Holistic Adjunctive Approaches to Breast Cancer Care: Effects on Morbidity and Mortality — A Focus on Metastatic Disease

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Abstract

Do you know someone who is living with breast cancer? Did you know that holistic approaches can support well-being, reduce complications, and improve overall outcomes in individuals living with breast cancer, including those with metastatic disease? Given the limited research on metastatic breast cancer, this paper highlights emerging evidence on how exercise, nutrition, mindfulness, and artistic expression may impact morbidity and mortality in this population. Searching Google Scholar and PubMed databases from 2022-2026, a review of literature was conducted. Findings indicate that holistic adjunctive approaches are associated with improved morbidity and mortality outcomes in breast cancer, including metastatic disease, through the regulation of the inflammatory response. Overall, research supports that holistic approaches are effective strategies to improve quality of life and clinical outcomes in breast cancer, helping individuals live better and potentially longer, with emerging evidence in metastatic disease.

Introduction

Breast cancer is the most commonly diagnosed cancer among women worldwide and remains a leading cause of cancer-related death. Most breast cancer deaths occur when the disease progresses to metastatic breast cancer (MBC), which develops when cancer spreads from the breast to distant organs such as the lymph nodes, bones, lungs, liver, skin, and brain[1,2]. Breast cancer is classified in stages ranging from stage 0 (asymptomatic) to stage IV (terminal, with continuous progressive deterioration). Stage III and IV are considered advanced-stage cancer by the American Cancer Society[3]. Holistic adjunctive approaches to cancer care are increasingly recognized as important components of cancer prevention and overall survival. Evidence suggests that engaging in healthy behaviors such as regular exercise, balanced nutrition, and overall wellness may help reduce cancer risk, improve tolerance to treatment, and support long-term survivorship[4]. While a robust body of research supports these approaches in early-stage cancers, metastatic disease accounts for approximately 90% of all cancer-related deaths. Despite some progress in funding, investment in MBC research remains disproportionately low. From 2000–2013, only 7% of breast cancer research funding was devoted to MBC, increasing to 13% between 2014–2020, still far below the level needed to address the disease responsible for the majority of breast cancer deaths[5]. The literature highlights four key holistic interventions in cancer care: exercise, nutrition, mindfulness, and artistic expression.

Materials and Methods

A review of the literature was conducted using search of Google Scholar and PubMed databases from 2022-2026.

Results

Exercise

Exercise has emerged as a key adjunctive intervention in metastatic breast cancer care, with growing evidence demonstrating its ability to improve quality of life while also exerting measurable biological effects on inflammation and disease progression. In patients with metastatic breast cancer, structured physical activity plays an important role in mitigating treatment-related side effects and enhancing overall quality of life (QOL). A systematic review and meta-analysis of clinical trials found that aerobic and strength training programs improve muscle mass, reduce fatigue and dyspnea, and enhance QOL in advanced-stage cancer patients. Conventional therapies used to treat metastatic cancers such as surgery, chemotherapy, and radiation cause fatigue, diarrhea, hypertension, alopecia, weight loss that leads to a decrease in muscle mass, and, overall, a significantly decreased QOL.. In a healthy population, physical exercise used as preventative therapy increases muscle mass, reduces fat, improves physical appearance and vitality, and facilitates socialization and produces relaxing effects. Thus, emphasizing the importance of exercise as adjuvant therapy for patients with cancer. Evidence supports decreased stress, anxiety and depression, pain, fatigue, dyspnea, and insomnia. In addition to enhanced physical function, improvements were seen in mental fatigue, gait, sleep quality and patient autonomy. Research on the positive impact of physical exercise, including yoga and electrostimulation training, on advanced-stage cancer has influenced multidisciplinary teams in hospitals to include regular exercise as part of comprehensive patient care[3].

Another systematic review reported that exercise interventions improve physical function and QOL in individuals with bone metastases and are safe when supervised[6]. Further supporting these findings, a large multinational randomized controlled trial involving patients with metastatic breast cancer demonstrated that supervised aerobic and resistance exercise significantly improved fatigue, dyspnea, and health-related QOL compared with standard care[1]. The most common site for distant metastases in breast cancer is in the bones. Osteoporosis from treatment with aromatase inhibitors increases the risk of fractures and spinal cord compression. However, a supervised exercise program with appropriate adaptations showed that exercise is safe for patients with advanced cancer. Side effects from cancer treatments can also negatively affect QOL. As most literature is based on early-stage cancers, results may not be directly applicable to advanced cancer populations given differences in disease, treatment, and increased risk of disease progression[1].

A randomized control trial (PREFERABLE-EFFECT) assessed the effects of exercise on fatigue and QOL in patients with metastatic breast cancer. The multinational study was primarily developed to evaluate the impact of a structured and individualized exercise intervention on fatigue and health related quality of life (HRQOL) over a nine-month period. Improvements in both fatigue

and HRQOL were seen at 6 months and maintained throughout the study. Secondary outcomes of the study reported significantly better HRQOL in the exercise group at 3 months. These outcomes included physical functioning, dyspnea, pain, cognitive functioning, insomnia, and social functioning as seen in figure 1.

Despite prevailing uncertainty among health care professionals regarding people with MBC engaging in exercise, a supervised exercise program like EFFECT is beneficial, well tolerated, and safe for individuals with MBC and stable bone metastases. The additional positive effects on pain and dyspnea suggest that exercise may be used as a supportive treatment. While fatigue and pain were mentioned as a deterrent to start or continue exercising, with some people believing that exercise could worsen their symptoms, the evidence indicated that physically active cancer survivors were found to have less pain compared to those who have low activity levels. Educating patients on current research could help in understanding the benefits of exercise while minimizing the fears that diminish motivation. These evidence-based results indicate that a supervised aerobic and resistance exercise program for patients with MBC is recommended as an integral part of supportive care[7].

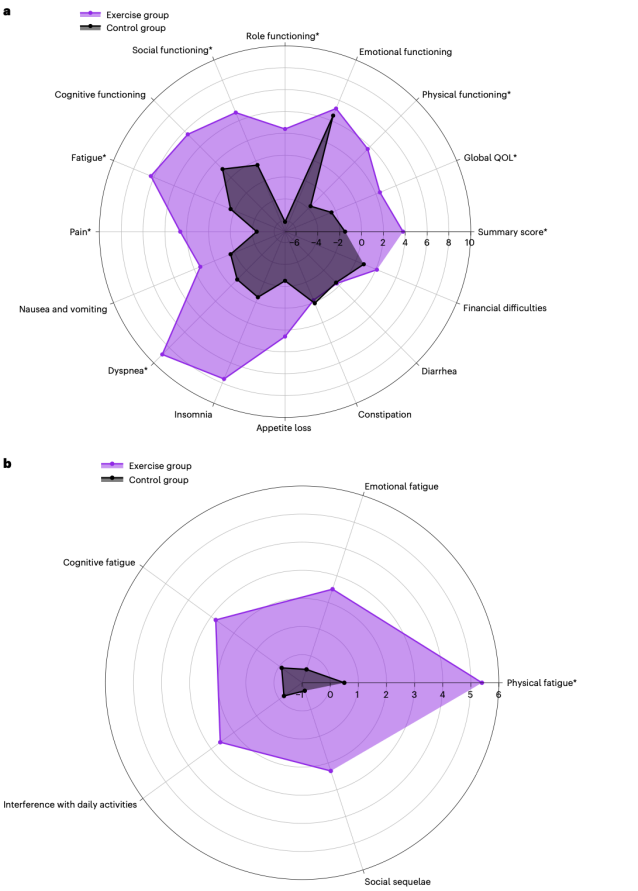


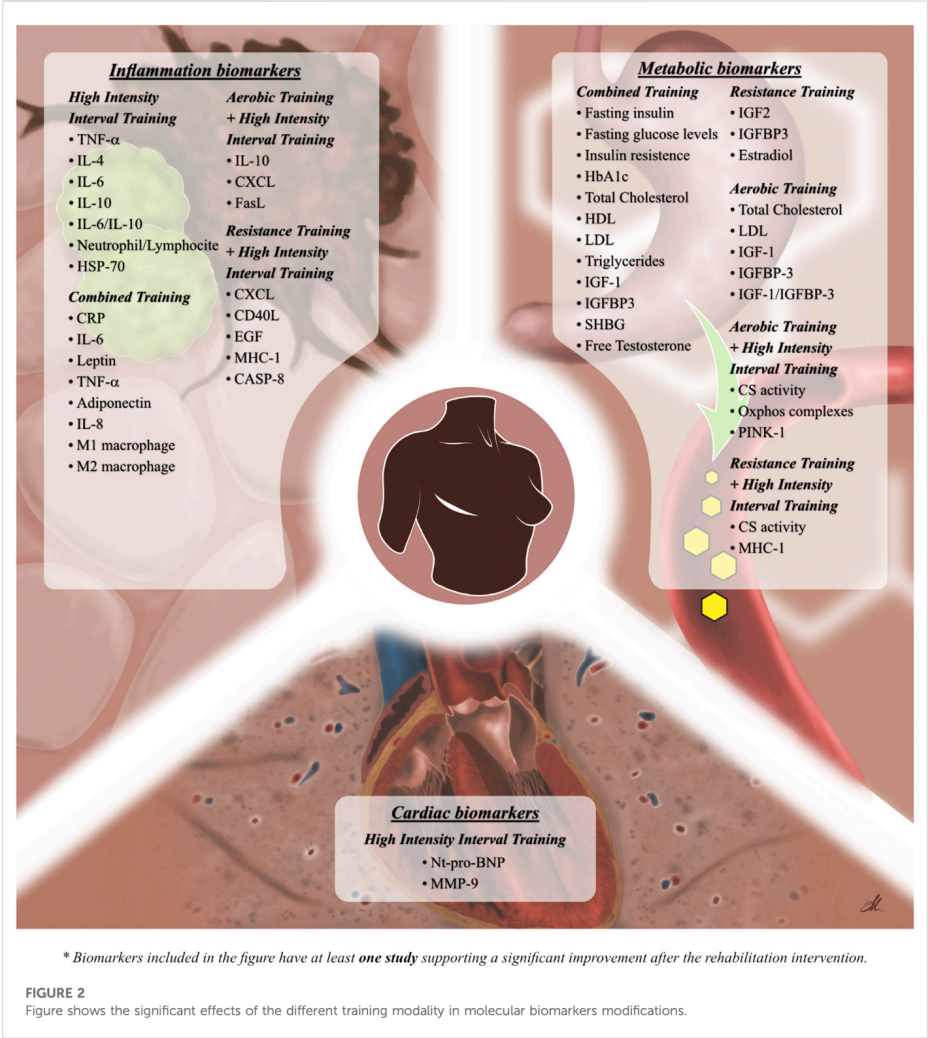
Fig. 3 | Radar plots demonstrating changes from baseline to 6 months post baseline in quality of life and fatigue scores for participants randomized to the exercise or control groups. A radar plot for all quality of life outcomes (**a**) and a radar plot for all fatigue dimensions (**b**). It should be noted that the scale of all quality of life symptom outcomes and fatigue outcomes were inverted to facilitate interpretability. An increase from baseline to 6 months post baseline now indicates an improvement for all outcomes. Asterisk, statistically significant BGD.

Figure 1[7]

Emerging evidence suggests that exercise may exert direct biological effects on cancer progression. A recent study found that a single session of resistance or high-intensity interval training increased anti-cancer myokines and suppressed breast cancer cell growth in vitro, highlighting its potential as a non-pharmacological strategy[8].

Consistent findings from systematic reviews and meta-analyses of randomized controlled trials demonstrate that physical activity significantly reduces key inflammatory biomarkers.(reference papers for this statement). Although many cytokines have been studied, changes in interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), and C-reactive protein (CRP) have been most consistently altered, with several studies reporting statistically significant improvements[9,10,11]. These biomarkers, illustrated in Figure 2, play a central role in systemic inflammation and cancer progression.

Collectively, this evidence suggests that exercise may improve clinical outcomes and potentially reduce breast cancer recurrence and mortality through modulation of inflammatory and metabolic pathways[10,11]. Overall, exercise not only improves physical function and quality of life in patients with metastatic breast cancer, but also targets key inflammatory biomarkers such as IL-6, TNF-α, and CRP, supporting its potential role in reducing disease progression, recurrence, and mortality[10,11].



** Biomarkers included in the figure have at least **one study** supporting a significant improvement after the rehabilitation intervention.*

FIGURE 2
Figure shows the significant effects of the different training modality in molecular biomarkers modifications.

Figure 2[11]

Diet

Dietary patterns also play a pivotal role in breast cancer outcomes by modulating inflammatory pathways, particularly pro-inflammatory cytokines such as IL-6 and TNF-α, as well as metabolic and hormonal processes that collectively influence disease progression, recurrence, and mortality[12]. Diet plays a critical role in cancer progression, prognosis, and survivorship, with growing evidence demonstrating its ability to influence inflammatory and metabolic pathways that impact morbidity and mortality. A systematic review and meta-analysis examined the association between dietary patterns and cancer prognosis. Evidence showed that adherence to a Mediterranean diet, often combined with exercise, enhanced overall QOL. A higher-quality diet demonstrated a 23% reduction in overall mortality of breast cancer survivors in a meta-analysis using a random-effects model[12]. The Mediterranean diet is a dietary pattern that emphasizes high consumption of fruits, vegetables, whole grains, nuts, and olive oil, with moderate intake of fish and dairy and limited consumption of red meat, saturated fats, and added sugars[13].

Dietary interventions, often combined with exercise, provide multiple benefits for individuals living with cancer. Increased body fatness is a predictor of adverse outcomes in patients with breast cancer. Better survival is associated with consumption of foods containing fiber, soy, and lower total and saturated fat intake. A specific scale for breast cancer, FACT-B, showed significant improvement in QOL after 6 months following a plan of individualized exercise and low-calorie diet program. A 2-week intervention in breast cancer patients including physical exercise, dietary instruction, and a 1200 kcal/day calorie restriction reported increased QOL. A 'fatigue reduction diet' (diet high in fruit, vegetables, whole grains, and omega-3 fatty acids) investigated in a 3-month randomized pilot trial revealed improved fatigue and quality of sleep[12].

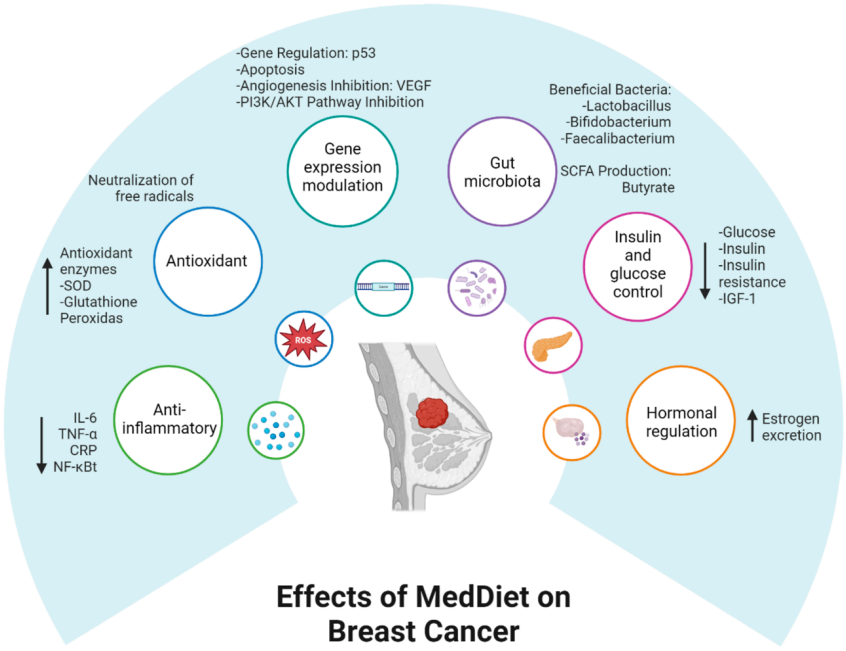
Evidence indicates that pro-inflammatory dietary patterns, characterized by higher intake of processed meats, refined sugars, and soft drinks, are associated with poorer prognosis, including a higher combined risk of mortality, recurrence, and metastasis, whereas anti-inflammatory diets, such as the Mediterranean diet, are linked to lower overall mortality and improved quality of life among cancer survivors. For example, in the Women's Health Initiative (WHI) Dietary Modification clinical trial, participants followed a dietary intervention for 8.5 years with a median follow-up of 19.6 years[12]. Results indicated that a low-fat diet emphasizing greater intake of fruits, vegetables, and grains was linked to significantly lower overall mortality (15%) as well as reduced breast cancer–specific mortality (21%) in postmenopausal women[12]. Another study found that higher intake of red meat and alcohol was associated with increased breast cancer risk, whereas greater consumption of fruits and vegetables appeared to have a protective effect[13].

Multiple studies support the protective effects of the Mediterranean diet against breast cancer. Greater adherence to this dietary pattern has been associated with a reduced risk of breast cancer, and one randomized clinical trial found a 62% reduction in the likelihood of developing malignant breast cancer among women following a Mediterranean diet supplemented with extra-virgin olive oil[13].

The effects of the Mediterranean diet on breast cancer risk and progression are driven by several interconnected biological mechanisms, including the regulation of inflammation and oxidative stress, gene expression, gut microbiota, insulin signaling, and hormonal balance. One of the primary mechanisms involves its anti-inflammatory and antioxidant effects, as the diet is rich in monounsaturated fats and antioxidant compounds that help reduce cellular damage and limit cancer progression. In addition, the Mediterranean diet influences gene expression by regulating pathways involved in cell proliferation, apoptosis, and angiogenesis, potentially inhibiting tumor growth and metastasis. It also plays a significant role in shaping the gut microbiota, promoting a diverse and balanced microbial environment that may reduce inflammation and lower cancer risk. Furthermore, by emphasizing low glycemic index foods, this dietary pattern supports insulin and glucose regulation, thereby reducing signals that promote cancer cell growth. Finally, the Mediterranean diet may contribute to hormonal regulation, particularly by lowering circulating estrogen levels, a key factor in breast cancer development. Together, these mechanisms suggest that the Mediterranean diet may play a meaningful role in the prevention and management of breast cancer[13].

Breast cancer contributes significantly to both morbidity and mortality in women worldwide, particularly as the disease progresses. In addition to the physical and psychological burden associated with both the disease and its treatment, these factors can negatively impact quality of life and treatment adherence. However, adherence to a Mediterranean dietary pattern has been linked to improved outcomes, including better overall health, enhanced quality of life, and improved prognosis. Importantly, evidence from prospective studies suggests an inverse relationship between adherence to this diet and breast cancer mortality, indicating that higher adherence may be associated with a lower risk of death. For example, a large Greek cohort study reported that even a modest increase in adherence to the Mediterranean diet was associated with a 25% reduction in overall mortality. Taken together, these findings suggest that the Mediterranean diet may play a supportive role in improving both morbidity and mortality outcomes in women with breast cancer[13].

A randomized controlled trial examining a whole-food, plant-based dietary intervention in women with metastatic breast cancer demonstrated significant improvements in several metabolic and hormonal risk factors associated with disease progression. Participants in the intervention group experienced meaningful weight loss, along with reductions in fasting insulin levels, insulin resistance, and cholesterol markers. Additionally, improvements were observed in cardiometabolic health indicators, suggesting that dietary changes may help address treatment-related weight gain and associated risks. While no significant differences were found in short-term cancer progression markers, the intervention was well tolerated and showed clinically relevant benefits in factors known to influence long-term outcomes. These findings highlight the potential role of dietary interventions as a supportive strategy in the management of metastatic breast cancer. Taken together, the evidence suggests that dietary patterns not only improve breast cancer outcomes but also influence key inflammatory and metabolic pathways[14]. Anti-inflammatory diets, particularly the Mediterranean diet, appear to downregulate pro-inflammatory cytokines such as IL-6 and TNF-α while supporting metabolic and hormonal regulation, thereby contributing to reduced disease progression, recurrence, and mortality.



Abbreviations: IL-6 - Interleukin-6; TNF-α - Tumor Necrosis Factor-alpha; CRP - C-Reactive Protein; NF-κB - Nuclear Factor Kappa B; SOD - Superoxide Dismutase; ROS - Reactive Oxygen Species; p53 - Tumor Protein p53; VEGF - Vascular Endothelial Growth Factor; PI3K/AKT - Phosphoinositide 3-Kinase/Protein Kinase B pathway; SCFA - Short-Chain Fatty Acids; IGF-1 - Insulin-like Growth Factor 1.
Source: Created with BioRender.com by the authors.

Figure 3[13]

Mindfulness

Chronic psychological stress plays a significant role in cancer progression by influencing both psychosocial well-being and underlying biological pathways. In patients with cancer, elevated stress and depression are associated with dysregulation of inflammatory processes, including increased levels of cytokines such as IL-6 and TNF-α, which have been linked to poorer prognosis and increased mortality. Beyond its biological effects, chronic stress has important clinical and psychosocial implications for patients with cancer. Patients with cancer not only experience physical symptoms related to tumor burden and treatment toxicities but also have higher rates of comorbid psychological conditions compared to individuals without cancer.

Depression and anxiety are among the most common psychological conditions affecting individuals with cancer, with research indicating that approximately 75% of patients experience these disorders and 50% to 85% report both simultaneously. These conditions are often underrecognized despite their significant impact, as they can interfere with treatment adherence, reduce survival rates, and increase the overall cost of care. Additionally, individuals with depression face a 40% to 60% higher risk of early mortality compared to the general population[15].

Depression occurs at significantly higher rates among patients with cancer, estimated to be up to four times more common than in individuals without cancer. Despite this high prevalence, many cases remain undiagnosed. This is particularly concerning, as depression has been associated with increased mortality and poorer overall prognosis in this population[16].

Evidence from meta-analyses and randomized controlled trials indicates that both psychological stress and underlying biological processes contribute to depressive symptoms in this population. In particular, depression has been linked to dysregulation of inflammatory pathways, including elevated levels of cytokines such as interleukin-6 (IL-6) and tumor necrosis factor–alpha (TNF-α), as well as alterations in stress-related hormonal pathways involving cortisol, as seen in figure 4. Importantly, these inflammatory mediators are involved across all stages of cancer development, from initial tumor formation to progression and metastasis. These interconnected mechanisms suggest that depression may influence not only quality of life but also overall disease outcomes[16].

Chronic psychological stress has been identified as a significant contributor to cancer development and progression through its effects on inflammation and immune function. Activation of the hypothalamic–pituitary–adrenal (HPA) axis and sympathetic nervous system leads to increased levels of cortisol and catecholamines, which disrupt immune surveillance and promote an immunosuppressive environment. At the same time, chronic stress induces sustained low-grade inflammation through elevated production of proinflammatory cytokines. This inflammatory state plays a critical role in tumor growth, angiogenesis, and metastasis. In addition, stress-related signaling has been shown to further promote tumor invasion and metastasis by facilitating tissue remodeling and new blood vessel formation, ultimately contributing to increased cancer morbidity and mortality[17].

Chronic stress not only contributes to cancer development but has also been linked to increased recurrence, poorer prognosis, and decreased survival. It may also negatively influence treatment outcomes by altering immune function and promoting a persistent inflammatory state within the tumor environment. Importantly, growing evidence suggests that interventions such as mindfulness and regular physical activity may help mitigate these effects by reducing stress hormone levels, lowering inflammation, and supporting immune response[18].

Mindfulness, originating from Buddhist traditions, is commonly defined as a nonjudgmental awareness of the present moment, with attention directed toward thoughts, bodily sensations, and the breath. This approach allows individuals to observe internal experiences with reduced reactivity, fostering acceptance and improved psychological well-being[16].

Together, these findings suggest that mindfulness-based interventions targeting psychological stress may not only improve quality of life but also modulate inflammatory pathways implicated in cancer progression, supporting a role in reducing recurrence and mortality[18].

Mindfulness-based interventions (MBIs) are increasingly recognized as potential approaches for managing cancer-related distress and affective symptoms. Existing research suggests that MBIs can help reduce depressive symptoms, lessen fatigue, and improve overall quality of life in patients with cancer, although their relationship with survival outcomes has not been clearly defined. Considering the association between depression and reduced survival in this population, it is plausible that interventions targeting depression may also have a positive impact on survival[16]. MBI's, including mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT), have been widely studied for their effects on psychological well-being. MBSR emphasizes structured mindfulness practices, while MBCT incorporates cognitive strategies to reduce rumination and negative thought patterns. Collectively, findings from meta-analyses and randomized controlled trials indicate that these interventions are associated with significant reductions in stress, anxiety, depression, and rumination, along with improvements in overall quality of life and well-being. In one randomized controlled trial, both MBCT and loving-kindness meditation (LKM) demonstrated greater reductions in depression and rumination compared to controls across multiple time points, along with sustained improvements in self-acceptance and quality of life[16]. Further support comes from a systematic review and meta-analysis of 18 randomized controlled trials, which found that mindfulness-based interventions significantly improve quality of life and reduce depression, anxiety, pain, and fatigue in patients with cancer. Importantly, significant improvements were observed across all measured outcomes[19].

Overall, the evidence suggests that mindfulness-based interventions may improve breast cancer outcomes by reducing psychological stress and downregulating pro-inflammatory mediators such as IL-6 and TNF-α, while restoring neuroendocrine and immune balance, thereby contributing to decreased disease progression, recurrence, and mortality.

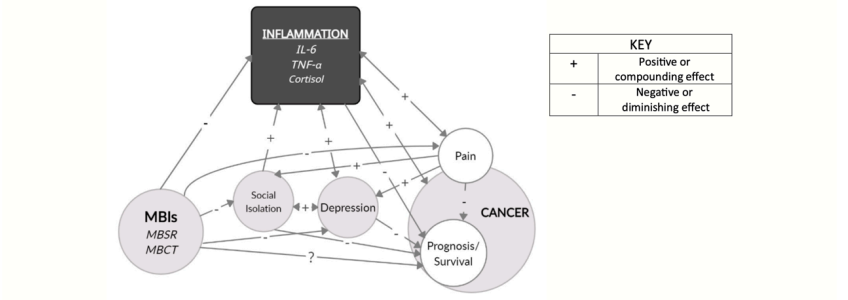


FIGURE 1. Mindfulness, inflammation and cancer prognosis. This conceptual framework illustrates the many relationships that suggest a possible correlation between mindfulness and cancer survival. IL-6 indicates interleukin-6; MBCT, mindfulness-based cognitive therapy; MBI, mindfulness-based intervention; MBSR, mindfulness-based stress reduction; TNF-α, tumor necrosis factor α.

Figure 4[16]

Art and Music Therapy

Artistic expression, including music and art therapy, plays a meaningful role in cancer care by addressing psychological distress and emotional burden, both of which significantly impact quality of life, treatment adherence, and overall disease outcomes.By using music as a therapeutic tool, this intervention supports both emotional and physical well-being, helping to ease distress, promote relaxation, and improve overall health. These benefits have been observed in patients with long-term and advanced cancer, including those receiving palliative care. Music influences both the mind and body, making it a valuable tool for supporting individuals with anxiety and depression. It triggers the release of brain chemicals, such as endorphins, that can elevate mood, increase energy and confidence, and help lessen pain, stress, and emotional distress. Through these effects, music therapy plays an important role in improving overall well-being and can benefit cancer patients throughout the course of their treatment.

A meta-analysis evaluating music therapy in cancer patients found it to be more effective than conventional approaches in reducing symptoms of depression and anxiety. Evidence suggests that participating in music therapy for one to two months can lead to meaningful improvements in mental health and overall quality of life. Additional findings indicate that music therapy can reduce negative emotional states such as low mood, despair, and hopelessness, supporting its role as a valuable complementary treatment in cancer care[15].

Music therapy has been shown to help reduce emotional distress by improving mood, easing anxiety, and providing distraction from the burden of illness and treatment[15]. It may also help lessen treatment-related side effects, including pain and certain chemotherapy-related complications[15]. Overall, music therapy is considered an effective complementary approach for improving psychological well-being in women with breast cancer. As previously discussed, a substantial portion of cancer-related mortality has been linked to untreated depression and anxiety, highlighting the critical role of psychological health in patient outcomes. Music therapy has been identified as an effective intervention for addressing these conditions, helping to reduce depressive symptoms and anxiety commonly experienced by individuals with breast cancer.

A meta-analysis examining music therapy in breast cancer patients found significant reductions in anxiety, depression, and pain, along with improvements in overall quality of life. As a noninvasive, multidisciplinary intervention, music therapy works by engaging both emotional and physiological pathways, helping regulate stress responses such as heart rate, blood pressure, and respiration. By influencing cognitive and emotional processing, it can alter the perception of pain and reduce psychological distress. These findings highlight the role of music therapy as an effective supportive intervention for improving psychological well-being and quality of life in breast cancer patients[20].

Cancer patients often struggle with fears about physical changes, social judgment, and mortality, which can negatively affect their mental health. Music-based approaches may help patients better manage the emotional strain of treatment by influencing brain activity tied to stress and emotional regulation. Even short periods of listening to music can improve physiological balance, reflected in nervous system responses. These interventions may also ease common side effects of treatment, such as pain, fatigue, nausea, and stress, helping patients feel more physically and emotionally at ease[21].

A retrospective study evaluated the impact of music therapy on patients with end-stage cancer, who often experience significant physical and psychological distress. Patients who received music therapy in addition to standard care showed significantly lower anxiety and depression scores compared to those receiving conventional care alone. Music therapy appears to work by influencing emotional and neurological pathways, including brain regions involved in stress and emotion regulation, while also affecting the autonomic nervous system. These changes can reduce psychological distress, improve sleep quality, and enhance immune function. Overall, the findings suggested that music therapy is an effective, low-risk intervention that improves emotional well-being and quality of life in patients with end-stage cancer[22]. Given its ability to improve psychological well-being without added risk and with minimal cost burden, incorporating music therapy into treatment may not only enhance quality of life but also contribute to reducing cancer-related mortality[15].

In addition to music therapy, art therapy represents another form of artistic expression that can help address the psychological and emotional challenges associated with cancer. A multiple case study explored how art therapy supports terminal cancer patients and their families as they face end-of-life challenges. The findings suggest that art therapy helps patients cope with the reality of death by reducing anxiety and existential distress while improving self-expression, connection, and overall quality of life. Through creative expression, patients and their families are able to communicate complex emotions, preserve personal identity, and strengthen relationships. Artwork also serves as a meaningful way to create lasting memories and maintain emotional bonds during the dying process. Family art therapy was also shown to shift perspectives on end-of-life, allowing patients and their families to view it not only as a crisis but as an opportunity for meaning, growth, and connection. Over time, participants became more comfortable expressing emotions, developed more open communication, and demonstrated increased emotional resilience. Artistic expression acted as a bridge for communication, enabling individuals to share feelings that might otherwise remain unspoken. Additionally, art therapy strengthened family cohesion and helped maintain supportive relationships despite the challenges of illness. It encouraged shared experiences, emotional healing, and stability within family dynamics. Overall, the study highlights art therapy as a valuable tool for fostering meaning, improving communication, and enhancing emotional well-being for both terminal cancer patients and their families[23].

Art therapy serves as an important component of supportive and palliative cancer care by addressing physical, emotional, and psychosocial needs throughout the illness. It helps reduce treatment-related side effects, enhances coping, and improves overall quality of life. By promoting emotional expression and communication, art therapy strengthens connections

between patients, families, and caregivers, ultimately supporting well-being and holistic care in advanced cancer stages[24].

Women living with cancer often report a lack of support after treatment and face challenges in rebuilding their identity. Art-based interventions provide a space for reflection and self-expression, allowing patients to process their experiences and navigate personal transformation. Through creative engagement, individuals gain insight into their illness, develop confidence, and reconstruct a more positive sense of self. These interventions support emotional expression, foster new perspectives, and promote long-term coping, ultimately helping patients adapt to life after cancer and improve overall well-being[25]. Overall, the evidence suggests that artistic expression through music and art therapy can improve psychological well-being and quality of life in individuals with breast cancer, helping to reduce anxiety, depression, and emotional distress, which are known to negatively influence treatment adherence, disease progression, and mortality.

Discussion

Taken together, the evidence presented highlights that holistic adjunctive approaches, including exercise, nutrition, mindfulness, and artistic expression, play a significant role in improving outcomes for individuals with breast cancer by targeting both psychological and biological pathways. Across these interventions, a central unifying mechanism is the modulation of inflammation, particularly through the regulation of the pro-inflammatory state induced by cancer disease (such as cytokines IL-6 and TNF-α). Exercise and dietary interventions demonstrate clear direct effects on these inflammatory biomarkers, while mindfulness-based interventions influence these pathways through both physiological regulation of stress responses and reductions in psychological distress. Although music and art therapy are not classified as mindfulness-based interventions, their demonstrated effects on stress reduction and emotional regulation suggest that they may influence similar pathways, potentially contributing to downstream effects on inflammation and disease outcomes. While much of the existing research has been conducted in early-stage cancer populations, the emerging evidence in metastatic breast cancer is promising and highlights the need for further investigation. Collectively, these findings support the integration of holistic, multidisciplinary approaches into standard cancer care as a means of improving both morbidity and mortality in patients with breast cancer.

Future research should focus on large-scale randomized controlled trials to further evaluate the long-term effects of lifestyle interventions on inflammatory biomarkers and clinical outcomes, particularly in metastatic breast cancer populations. In addition, efforts should focus on applying these findings into clinical practice through patient and provider education supported by evidence-based practice. Evidence-based holistic interventions can be implemented into practice through community-based programs. Determined Disruptors was founded by a young caregiver supporting a mother with metastatic breast cancer, with the goal of improving physical and emotional well-being through shared activities. Determined Disruptors is a nonprofit organization that supports the physical, emotional, and spiritual well-being of women

living with breast cancer through funded, shared activities designed to promote engagement and connection. These interventions, including physical activity, creative expression, and mindfulness-based practices, which are implemented in accessible group-centered settings that encourage both participation and emotional resilience. Programs such as these demonstrate how holistic approaches can support both psychological and physiological well-being. Increasing awareness and accessibility of these interventions may contribute to improved quality of life and overall outcomes for individuals living with breast cancer.

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