect domains of attention, working memory, and several psychomotor abilities (Correa & Ahles, 2008; Hurria et al., 2007; McDonald & Saykin, 2011). A meta-analysis that evaluated the effects of chemotherapy on women with breast cancer revealed significantly lower cognitive ability for executive function, information processing speed, verbal memory, and visual memory as compared to normative data (Reuter-Lorenz & Cimprich, 2013). Deficits in cognitive function were also found in women who had received adjuvant chemotherapy for breast cancer six months postchemotherapy (Jim et al., 2012). In addition, brain-imaging techniques revealed a reduction of brain gray matter density in patients who received chemotherapy for breast cancer (McDonald & Saykin, 2011). The reduced density was observed bilaterally in the frontal and temporal brain regions one month after chemotherapy treatments relative to baseline density. The changes in gray matter were not found in patients with breast cancer who were not

Purpose/Objectives: To explore the efficacy of mindfulness-based music therapy (MBMT) to improve attention and decrease mood distress experienced by women with breast cancer receiving adjuvant chemotherapy.

Design: Quantitative, descriptive, longitudinal approach.

Setting: A comprehensive cancer hospital and a university in southern Florida.

Sample: 15 women with a diagnosis of breast cancer, stages I–III, receiving adjuvant chemotherapy.

Methods: Participants individually received MBMT for one hour per week for four weeks. The sessions consisted of varied music activities accompanied by mindfulness attitudes, or mental strategies that enhance moment-to-moment awareness, and weekly homework. Demographic information was collected at baseline.

Main Research Variables: Attention was measured using Conners’ Continuous Performance Test II. Mood was measured using the Profile of Mood States–Brief Form. Narrative comments collected from the homework assignments served to reinforce quantitative data.

Findings: Repeated measures analysis of variance showed that attention improved significantly over time. Although all mood states significantly improved from the beginning to the end of each MBMT session, the mood state of fatigue decreased significantly more than the other mood states.

Conclusions: MBMT enhances attention and mood, particularly the mood state of fatigue, in women with breast cancer receiving adjuvant chemotherapy.

Implications for Nursing: A preferred music listening and mindfulness exercise may be offered to women with breast cancer who experience attention problems and mood distress.

Key Words: mindfulness-based music therapy; breast cancer; attention; mood

ONF, 42(3), 276–282. doi: 10.1188/15.ONF.276-282

treated with chemotherapy or who were healthy controls. One year later, patients showed partial recovery of gray matter (McDonald & Saykin, 2011).

Women with breast cancer receiving adjuvant chemotherapy report frequently having problems with focus, attention, and short-term memory; one typical

complaint is that they often forget where they put their car keys. Improvement in attention ability is much desired by these patients and their physicians (A. Montero, personal communication, July 13, 2012). Treatment can interfere with the activities of daily living; poor information processing, attention, and working memory also are negatively associated with treatment (Brezden, Phillips, Abdolell, Bunston, & Tannock, 2000; Jansen, Miaskowski, Dodd, Dowling, & Kramer, 2005; Von Ah & Tallman, 2014). In addition, negative mood states (e.g., anxiety, fatigue, depression) are often observed in women with breast cancer (Berger & Higginbotham, 2000). Fatigue is a common complaint and is rated as the longest lasting and most disruptive symptom that results from adjuvant chemotherapy treatment (Berger & Higginbotham, 2000; Carlson et al., 2004, 2013). These areas of concern for patients and healthcare providers require intervention, and one noninvasive approach may be offered by mindfulness: MBMT.

Mindfulness

Mindfulness is a contemplative practice of being fully aware of what is occurring in the present moment (Bishop et al., 2004; Brotto, 2013). It involves paying attention to an item, event, or moment without overanalyzing, evaluating, or judging. The practice of mindfulness can help a person not to worry about the past or the future, as well as to move out of automatic pilot responses (Brown & Ryan, 2003; Kabat-Zinn, 1990; Williams, Teasdale, Segal, & Kabat-Zinn, 2007). Sometimes referred to as the third wave of psychology, mindfulness is useful as an approach for increasing awareness and responding skillfully to mental processes that contribute to emotional distress and maladaptive behavior (Bishop et al., 2004). Mindfulness involves being aware of and attentive to the form of thoughts rather than the content of thoughts. Whereas cognitive behavior therapy emphasizes addressing the content of distressing thoughts and reframing them, mindfulness entails being aware of having those types of thoughts, feelings, and body sensations. This sort of functioning is referred to as pre-reflexive because it acts on, not within, thought, feeling, and other forms of consciousness (Brown & Ryan, 2003).

Cognitive mechanisms have been reported as significantly improving with the practice of mindfulness (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010), even when practiced in the short term (Tang et al., 2007). Benefits of mindfulness practice include increased focus and self-regulation (Baer, 2003), as well as increased attention and working memory (Chiesa, Calati, & Serretti, 2011; Jha et al., 2007, 2010). Significant improvements in mood and sleep (Carlson & Garland, 2005; Carlson et al., 2013) and increased well-being (Brown & Ryan, 2003) were reported by women with breast cancer who

participated in a mindfulness-based stress reduction (MBSR) program. In a randomized, wait-list controlled study, the mood and symptoms of stress of outpatients with cancer significantly improved after partaking in weekly 1.5-hour MBSR sessions for seven weeks (Specia, Carlson, Goddey, & Angen, 2000). The MBSR program consisted of three components: teaching materials pertaining to relaxation and meditation, experiential practice of meditation in group and home settings, and group work focused on problem solving. The patients had varied cancer diagnoses, stages of illness, and ages; breast cancer constituted the largest subgroup. A significantly reduced mood disturbance was found for the Profile of Mood States–Brief Form (POMS-BF) subscales of anxiety, depression, anger, and confusion (McNair & Heuchert, 2006). A significant increase in vigor was also reported, whereas fatigue was not found to be significantly improved (Specia et al., 2000).

Graham (2010) found that music stimuli may serve as an ideal source of focus for mindfulness. Although mindfulness-based art therapy was found to significantly reduce symptom distress in women with cancer (Monti et al., 2006), its efficacy to improve attention was not investigated. The practice of mindfulness and music therapy was presented to conference attendees at the 14th World Congress of Music Therapy (Lesiuk, 2014). However, to the author's knowledge, no known studies of MBMT examine the effects of cognition in any patient population. This article examines the effect of an MBMT program on attention and mood states in women receiving adjuvant chemotherapy for breast cancer. The findings reported in the current article may contribute to nursing and mindfulness-based practices, as well as to music therapy literature and clinical practice.

Methods

Study Design and Procedure

This study aimed to determine (a) the effect of MBMT on participant attention, as measured by the Conners' Continuous Performance Test II (CPT-II), version 5, prior to and following the four-week MBMT program (Conners, 2004) and (b) the immediate effect of MBMT on participant mood, as measured by POMS-BF. A descriptive, longitudinal design was used. Demographic information was collected at baseline. Attention was measured by eight subscales and at two time points (once at baseline [Time 1] and again at the completion of the study [Time 2]). Mood was measured using the POMS-BF at the beginning (pre) and end (post) of each weekly one-hour session. Each MBMT weekly session differed by theme.

The study received participants research approval from the Sylvester Comprehensive Cancer Center, part of the University of Miami Health System, and the

Table 1. Mindfulness-Based Music Therapy Weekly Sessions

| Session | Music Therapy Activity | Mindfulness Attitude |
|---------|---|---------------------------|
| 1 | Focused music listening and writing | Nonjudging |
| 2 | Novel instruments and familiar songs | Beginner's mind |
| 3 | Rhythm imitation, simple instrument playing | Suspending judgment |
| 4 | Music-assisted relaxation | Acceptance and letting go |

University of Miami, both in Florida. An MBMT program was developed by the author to potentially enhance the attention and mood states of women who received adjuvant chemotherapy for breast cancer. Participants in the MBMT program received individualized one-hour MBMT sessions once a week for four weeks in a comfortable room within the Frost School of Music at the University of Miami. Participants were also assigned 15–20 minutes of daily homework consisting of music listening exercises and written reflections that matched the weekly theme and mindfulness attitude, respectively. Each week, participants were provided with a different music CD created by the author.

The POMS-BF, measuring mood state, was administered immediately prior to and following each session. The CPT-II, measuring attention, was administered immediately prior to the first session and following the end of the fourth session. All participants completed the four MBMT sessions. Table 1 shows the various music therapy activities by week and the accompanying four mindfulness attitudes, which are mental strategies that allow individuals to enhance their practice of being in the moment. Each session began with an opening exercise using sound and then music as the anchor for attention. The opening exercise, which lasted about five to seven minutes, was developed to introduce focus on sound and music rather than on breath, which is the traditional focus (Graham, 2010). Discussions followed regarding whether participants' minds wandered or remained on the sound, as well as whether they could simply observe their thoughts, feelings, and body sensations without reacting to them. The full disclosure of the program requires a lengthy description beyond the purpose of the findings reported here. Therefore, MBMT program development, a detailed description of the program, and narrative comments from homework are provided for readers elsewhere (Lesiuk, 2014).

Participants

Fifteen women with a diagnosis of breast cancer were recruited from the Sylvester Comprehensive Cancer

Center. The women traveled to the clinic for their appointments and chemotherapy treatments. All participants spoke English fluently. Criteria for inclusion in the study were a diagnosis of breast cancer (stages I–III) and current adjuvant chemotherapy treatment. Exclusion criteria included any prior cognitive impairment (e.g., head injury, history of psychosis). Women who met the study criteria were identified by the clinic nurse and were provided with information about the MBMT study from the researcher. Session meeting times that were agreeable to each participant were scheduled.

Measures

Conners' Continuous Performance Test II: The CPT-II is a 14-minute-long computerized assessment of attention, impulsivity, and vigilance. The CPT-II may be used as a screening tool to monitor the effectiveness of treatment and medication or for research purposes. The CPT-II profiles produced help to identify potential problems of executive function in clinical populations. During administration of the CPT-II, participants press a computer keyboard spacebar as quickly and accurately as possible for every screen display of a letter of the alphabet, except for the letter "X." Following administration of the CPT-II, a score report in which participant raw scores are converted to t scores is generated. These scores may be compared to those of individuals in the normative group of the same gender and age range.

For the purpose of this study, CPT-II scores specifically related to the measure of attention were analyzed. For example, a t score of omissions indicates failing to respond to the target alphabet letters, and a t score of commission errors indicates responses incorrectly given

Table 2. Demographic Characteristics (N = 15)

| Characteristic | n |
|-------------------------------|----|
| Education | |
| High school | 4 |
| Bachelor's degree | 5 |
| Master's degree | 3 |
| Other | 3 |
| Ethnicity | |
| Caucasian | 6 |
| Hispanic | 6 |
| African American | 2 |
| Asian | 1 |
| Stage of breast cancer | |
| I | 2 |
| II | 6 |
| III | 7 |
| Treatment^a | |
| Adjuvant chemotherapy | 15 |
| Surgery | 11 |
| Hormone therapy | 4 |
| Radiation therapy | 4 |

^a More than one treatment could be reported.

Table 3. Repeated Measures Analysis of Variance of Attention and Time

| Variable | SS | df | MS | F |
|--------------------------|-----------|----|--------|-------|
| Attention | 928.43 | 7 | 132.63 | 0.71 |
| Error (attention) | 18,226.24 | 98 | 185.98 | – |
| Time | 1,267.07 | 1 | 1,267 | 6.69* |
| Error (time) | 2,651.53 | 14 | 189.4 | – |
| Time × attention | 421.7 | 7 | 60.24 | 1 |
| Error (time × attention) | 5,899.67 | 98 | 60.2 | – |

* $p < 0.05$

MS—mean square; SS—sum of squares

to the nontarget letter, “X.” Several response times are calculated in milliseconds for the remaining measures (i.e., hit reaction time, hit reaction time standard error, variability, detectability, reaction interstimulus interval change, and standard error by interstimulus interval). All of these scores constitute a measure of attention for each participant. Detailed explanations of the response times are provided by Conners (2004). CPT-II measures, when combined into indices for neurologic assessment, have a reliability coefficient of 0.92 (Conners, 2004).

Profile of Mood States–Brief Form: POMS-BF consists of 30 items regarding how an individual feels at the time of testing. This mood scale is efficient at differentiating the effects of experimental manipulations of mood in patients with cancer (Andersen et al., 2007). The brief version was developed in 1989 for the purpose of providing a shorter and less time-consuming form to patients in medical settings. For each of the six POMS-BF subscales (i.e., anger-hostility, confusion-bewilderment, depression-dejection, fatigue-inertia, tension-anxiety, and vigor-activity), patients respond to items on a five-point Likert-type scale by circling numbers from 0 (not at all) to 4 (extremely). For example, items within the tension-anxiety subscale include “tense, shaky,” whereas items within the vigor-activity subscale include “lively, vigorous.” All internal consistencies of the factors are high, with 0.9 or above (McNair & Heuchert, 2006). Relatively lower stability coefficients are expected for the POMS-BF scale; individuals’ state moods fluctuate because of situational factors in the time they are captured.

Data Analysis

Data were analyzed using SPSS®, version 22, and all statistical assumptions were met. A repeated measures analysis of variance (ANOVA) was used for analysis of the effect of MBMT on participant attention over time. A repeated measures ANOVA was used for analysis of the effect of MBMT on participant mood from each of the four weekly pre- and postsessions. All 15 participants completed the four sessions. Participants were not required to log homework time. However, participants

were asked at the end of the study how much time, on average, they had spent on homework per week; time spent ranged from 30 minutes to seven hours. Missing items found infrequently on the POMS-BF scales were averaged with similar subscale item responses prior to data entry.

Results

Participants

The mean age of the 15 participants was 52.6 years (SD = 11.3, range = 27–70 years). All participants were receiving adjuvant chemotherapy while enrolled in the MBMT study. Most participants received chemotherapy every three weeks for six cycles. Participants had, on average, 1.9 years (SD = 3.25, range = 0–10 years) of music training. Two of the women were involved in active music making (e.g., singing in a choir), and five had some previous experience with meditation (see Table 2).

Attention

A repeated measures ANOVA revealed that the two-way interaction of time with attention is not significant (see Table 3). However, the main effect of time is statistically significant ($F [1, 14] = 6.69, p = 0.022$). The attention t score at Time 1 is 51.54 (SE = 1.76) and 46.94 (SE = 0.87)

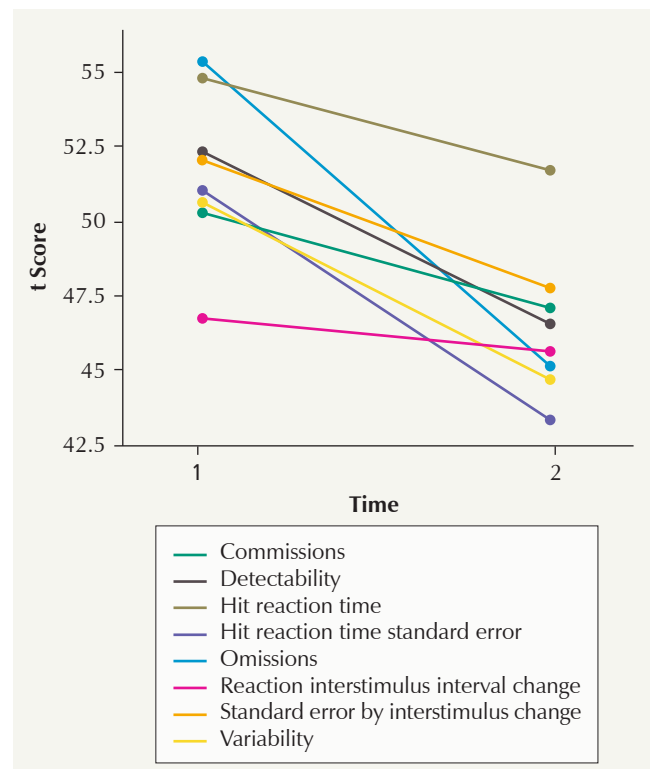


Figure 1. Conners' Continuous Performance Test II of Attention Mean Scores at Baseline (Time 1) and Following All Sessions (Time 2)

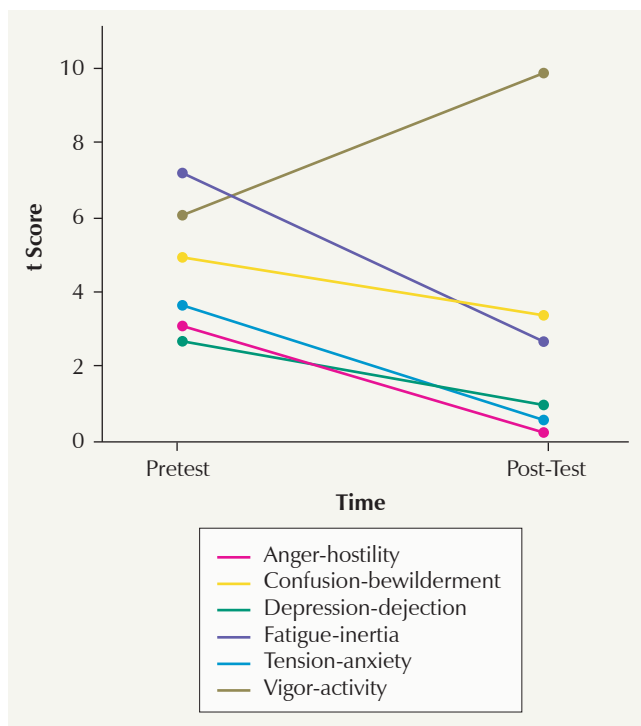


Figure 2. Profile of Mood States–Brief Form Mean Scores Before and After All Sessions

at Time 2. The significantly lower score at Time 2 indicates an improvement in attention over time. Figure 1 illustrates the attention measure over time.

Mood Distress

A repeated measures ANOVA revealed that the change in mood from the beginning to the end of each session did not vary by the type or the theme of the session for each subscale. However, the change in mood from the beginning to the end of each session differed by subscale across all sessions ($F [5, 65] = 20.83, p < 0.001$). Although a statistically significant reduction in mood disturbance from the beginning to the end of the MBMT sessions was observed, the magnitude of the change was not the same across all mood states.

Figure 2 illustrates the overall mean of the POMS-BF subscales at the beginning (pre) and end (post) of the MBMT sessions. All mood states of the participants improved from the start to the end of all four MBMT sessions. Post-hoc pairwise comparisons reveal

ed that fatigue decreased significantly more than the other negative mood states. The mean of the fatigue-inertia subscale pretest was 6.13, and the post-test mean was 1.43, with the largest subscale difference score being 4.7 ($p < 0.001$).

A follow-up analysis using Bonferroni correction to control for overall alpha level shows significant mean differences between pretest and post-test for each POMS-BF subscale (see Table 4). These improvements in mood state indicate a relevant change in symptom distress of the women.

Discussion

This pilot study found that the MBMT program significantly improved attention over time. This significant improvement in attention over time reinforces the findings posited by Chiesa et al. (2011) and Jha et al. (2007) that mindfulness-based interventions significantly improve attention. In addition, music stimuli appear to be an excellent way to capture attention for passive listening (Huron, 1992) and active music making (Gardiner, 2005).

The results of this pilot study also determined that MBMT significantly reduced negative mood states in women with breast cancer who were receiving adjuvant chemotherapy. Specifically, the MBMT intervention significantly reduced states of tension, depression, anger, fatigue, and confusion in women with breast cancer, and it significantly improved their levels of vigor and activity. Statements made by the women during the MBMT corroborate the quantitative findings regarding mood states. For example, some women reported feeling more relaxed and less stressed, as well as being able to sleep better. The problem of fatigue frequently reported by women receiving adjuvant chemotherapy treatment for breast cancer (Berger & Higginbotham, 2000) showed the greatest decrease

Table 4. Profile of Mood States–Brief Form Subscale Means and Mean Differences From Pre- to Postsession

| Subscale | Pre | | \bar{X} diff | SE | Post | |
|------------------------|-----------|------|----------------|--------|-----------|------|
| | \bar{X} | SD | | | \bar{X} | SD |
| Anger-hostility | 2.8 | 2.53 | 2.75 | 0.65** | 0.05 | 0.14 |
| Confusion-bewilderment | 4.28 | 3.13 | 2.35 | 0.73* | 1.93 | 0.78 |
| Depression-dejection | 2.28 | 2.09 | 1.87 | 0.47** | 0.42 | 1.35 |
| Fatigue-inertia | 6.13 | 3.49 | 4.7 | 0.65** | 1.43 | 1.6 |
| Tension-anxiety | 3.75 | 2.68 | 3.35 | 0.59** | 0.4 | 0.69 |
| Vigor-activity | 6.26 | 3.09 | -3.23 | 0.71** | 9.5 | 4.79 |

* $p < 0.01$; ** $p < 0.001$

SE—standard error; \bar{X} diff—mean difference

Note. The difference scores are calculated by subtracting the total postsession mood scores from the total presession mood scores. Positive change scores indicate improvement in the negative moods, whereas the negative change score indicates an improvement in the positive mood.

Knowledge Translation

Mindfulness-based music therapy (MBMT) improves attention and mood in women with breast cancer receiving adjuvant chemotherapy.

Fatigue is significantly relieved by MBMT in these patients.

MBMT can be used by nurses for their patients.

following the MBMT sessions. The significant reduction in negative mood states, particularly fatigue, and the marked improvement in vigor confirms the benefits for mood alteration from a MBMT intervention. Speca et al. (2000) did not find improvements in fatigue in the use of an MBSR program for patients with cancer; however, fatigue was reduced significantly with MBMT. Perhaps the MBMT program, with its combined emphasis on enhancing attention and reducing mood distress, is particularly effective for fatigue reduction.

Although the development, detailed description, and participant narrative comments of the MBMT program are provided for readers elsewhere (Lesiuk, 2014), the following participant comment, taken from a participant's homework journal regarding acceptance and letting go, corroborates the finding that negative moods can be altered through MBMT.

This week, the music was extremely relaxing and beautiful. . . . My mood, thoughts, and feelings changed. I was apprehensive, nervous, etc. Now, I feel acceptance, relaxed, ready for the approaching surgery—totally with a positive attitude!

The current study is limited by a small sample size and the absence of a wait-list control condition. In addition, although chemotherapy treatments were concurrent with the MBMT sessions, they varied in duration prior to the MBMT sessions. For example, some women had completed only one-third or one-half of their treatments when they began the study, whereas others were closer to completing the prescribed cycles of chemotherapy. Future research investigations should account for the length of time and number of cycles of chemotherapy received prior to and during MBMT. Attention and mood responses may be variable based on the length of time on chemotherapy and the number of chemotherapy cycles women had been receiving.

Recommendations for a more comprehensive research study beyond this pilot study include use of a larger number of participants and a wait-list control condition. MBMT could also be offered in a small-group format as opposed to only individual sessions. The social connection available in a group setting may further enhance the benefits of MBMT for the women. Measuring the effect of MBMT on fatigue during stages of chemotherapy

treatment (Berger & Higginbotham, 2000) would elucidate the strength of the MBMT to reduce fatigue. Women with stage IV breast cancer were excluded from participation in the current study, but a study of the effect of MBMT on symptom distress and quality of life for women with stage IV breast cancer is also recommended. Measures of perceived home and work-life stress also could be included to account for MBMT effectiveness when these factors are controlled for.

Implications for Nursing

Nurses who observe symptom distress and attention problems in women receiving adjuvant chemotherapy for breast cancer may help by facilitating a simple mindfulness-based music technique for their patients. For example, patients can be instructed to bring in their preferred music selections and focus on a particular attribute in the music (e.g., melody, specific instrument). In beginning mindfulness practice, the patient's attention may naturally drift to thoughts, feelings, or body sensations. However, the patient should be instructed to gently guide her mind back to the particular attribute in the music. The patient should also be told to be aware of any thoughts and to watch them as a bystander would. This mindfulness exercise that involves being with the music in the moment can be practiced at any time.

Guided instructions for using preferred music listening to practice mindfulness are provided by Graham (2010) and Goldberg (2014). The music listening and mindfulness practice may not only be employed by patients, but also by nurses who desire to practice mindfulness. A music therapist may provide guidance to nursing staff regarding how to facilitate mindfulness-based music listening with their patients. Nursing administrators interested in providing MBMT for their patients should contact the American Music Therapy Association (www.musictherapy.org) or the author of the current article for assistance with locating music therapy services.

Conclusion

The unique contribution of music to mindfulness practice in the form of MBMT significantly improved attention and mood states for women receiving adjuvant chemotherapy for breast cancer. The symptom of fatigue, a common complaint of the women, was particularly alleviated by the MBMT treatment. This music-based intervention, although in need of further investigation with a larger sample, is promising for the relief of symptom distress and to allay the attention problems associated with chemobrain.

The author gratefully acknowledges Joyce Chavarria, DNP, RN, OCN®, and Olga V. Moreira, MSN, ARNP, for their assistance with patient referrals and program support.

Teresa Lesiuk, PhD, MT-BC, is the director of and an associate professor in the music therapy program in the Frost School of Music at the University of Miami in Coral Gables, FL. This study was funded, in part, by the Provost's Research

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