

Measuring the Psychological Impact of Mindfulness Meditation on Health Among Patients With Cancer: A Literature Review

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Purpose/Objectives: To describe the construct of mindfulness meditation and systematically review instruments measuring the psychological impact of mindfulness-based stress reduction (MBSR) on health among patients with cancer.

Data Sources: PubMed, CINAHL®, PsycINFO®, ISI Web of Knowledge®, EBSCO, and published literature (1987–2006).

Data Synthesis: 13 psychological instruments used in seven studies (2000–2005) to measure effects of MBSR on health in patients with cancer were reviewed. Most studies used a one-group pre- and post-test design. The post-MBSR outcomes for each instrument varied, suggesting different yet promising relationships. For some instruments, data were insufficient to conclude sufficiently whether any were strong or appropriate to use in future intervention studies.

Conclusions: To enhance knowledge of MBSR, more intervention research studies of MBSR in patients with cancer and reexamination of specific instruments are needed.

Implications for Nursing: Based on the review, instruments can measure MBSR effects and found MBSR to be a potentially beneficial oncology nursing intervention.

Key Points . . .

- Mindfulness meditation is an awareness of moment-by-moment experiences arising from purposeful attention, along with nonjudgmental acceptance of the experiences.
- Various instruments have been used to measure the psychological impact of mindfulness meditation on health.
- Although the literature on mindfulness meditation is sparse, preliminary findings point to a potential positive impact of mindfulness-based stress reduction on the health and well-being of patients with cancer.

construct of mindfulness meditation and an overview, attributes, and limitations of selected research instruments. An understanding of mindfulness meditation and related research instruments will help future researchers build a solid conceptual framework to design studies, choose an appropriate existing tool(s), and develop new research instruments.

Background

Mindfulness Meditation

Mindfulness meditation has been defined as an awareness of moment-by-moment experiences that arises from purposeful attention, along with nonjudgmental acceptance of the experiences (Kabat-Zinn, 2003; Leigh, Bowen, & Marlatt, 2005). Meditation resides at the core of Buddha's teaching more than 2,500 years ago (Bonadonna, 2003) and also is the fundamental stance underlying all streams of Buddhist meditative practice. Meditation was introduced to Western culture in the 1960s (Kabat-Zinn, 2003). Although many

The popular and professional literature provide evidence that mindfulness meditation is applied widely to promote well-being in populations of healthy people and patients with chronic illnesses. Although for centuries mindfulness meditation has been cultivated in the daily lives of Eastern populations, the technique is an alternative therapy that is in its infancy in the Western world, having been introduced in the 1960s. Based on mindfulness meditation's potential impact in managing the growing cost of health care in society and the potential benefit to the well-being of healthy people and those with chronic illnesses, in 2006 the National Institutes of Health (NIH) awarded approximately \$2.5 million in grant funding to an oncology nurse researcher to study the effects of the technique among patients with cancer (Bauer-Wu, 2005). The funding verifies the trend toward increasing awareness of mindfulness meditation in the Western world and supports the need for further research in the field. Despite mindfulness meditation's promise in improving outcomes for patients with cancer and other chronic illnesses, the literature has limited rigorous data-based studies on which to build the body of scientific work in mindfulness meditation. Therefore, clarifying the construct of mindfulness meditation is important, as is examining the existing instruments used to measure the effects of the technique on patients with cancer. This article will provide a description of the

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forms of meditation are practiced throughout the world, this literature review focused on meditation forms practiced in clinical interventions based on mindfulness training that was included as a component of larger treatment packages (Dimidjian & Linehan, 2003).

Different methods are used to teach mindfulness, and the practice of mindfulness comprises several component activities. Meditation forms practiced in clinical interventions based on mindfulness training are mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) (Baer, 2003). MBSR was developed in 1979 by Kabat-Zinn (1982), a scientist, writer, and meditation teacher, and offered to the public through an outpatient stress-reduction clinic at the University of Massachusetts Medical Center (Kabat-Zinn, 2003). The MBSR program was conducted as an 8- to 10-week course for a group of as many as 30 participants who met weekly for two to two and a half hours for instruction and practice in mindfulness meditation skills, together with discussion of stress, coping, and homework assignments. An all-day (seven to eight hours) intensive mindfulness session usually was held around the sixth week (Baer). The program included information about the psychophysiology of stress, experiential mindfulness practice, and discussions about how participants were progressing with their home practice and challenges they were experiencing in the process (Ott, Norris, & Bauer-Wu, 2006). In the first class, participants received an audiotape or CD that supported their practice at home. During class, participants were taught meditation fundamentals and practiced sitting meditation, body scan, and hatha yoga. Participants were instructed to practice those skills outside of the group meetings for at least 45 minutes per day, six days per week (Baer). Furthermore, participants were encouraged to bring informal mindfulness to their daily life activities (Santorelli, 1999).

MBCT was conducted as an eight-week group intervention. Based on the MBSR program, MBCT incorporated elements of cognitive therapy that facilitated a detached or decentered view of one's thoughts, including statements such as "thoughts are not facts" and "I am not my thoughts." MBCT was designed to prevent depressive relapse by teaching formerly depressed individuals to observe their thoughts and feelings nonjudgmentally and as mental events that come and go rather than aspects of themselves or accurate reflections of reality. This attitude toward depression-related cognition was believed to prevent the escalation of negative thoughts into ruminative patterns (Teasdale, Segal, & Williams, 1995).

Cancer and Mindfulness Meditation

The diagnosis of cancer is a profoundly stressful experience. Most people fear the diagnosis because of its life-threatening implications and the potentially serious side effects of treatment. Cancer is the second-leading cause of death in the United States, exceeded only by heart disease (National Center for Health Statistics, 2006). The National Cancer Institute (2007) estimated that 178,480 women will be diagnosed with and 40,460 women will die from breast cancer in 2007. The diagnosis of cancer is traumatizing for patients and their families and may lead to significant immediate and long-term emotional sequelae (Stark et al., 2002). Cancer diagnosis, treatment, and survivorship all are associated with a multitude of psychological and physical consequences. The experience of cancer can be so emotionally distressing for some patients that they may meet

diagnostic criteria for a mental illness such as anxiety, depression, or post-traumatic stress disorder (Ott et al., 2006).

Mindfulness meditation can be helpful to patients with cancer across the continuum of care, from diagnosis through treatment, follow-up care, and survival, as well as at the end of life. Mindfulness meditation can positively influence the experience of chronic illness and serve as a primary, secondary, or tertiary prevention strategy (Bonadonna, 2003). Research shows that practitioners of meditation experience positive health benefits, such as greater intimacy with and reduced fear of other people, increased energy, greater relaxation, and less susceptibility to depression (Wright, 2007). In addition, Carlson et al. (2003, 2004) reported positive effects of mindfulness meditation on the immune system of patients with cancer. Meditation also includes useful skills that patients can practice by themselves to reduce and cope with stress, promote relaxation, and alleviate physical discomfort and emotional distress (Bonadonna; Ott, 2004). Mindfulness meditation interventions are a kind of mind-body therapy becoming increasingly popular and gaining credibility for use in the oncology population (Baer, 2003; Ott et al., 2006). As a result, instruments used to measure the effects of mindfulness meditation in intervention studies need to be reviewed and evaluated.

Review

Articles published from 1987–2006 were retrieved using PubMed, CINAHL®, PsycINFO®, ISI Web of Knowledge®, and EBSCO (N = 9). The inclusion criteria consisted of original research investigating the impact of mindfulness meditation intervention in patients with cancer. Searches used combinations of the following key words: mindfulness, mindfulness-based stress reduction, mindfulness meditation, and cancer. The search netted seven studies that used an instrument to measure the psychological impact of mindfulness meditation (see Table 1). The studies, published from 2000–2005, were from the disciplines of psychology and health science and conducted in the United States and Canada by research teams.

All study participants were patients with breast or prostate cancer. Studies included homogenous and heterogeneous samples by type and stage of cancer. Five of the study designs were one-group pre- and post-test. The other two studies used a randomized, wait-list controlled design. In a wait-list controlled design, during the intervention, participants in the wait-list control group do not receive the intervention until the study ends. The number of the participants in each study varied (range = 27–90).

All intervention studies used the MBSR program, but the duration of the programs varied from six to eight weeks. The duration of practice sessions varied from 63–72 hours per week. Two studies (Carlson, Ursuliak, Goodey, Angen, & Specia, 2001; Specia, Carlson, Goodey, & Angen, 2000) focused on participants with a heterogeneous stage and type of breast or prostate cancer, whereas two other studies (Brown & Ryan, 2003; Carlson, Specia, Patel, & Goodey, 2003) focused on participants with early-stage breast or prostate cancer. Three studies (Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003; Tacon, Caldera, & Ronaghan, 2004, 2005) with homogeneous participants focused only on patients with breast cancer.

Table 1. Intervention Studies

Study	Field and Location	Design	Treatment Group	Control Group	Participants
Specia et al., 2000	Psychosocial resources, Alberta, Canada	Between-group randomized controlled design	MBSR, seven weekly, 90-minute group sessions (N = 61)	Wait list N = 48	Outpatients heterogeneous in type and stage of cancer
Carlson et al., 2001	Psychosocial resources, Alberta, Canada	One-group pre- and post-test	MBSR, seven weekly, 90-minute group sessions (N = 89)	—	Patients heterogeneous in type and stage of cancer
Brown & Ryan, 2003	Psychology, Rochester, NY	One-group pre- and post-test	MBSR, eight weekly, 90-minute group sessions (N = 58)	—	Patients with early-stage breast or prostate cancer
Carlson et al., 2003	Psychosocial resources, Alberta, Canada	One-group pre- and post-test	MBSR, eight weekly, 90-minute group sessions (N = 59)	—	Patients with early-stage breast or prostate cancer
Shapiro et al., 2003	Psychology, Arizona	Between-group randomized controlled design	MBSR, six weekly, 120-minute group sessions (N = 31)	FC N = 32	Women with breast cancer
Tacon et al., 2004	Health exercise and sport science, Texas	One group pre- and post-test	MBSR, eight weekly, 90-minute group sessions (N = 27)	—	Women with breast cancer (no display of symptom contraindicating participation)
Tacon et al., 2005	Health exercise and sport science, Texas	One group pre- and post-test	MBSR, eight weekly, 90-minute group sessions (N = 30)	—	Women with breast cancer

FC—free choice; MBSR—mindfulness-based stress reduction

The main independent psychological variables of the majority of the research studies were mood, stress, and anxiety. Following the MBSR intervention, findings showed significant decreases in mood, stress, and anxiety and significant improvements in two of three subscales of health locus of control (internal health and chance), two of three coping styles (reactive style and suppressive style), two subscales of mental adjustment (helplessness and hopelessness and anxious preoccupation), and sleep quality. Sleep efficacy showed no significant improvement.

Studies in Heterogeneous Groups of Participants

Specia et al. (2000) assessed the effects of participation in MBSR on mood disturbance and symptoms of stress in 109 outpatients with different types and stages of breast or prostate cancer. A convenience sample of eligible patients gave informed consent; they were assigned randomly to an immediate treatment condition or a wait-list control condition. The intervention consisted of a weekly meditation group lasting one and a half hours for seven weeks in addition to home meditation practice. Instruments used in the study were the Profile of Mood States (POMS) (McNair, Lorr, & Droppelman, 1971) to measure primary outcomes of mood (including six subscales: tension and anxiety, depression and dejection, anger and hostility, vigor, fatigue, and confusion) and the Symptoms of Stress Intervention (SOSI) (Leckie & Thompson, 1979) to measure physical, psychological, and behavioral responses to stressful situations. Patients' mean preintervention scores on dependent measures were equivalent between groups. Ninety patients completed the study. After the intervention ended, in the seventh week, patients in the treatment group had significantly lower scores on total mood disturbance and subscales of depression, anxiety, anger, and confusion and more vigor than control subjects. The treatment group also had fewer overall symptoms of stress; fewer cardiopulmonary and gastrointestinal symptoms; less emotional irritability, depression, and cognitive disorganization; and fewer habitual patterns of stress. Overall reduction in total mood disturbance was 65%, with a 31% reduction in symptoms of stress. The authors concluded that the program

was effective in decreasing mood disturbance and stress symptoms in male and female patients with a wide variety of cancer diagnoses, stages of illness, and ages.

Carlson et al. (2001) assessed the same group of subjects immediately after the MBSR intervention and six months after program completion. Fifty-four of 80 patients completed the six-month follow-up. Participants' scores decreased significantly from before to after the intervention on the POMS and SOSI total scores and most subscales, indicating less mood disturbance and fewer symptoms of stress; the improvements were maintained at the six-month follow-up. Patients living with more advanced stages of cancer had scores showing less initial mood disturbance than those newly diagnosed, whereas more home practice and higher initial POMS scores predicted improvement on the POMS between the pre- and postintervention score. Women and patients who completed more education had higher initial SOSI scores, and improvements on the SOSI were predicted by more education and greater initial mood disturbance. The authors concluded that the program was effective in decreasing mood disturbance and stress symptoms for as many as six months in male and female patients with a wide variety of cancer diagnoses, stages of illness, educational backgrounds, and ages.

Carlson et al. (2003) investigated the effects of an MBSR program on quality of life, mood states, stress symptoms, lymphocyte counts, and cytokine production among 49 patients with breast cancer and 10 patients with prostate cancer. Subjects participated in a weekly meditation group lasting one and a half hours for eight weeks in addition to home meditation practice. Demographic and health behavior variables, quality of life, the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) (Aaronson et al., 1991; 1993), mood (POMS), stress (SOSI), and counts of natural killer (NK), NK T cell, B cell, total T cell, T helper cell, and T cytotoxic cells, as well as NK and T-cell production of tumor necrosis factor, interferon gamma (IFN- γ), interleukin-4 (IL-4), and IL-10, were assessed pre- and post-intervention. Forty-two participants completed the study. Findings showed significant improvement in overall

Table 2. Instruments Used to Measure the Effects of Mindfulness Meditation

Instrument	Number of Studies	Number of Items/Subscales	Subscales	Independent Variables	Rating Scale
Profile of Mood States (McNair et al., 1971)	5	65/6	Tension and anxiety Depression and dejection Anger and hostility Vigor and activity Fatigue and inertia Confusion and bewilderment	Anxiety Depression Anger Vigor Fatigue Concentration	Five-point scale (0 = not at all to 4 = very much so); lower score is preferable.
Symptoms of Stress Inventory (Leckie & Thompson, 1979)	4	95/10	Peripheral manifestations Cardiopulmonary Central and neurologic Gastrointestinal Muscle tension Habitual patterns Depression Anxiety and fear Emotional irritability Cognitive disorganization	Physical, psychological, and behavioral responses to stressful situations	Five-point scale (never to frequently); lower score is preferable.
State-Trait Anxiety Inventory (Spielberger, 1983)	3	20/1	—	Anxiety	Four-point Likert-type scale (1 = not at all to 4 = very much so); lower score is preferable.
Mental Adjustment to Cancer Scale (Watson et al., 1988)	2	40/5	Fighting spirit Helplessness and hopelessness Anxious preoccupation Fatalism and stoic acceptance Avoidance and denial	Psychological adjustment to cancer	Four-point rating scale (1 = definitely does not apply to me to 4 = definitely applies to me); higher score is preferable for fatalism. Lower score is preferable for other subscales.
European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (Aaronson et al., 1991)	2	30/0	Five functional domains • Physical function • Role function • Emotion function • Cognitive function • Social function	Physical functioning subscale	Two-point scale (1 = no problem to 2 = problem); lower score is preferable for symptom scales.
			Three symptom scales • Fatigue • Pain • Nausea and vomiting	Physical symptoms (included three symptom scales and six single items)	Four-point scale (1 = not at all to 4 = very much so); lower score is preferable for symptom scales.
			Six single items • Dyspnea • Sleep • Appetite • Constipation • Diarrhea • Financial impact of symptoms Two global items (health and overall quality of life)		
Multidimensional Health Locus of Control Scales (Wallston et al., 1978)	1	18/3	Internal health locus Powerful other locus Chance locus	Locus of control in health	Seven-point scale (1 = strongly agree to 7 = strongly disagree); lower score is preferable.
Problem-Focused Styles of Coping (Heppner et al., 1995)	1	18/3	Reflective or thoughtful style Reactive or impulsive style Suppressive or control style	Coping tendencies	Four-point scale (1 = almost never to 4 = almost all of the time); high score is preferable for the reflective or thoughtful style; low score is preferable for other styles.
Mindfulness Attention Awareness Scale (Brown & Ryan, 2003)	1	15/1	—	Mindful states in day-to-day life	Six-point scale (1–6); high score is preferable.

(Continued on next page)

Table 2. Instruments Used to Measure the Effects of Mindfulness Meditation (Continued)

Instrument	Number of Studies	Number of Items/Subscales	Subscales	Independent Variables	Rating Scale
Beck Depression Inventory (Beck et al., 1961)	1	21/1	—	Depression	Each question has a set of four possible answer choices, ranging in intensity. Lower score is preferable.
Penn State Worry Questionnaire (Meyer et al., 1990)	1	16/1	—	Generalized anxiety disorder	Lower score is preferable.
Functional Assessment of Cancer Therapy—Breast (Brady et al., 1997)	1	27/4	General cancer concerns scale consists of four dimensions: physical well-being, social/family well-being, emotional well-being, and functional well-being	Health-related quality of life	Five-point Likert-type scale; high score is preferable for general cancer concern.
		9/1	Nine breast cancer-specific items		Lower score is preferable for specific items.
Shapiro Control Inventory (Shapiro, 1992)	1	187/9	Positive assertive Positive yielding Negative assertive Negative yielding	Sense of control in both general and specific domain	High score is preferable for positive subscales. Lower score is preferable for negative subscales.
Sense of Coherence (Antonovsky, 1987)	1	29/3	Comprehensibility Manageability Meaningfulness	Sense of coherence	Seven-point scale (1 = never to 7 = very often); high score is preferable.

quality of life, symptoms of stress, and sleep quality. Although the overall number of lymphocytes or cell subsets had no significant changes, T cell production of IL-4 increased and IFN- γ decreased; further, NK cell production of IL-10 decreased. Those findings differ from the findings of a study by Fawzy et al. (1990), who reported significant increases in the percentage of lymphocytes and NK cells following a six-week psychosocial intervention. However, the results by Carlson et al. (2003) are consistent with a shift in immune profile from one associated with depressive symptoms to a more normal immune profile. Carlson et al. (2003) concluded that MBSR participation was associated with enhanced quality of life and decreased stress symptoms. The study was the first to show changes in cancer-related cytokine production associated with program participation.

Brown and Ryan (2003) reported a series of five studies. The first four studies tested the Mindfulness Attention Awareness Scale (MAAS), a new instrument developed by the authors, in healthy people, including psychology students ($n = 1,253$) enrolled in the first study, Zen participants ($n = 53$) enrolled in the second study, undergraduate students ($n = 90$) enrolled in the third study, and employed adults ($n = 83$) enrolled in the fourth study. The fifth study, which met the criteria for this literature review, was a clinical intervention study to determine whether changes on the MAAS reflected changes in adjustment and well-being. Thirty-two patients with breast cancer and nine patients with prostate cancer completed an intervention that consisted of a one-and-a-half-hour weekly meditation group for eight weeks in addition to home meditation practice. The instruments in the study consisted of the EORTC QLQ-C30 to measure physical functioning and symptoms, the POMS, and the SOSI. In testing the relationship between mindfulness and outcomes, total disturbance and stress were regressed on MAAS scores

while controlling for any demographic, medical, or health variables. The results of the study showed that the SOSI scores dropped significantly during the intervention period ($p < 0.01$). No significant change was observed in sample-wide MAAS or POMS scores.

Studies in Homogeneous Groups of Participants

Shapiro et al. (2003) examined the efficacy of MBSR intervention for women with breast cancer. The intervention consisted of weekly two-hour MBSR for six weeks. Two weeks prior to the intervention, participants completed a series of self-report questionnaires, including measures of quality of life, psychological distress, sense of control, anxiety, depression, sense of coherence, and worry. Furthermore, they completed a sleep diary one week before and after intervention and throughout the six-week intervention. All of the variables were reassessed one week, three months, and nine months after intervention. Instruments consisted of psychological measures and a sleep diary. Sixty-three patients were randomized to MBSR or a free-choice (FC) condition ($FC = 32$, $MBSR = 31$). FC was an opportunity for participants to choose freely which stress-management technique to engage in each week (e.g., talking to a friend, exercising, taking a warm bath). Fifty-four participants completed postassessment data ($FC = 28$, $MBSR = 26$), 41 completed the three-month follow-up assessment ($FC = 23$, $MBSR = 18$), and 49 completed the nine-month follow-up assessment ($FC = 27$, $MBSR = 22$). Of the 31 women who began the MBSR program, 26 completed at least four of the seven sessions and 24 completed five or more. Analyses of the data indicated that MBSR and the FC control condition produced significant improvement on daily diary sleep-quality measures, though neither showed significant improvement on sleep efficacy. Participants in the MBSR program who reported greater amounts of mindfulness

Table 3. Use of Instruments in Studies of Mindfulness Meditation

Instrument and Studies	Timing of Postintervention Measurement	Findings
Profile of Mood States (POMS)		
Speca et al., 2000	Week 7, immediately after intervention completion	Significant decrease in mood disturbance occurred in experimental group.
Carlson et al., 2001	Six months after intervention completion	Decrease in mood disturbance was maintained, but no significant improvements were observed.
Brown & Ryan, 2003	Week 8, right after intervention completion	No significant changes were observed for mood scores.
Carlson et al., 2003	In the beginning of the week after intervention completion	No significant changes were observed for mood scores.
Shapiro et al., 2003	One week, three months, and nine months after intervention completion	This study used POMS to measure the control variables, not to compare the pre- and postintervention change.
Symptoms of Stress Inventory		
Speca et al., 2000	Week 7, right after intervention completion	Significant decrease in stress symptoms occurred in the treatment group.
Carlson et al., 2001	Six months after intervention completion	Decrease in stress symptoms was maintained, but no significant improvements were observed.
Brown & Ryan, 2003	Week 8, right after intervention completion	Significant decrease in stress symptoms. Higher levels of mindfulness were related to lower levels of stress both before and after the mindfulness-based stress reduction (MBSR) intervention.
Carlson et al., 2003	In the beginning of the week after intervention completion	Significant decrease in stress symptoms was associated with MBSR.
State-Trait Anxiety Inventory		
Shapiro et al., 2003	One week, three months, and nine months after intervention completion	This study measured anxiety as the control variable and did not compare the pre- and postintervention change.
Tacon et al., 2004	Week 8, immediately after intervention completion	Significant decrease in state anxiety scores
Tacon et al., 2005	Week 8, immediately after intervention completion	Significant decrease in state anxiety
Mental Adjustment to Cancer Scale		
Tacon et al., 2004	Week 8, immediately after intervention completion	Significant improvement in Mental Adjustment to Cancer Scales in the subscale of helplessness and hopelessness and anxious preoccupation.
Tacon et al., 2005	In the beginning of the week after intervention completion	Significant improvement in Mental Adjustment to Cancer Scales in the subscale of helplessness and hopelessness and anxious preoccupation.
European Organization for Research and Treatment of Cancer Quality of Life Questionnaire		
Brown & Ryan, 2003	Week 8, immediately after intervention completion	No significant change
Carlson et al., 2003	In the beginning of the week after intervention completion	Significant improvement in quality of life associated with MBSR
Mindfulness Attention Awareness Scale		
Brown & Ryan, 2003	Week 8, immediately after intervention completion	Higher levels of mindfulness were related to lower levels of mood and stress both before and after the MBSR intervention.
Multidimensional Health Locus of Control Scale		
Tacon et al., 2004	Week 8, immediately after intervention completion	Significant decrease in the internal health locus and chance locus subscales.
Problem-Focused Styles of Coping		
Tacon et al., 2005	Week 8, immediately after intervention completion	Significant increase in the reactive style and the suppressive style
Beck Depression Inventory, Penn State Worry Questionnaire, Shapiro Control Inventory, Sense of Coherence, and Functional Assessment of Cancer Therapy–Breast		
Shapiro et al., 2003	One week, three months, and nine months after intervention completion	This study used all five instruments to measure the control variables and did not report the changes of control variables postintervention.

practice improved significantly more on the sleep-quality measure associated most strongly with distress. The authors concluded that MBSR appeared to be a promising intervention to improve the quality of sleep in women with breast cancer whose sleep complaints were a result of stress.

Tacon et al. (2004) investigated the effectiveness of an MBSR program on stress, state anxiety, mental adjustment to cancer, and health locus of control in 27 women with breast cancer. The intervention consisted of MBSR for one and a half hours a week for eight weeks. The dependent variables were stress, anxiety, mental adjustment to cancer, and health locus of control. The instruments included a single item asking participants to rate their current level of stress, the State-Trait Anxiety Inventory (STAI) (Spielberger, 1983) to measure anxiety, the Mental Adjustment to Cancer Scale (MAC) (Watson, Clark, & Tellegen, 1988) to assess psychological adjustment to cancer, and the Multidimensional Health Locus of Control Scales (MHLC) (Wallston, Wallston, & DeVellis, 1978) to measure locus of control in health. Findings indicated significant decreases in pre- to post-MBSR stress and state anxiety levels. Results also showed significant and beneficial changes for mental adjustment to cancer and health locus of control scores following completion of the MBSR intervention. The study provided initial support for the application of mindfulness-based stress interventions to individuals struggling with the stress and threat of cancer.

Tacon et al. (2005) investigated the effects of an MBSR program on state anxiety, differences in coping tendencies, and mental adjustment to cancer in 30 women with breast cancer. The intervention consisted of MBSR for one and a half hours a week for eight weeks in addition to home meditation practice. The instruments included the STAI, the Problem-Focused Styles of Coping (PF-SOC) (Heppner, Cook, Wright, & Johnson, 1995) to measure differences in coping tendencies, and the MAC. Findings showed anxiety decreased significantly following the training ($p < 0.001$), as did reactive ($p < 0.001$) and suppressive ($p < 0.05$) coping. Of the four MAC subscales used in the study, helplessness and hopelessness and anxious preoccupation ($p < 0.01$) showed significant decreases ($p < 0.01$). The remaining two subscales, fighting spirit and fatalism, changed in a positive direction, but the changes were not significant.

Instruments

In all, 13 instruments were used to measure the psychological effect of mindfulness meditation on health in intervention studies with patients with cancer from 2000–2005. Table 2 provides details regarding the instruments. Findings of the studies according to the instruments used can be found in Table 3.

Discussion and Recommendations

Many instruments have been used in intervention studies to measure the psychological impact of mindfulness meditation in patients with cancer. This article summarizes the strengths and appropriate fit of selected instruments used in multiple studies. Often, the studies reported findings showing relationships in similar directions. For example, the SOSI was used to measure stress symptoms in four studies, all of which found significant decreases in stress symptoms following MBSR. These findings suggest that the SOSI may be a suitable instrument to measure the psychological impact of MBSR in future studies. The same is true of the

POMS. Brown and Ryan (2003) noted that baseline mindfulness scores in their patient sample were higher than in other chronic illness populations tested in previous studies. They suggested that patients with cancer, when faced with a life-threatening illness, often reconsidered the way in which they had been living their lives, and many chose to refocus their priorities on existential issues such as personal growth and mindful living.

For some instruments, data were insufficient and researchers could not conclude whether they are sufficiently strong or appropriate to use in future intervention studies because the instruments (e.g., MAAS, MHLC, PF-SOC) were used for the first time in intervention studies of mindfulness meditation. More research studies are needed to further test the instruments in studies of MBSR and establish validity and reliability in the oncology population.

Limitations in the reviewed research studies indicate the need for special caution in synthesizing information from instruments used to measure the effect of mindfulness meditation on health in patients with cancer and drawing conclusions for future research. The first limitation is that little research exists in this area. To enhance knowledge of mindfulness meditation, more intervention research studies of the technique in patients with cancer and examination of specific instruments are needed. The second limitation is the weak research designs prevalent in the literature. Most studies used a one-group pre- and post-test design. Only two studies employed a randomized, controlled design. For future research, randomized, controlled studies that include FC groups as well as a routine care group across multiple settings are needed.

Based on the present review, however, certain recommendations can be made. In future intervention studies examining MBSR, the instruments used to measure the psychological impact should be used in parallel with a daily diary to describe the participants' psychological changes. A daily diary is an instrument that can reflect details of individuals' psychological changes as perceived by individuals themselves. Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) investigated using self-report assessment methods, including a daily diary, to explore facets of mindfulness in undergraduate psychology students and concluded that such methods have good psychometric properties and that exploration of the facets of mindfulness may be useful in understanding the nature of the construct and its relationships with other variables. Baer, Smith, and Allen (2004) also examined assessment of mindfulness by self-report using the Kentucky Inventory of Mindfulness Skills and reported that it may be a useful tool for researchers and clinicians working with mindfulness and its applications. Although the approaches have not been used in oncology samples, the results show that future research studies may identify more appropriate instruments to measure the psychological impact of mindfulness meditation.

Although this is a review of limited literature, findings offer guidance to researchers planning studies to evaluate the impact of mindfulness meditation in the cancer population. Future research is needed in this area to support interventions to enhance well-being in cancer survivors.

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