

# Exercise and Mindfulness-Based-Stress-Reduction: A Multidimensional Approach Towards Cancer Survivorship Care

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**Abstract:** Cancer survivors often experience a variety of physiological deficits resulting from cancer treatment such as reduced muscle strength, decreased range of motion and poor balance. Cancer survivors also commonly experience psychosocial side effects, such as anxiety, depression and fear of recurrence. Overall, it is common for cancer survivors to report a decrease in physical and emotional wellbeing and overall quality of life. Research suggests that improvements in physical health can be achieved through moderate intensity exercise such as light resistance training and moderate aerobic exercise in this population. Mindfulness-Based-Stress-Reduction (MBSR) programming utilizes various mind/body techniques that can reduce state anxiety levels, distress and depression. While cancer survivors face numerous physiological and psychological challenges, exercise interventions focus on physical health, while MBSR interventions focus on psychosocial health. The American Medical Association (AMA) recommends a patient's care should include psychological, physiological, psychosocial and educational components, emphasizing the need for an integrated approach to cancer survivorship. Integrating exercise and MBSR interventions may serve to optimize the overall health and quality of life of a cancer survivor.

**Keywords:** Cancer, Survivorship, Exercise, Mindfulness-Based-Stress-Reduction, Quality of Life, Health.

People are surviving cancer at a much greater rate, which may be attributed to improved methods of detection, treatment and care. Unfortunately, cancer survivors will often experience a variety of physical and/or emotional treatment-related side effects and symptoms which may have a negative impact on their health and quality of life. Common physical impairments consist of fatigue, muscular weakness, weight gain, cardiopulmonary inefficiency, while emotional symptoms may include anxiety, stress and depression. Various interventions have been developed and studied in order to help cancer survivors overcome difficulties with either physical or emotional symptoms or impairments [1]. Exercise may improve a cancer survivor's physiological functioning, such as muscular strength, endurance, cardiovascular functions and pulmonary function, reducing the negative treatment-related side effects and maintaining and restoring health and fitness [2-5]. Emotionally, cancer survivors may benefit from participating in mindfulness-based meditation, such as Mindfulness-Based-Stress-Reduction (MBSR), which can significantly reduce state anxiety levels, distress and depression, as well as reduce the fear of recurrence [6-10]. The American Medical Association (AMA) states psychological, physiological, psychosocial and educational interventions must be a part of a patient's care [9]. Cancer survivors face numerous physiological and

psychological challenges. The primary focus of physical interventions is to restore and improve physical impairments, while the primary focus for psychosocial impairments is to alleviate mental health impairments. Currently, few approaches to survivorship care have considered a multidimensional rehabilitative program that incorporates both exercise and physical activity as well as mindfulness-based meditation [2-5]. Therefore, the purpose of the article is to put forth a rationale for integrating exercise and MBSR interventions for optimizing survivorship care.

## EXERCISE AND PHYSICAL ACTIVITY FOR SURVIVORSHIPS

Research suggests that physical exercise can provide both physical and mental benefits. However, the majority of cancer survivors do not participate in exercise due to their perception that it may cause fatigue as well as the perceived high cost of exercise. Furthermore, many cancer survivors believe that there is a lack of facilities providing exercise programs staffed by fitness professionals with the appropriate qualifications [11, 12]. Research on alternative therapies consisting of various forms of mindfulness meditation have resulted in reductions in stress, mood disturbances, depression, anxiety, as well as improvement in physical functioning, sleep, fatigue, energy, spirituality, positive mind states and overall quality of life [13].

Cancer survivors often experience a decrease in their emotional health, characterized by depression,

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anxiety, stress, loss of appetite, sleep disturbance, hopelessness, anxiety and poor adherence to treatment and overall suffering [14-16]. Cancer survivors may develop physical impairments, such as loss of muscle mass resulting in reduced strength, decreases in range of motion and lymphedema that limit the use of one's upper and lower extremities, as well as cause balance issues. These physical impairments may make it difficult to perform various activities of daily living [17].

It is estimated that 10-25% of all cancer survivors report being depressed, while 30-50% of cancer survivors report difficulty with sleeping [18, 19]. Thirty-five to forty-five percent of breast cancer survivors may experience depression [20]. Furthermore, about half of cancer survivors report experiencing levels of pain and anxiety; 20% of cancer survivors meet the criteria for anxiety disorder [21]. Many cancer survivors experience cognitive difficulties that include impaired memory and the inability to concentrate while performing tasks [21]. Cumulatively, this may result in difficulties performing work-related activities, participation in leisure and social activities with friends and family, and impact the ability to sustain meaningful relationships. As a result, many cancer survivors will experience negative health quality of life related outcomes during and after treatment [21].

Research suggests that cancer survivors experiencing depression and/or anxiety during treatment are less likely to adhere to their treatment. There is also a 27% higher mortality rate in those with depression and anxiety [20]. It is reported that depression and anxiety remain in as many as 24 % to 89% of cancer survivors. The anxiety and distress of cancer recurrence is a common phenomenon and involves fear, worry, and intrusive thoughts. This fear of recurrence is common and persistent regardless of the cancer diagnosis and has been linked to higher morbidity rates among breast cancer survivors. Sustained fear of recurrence may cause psychological distress, decreases in quality of life and an array of physical impairments [22].

For a variety of chronic illnesses, physical exercise, characterized by a combination of aerobic, strength, and flexibility, is an effective intervention to improve deficits in quality-of-life dimensions, particularly emotional and physical well-being [3, 23-26]. Courneya and Friedenreich [3] advanced the idea that exercise may address the broad range of quality of life issues following a cancer diagnosis, whether in treatment or

post treatment, by maintaining and/or improving their physical and emotional wellbeing and reducing treatment related side effects [2-5]. Research indicates that cancer survivors who participate in regular moderate exercise that includes aerobic activity and resistance training, may experience positive adjustments to their psychosocial well-being with improved body-image and self-concept, as well as a decrease in distress symptoms, which include fatigue, sleeping difficulties, nausea, depression, and anxiety [4].

While exercise can afford many physical and psychosocial benefits, exercise interventions alone may not effectively address the coping issues that many cancer survivors struggle with as a result of their cancer diagnoses. It is critical that cancer survivors learn to cope with the many emotional issues that accompany a cancer diagnoses; inappropriate coping mechanisms may be associated with impaired immune, cardiovascular and endocrine function [27, 28]. Therefore, a more integrated and multidimensional approach to survivorship care that considers not only exercise interventions, but other alternative mind/body interventions must be considered in order to address the array of physiological and psychological side effects of a cancer diagnoses, promoting increased quality of life.

## **MINDFULNESS-BASED MEDITATION FOR SURVIVORSHIP**

Mindfulness meditation may promote awareness on the present moment to reduce stress, promote relaxation and improve one's awareness in the present moment and/or connection to one's self, effectively improving the many emotional deficits experienced by cancer survivors [13]. Mindfulness meditation is a non-authoritarian and non-hierarchical perspective so that an individual may achieve a degree of clarity, understanding and wisdom (i.e. essential dharma), promoting a greater interconnectedness progressing towards a greater level of health and wellbeing [27]. Mindfulness meditation interventions aim to improve one's ability to focus on sounds and objects, breathing, movement, and visualizations as well as attention.

Meditation teaches one to focus on the present moment and not to ruminate about the past or worry about the future with the aim of reducing one's suffering [29]. Despite the variety of meditation techniques, there are common components such as equanimity, detachment, and clear sensory perception

[30]. Historically, there are two general approaches to meditation: concentrative meditation and mindfulness meditation [31]. Concentrative meditation teaches one to focus their senses on a specific point or object as they learn to create a singular point of attention by focusing on a mantra, sound, visual image or object; this is termed "one-pointedness" or "zoom lens attention" [32, 33]. The second general form is mindfulness meditation in which one learns to increase their awareness of events as they occur in a specific moment involving the whole perceptual field [34]. An individual practices and subsequently learns to be attentive to the entire field of awareness and to keep their awareness open [32]. Through mindfulness meditation, one learns to nonjudgmentally accept new events as they occur and remain open to the new experience as long as it is in the present moment [32]. Mindfulness meditation teaches one to become non-reactive and not judge or interpret the way in which unique events enter into one's awareness [34].

#### **MINDFULNESS-BASED-STRESS-REDUCTION**

Mindfulness-Based-Stress-Reduction (MBSR) is the most common mindfulness therapy. MBSR is a very specific and structured psychoeducational and skill-based therapy that incorporates mindfulness meditation with Hatha yoga, body scan, and discussions on stress and coping [32]. During MBSR, individuals are taught to focus their attention on a specific target, such as breathing, pleasant or unpleasant thoughts and body sensation. If the mind starts to wander to past thoughts, memories or fantasies, individuals are taught to refocus to their present target object, such as breathing [32].

Results from randomized controlled trials suggest that MBSR is effective for reducing stress, mood disturbances, depression, anxiety, perceived stress, as well as improving physical functioning, sleep, fatigue, energy, spirituality, meaning, positive mind states and overall quality of life [13]. Mindfulness-based meditation, such as MBSR, may significantly improve the quality of life for many and varied populations, such as individuals struggling with ulcerative colitis, fibromyalgia syndrome, asthma, Chronic mild traumatic brain injury/post concussive syndrome, and Posttraumatic stress disorder (PTSD) [35-39]. For individuals with chronic pain, MBSR may significantly decrease pain intensity and disability. In individuals with cardiovascular disease, MBSR may reduce depression, anxiety, and stress, as well as improve hypertension. In individuals with various mental

disorders, such as bipolar and schizophrenia, MBSR may improve depressive symptoms, depression relapses and anxiety, and also provide a significant increase in metacognitive awareness of negative thoughts and feelings [40].

Research investigating the use of mindfulness-based mediation interventions, such as MBSR, has produced favorable outcomes for cancer survivors as well. A randomized controlled trial conducted by Speca [8] evaluated a stress reduction program for individuals of various cancer types. The participants consisted of men and women with various cancer types, such as breast, colon, ovarian, prostate and non-Hodgkins. The intervention was composed of four primary components, which included (1) a group process focused on problem solving for impediments to practice mindfulness application to the day-to-day, (2) theoretical material related to relaxation, (3) education and the body-mind connection and (4) the experiential practice of meditation during the group and home-based practice. The group stress reduction program was developed by the authors, but was modeled after the work of Kabat-Zinn of the Stress Reduction and Relation Clinic at the Massachusetts Medical Center. Speca [8] found that this three-pronged approach to mindfulness mediation and stress reduction was effective in reducing stress, anxiety, anger and confusion, as well as improving vigor. Equally as important, those who participated in the intervention also displayed fewer cardiopulmonary and gastrointestinal symptoms as well as a reduction in emotional irritability and cognitive disorganization.

A second study conducted by Tacón [9] evaluated an 8 week MBSR program in women with cancer that required the participants to meet 1 time per week for 1.5 hours. The participants consisted of women with various cancer types who were receiving either chemotherapy, radiation therapy or recently underwent surgery. During the weekly meeting, participants were taught three basic mindfulness practices which included the body scan, sitting meditation and hatha yoga. The body scan consisted of a gradual sweeping of attention throughout the entire body, teaching the participants to non-critically focus on body regions while focusing on breath awareness and relaxation. The sitting meditation required the participants to mindfully focus on their breathing as well as practice an awareness of their thoughts in a non-judgmental manner while noting any distracting thoughts as they arose. Lastly, participants were involved in Hatha yoga through which they stretched and engaged in postural

positions that promoted strengthening and relaxation of the musculoskeletal system as well as heightened awareness of how their body moved in space. The post-test data revealed that the intervention group had a significant reduction in state anxiety levels, distress and depression suggesting that MBSR is an effective intervention for improving the emotional and cognitive health of cancer survivors [9].

Many cancer survivors struggle with the fear of their cancer recurring, causing physiological distress and various physical problems regardless of their risk of recurrence, cancer site, and years after treatment [41-49]. Fear of recurrence is a multidimensional phenomenon that includes anxiety, fear and a cognitive dimension such as worry and intrusive thoughts that preoccupy the cancer survivor [49, 50]. However, research indicates that cancer survivors who participate in MBSR interventions will experience a reduction in fear of recurrence, which may reduce perceived stress and anxiety [6, 7].

### **MINDFULNESS-BASED-STRESS-REDUCTION AND IMMUNE FUNCTIONING**

Overall, research supports the notion that cancer-related psychological distress may be aided by MBSR in that individuals may experience improvements in global distress, anxiety, depression and enjoy an improved quality of life [51]. The impact of mindfulness-based meditation may go beyond the documented improvements in psychosocial factors and potentially improve a cancer survivor's immune functioning. To this end, several studies have investigated the relationship between MBSR and the immune system with the results revealing a decrease in cortisol level downward trending t-cell production of pro-inflammatory cytokines, reductions in peripheral blood mononuclear NK cell activity (NKCA) and IFN- $\gamma$  production, as well as increased production of IL-4, IL-6 and IL-10 [28, 52].

A reduction in cortisol levels is critical as research suggests that elevated levels of cortisol were associated with a poorer prognosis in cancer patients [53, 54]. Additionally, downward trending levels of T-cell production of pro-inflammatory cytokines are important because pro-inflammatory cytokines have been associated with increased levels of stress, depression, and heart disease [55, 56]. Therefore, MBSR may not only help cancer survivors improve depressive symptoms, anxiety, stress, and quality of life, but MBSR may also provide benefits towards the

functioning of the immune system, which are critical for survivorship [53, 54].

### **MULTI-MODAL INTERVENTIONS FOR IMPROVED QUALITY OF LIFE IN CANCER SURVIVORS**

Cancer survivors often experience various physiological and psychosocial deficits, such as reduced muscle strength, decrease range of motion, anxiety, depression, and fear of recurrence as a result of cancer treatment. As such, many cancer survivors will report a decreased physical and emotional wellbeing and overall quality of life. Common approaches to rehabilitative interventions for cancer survivors often take a unidimensional approach in that a cancer survivor may either participate in an exercise intervention or a mind/body focused program such as MBSR. Exercise interventions are effective for improving many of the physiological deficits and MBSR may improve the emotional health and stress management capabilities of cancer survivors while possibly bolstering the immune system. Therefore, survivorship care for cancer survivors should employ an integrated multi-dimensional approach including an exercise intervention and mindfulness-based stress management techniques.

### **REFERENCES**

- [1] Scott D, Mills M, Black A, Cantwell M, Campbell A, Donnelly M, *et al.* Multidimensional rehabilitation programmes for adult cancer survivors. The Cochrane Database of Systematic Reviews 2013; 3CD007730.
- [2] Courneya K. Exercise interventions during cancer treatment: biopsychosocial outcomes. *Exer & Sport Sci Reviews* 2001; 29(2): 60-64.  
<http://dx.doi.org/10.1097/00003677-200104000-00004>
- [3] Courneya K, Friedenreich C. Physical exercise and quality of life following cancer diagnosis: A literature review. *Annals of Behav Med* 1999; 21(2): 171-179.  
<http://dx.doi.org/10.1007/BF02908298>
- [4] Schneider CM, Dennehy CA, Carter SD. Exercise and cancer recovery. Champaign IL: Human Kinetics; 2003.
- [5] Schwartz A, Mori M, Gao R, Nail L, King M. Exercise reduces daily fatigue in women with breast cancer receiving chemotherapy. *Med& Sci In Sports & Exer* 2001; 33(5): 718-723.  
<http://dx.doi.org/10.1097/00005768-200105000-00006>
- [6] Campbell T, Labelle L, Bacon S, Faris P, Carlson L. Impact of Mindfulness-Based Stress Reduction (MBSR) on attention, rumination and resting blood pressure in women with cancer: A waitlist-controlled study. *J of Behav Med* 2012; 35(3): 262-271.  
<http://dx.doi.org/10.1007/s10865-011-9357-1>
- [7] Lengacher C, Shelton M, Reich R, Barta M, Johnson-Mallard V, Kip K, *et al.* Mindfulness based stress reduction (MBSR(BC)) in breast cancer: evaluating fear of recurrence (FOR) as a mediator of psychological and physical symptoms in a randomized control trial (RCT). *J of Behav Med* 2014; 37(2): 185-195.  
<http://dx.doi.org/10.1007/s10865-012-9473-6>

- [8] Speca M, Carlson L, Goodey E, Angen M. A randomized, wait-list controlled clinical trial: the effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosomatic Med* 2000; 62(5): 613-622. <http://dx.doi.org/10.1097/00006842-200009000-00004>
- [9] Tacón A. Mindfulness Effects on Symptoms of Distress in Women with Cancer. *J of Cancer Pain & Symptom Palliation* 2006; 2(2): 17-22. [http://dx.doi.org/10.1300/J427v02n02\\_03](http://dx.doi.org/10.1300/J427v02n02_03)
- [10] Würtzen H, Dalton S, Elsass P, Sumbundu A, Steding-Jensen M, Johansen C, *et al.* Mindfulness significantly reduces self-reported levels of anxiety and depression: Results of a randomised controlled trial among 336 Danish women treated for stage I-III breast cancer. *Euro J of Cancer* 2013; 49:1365-1373. <http://dx.doi.org/10.1016/j.ejca.2012.10.030>
- [11] Blanchard C, Denniston M, Baker F, Ainsworth S, Courneya K, Kennedy J, *et al.* Do adults change their lifestyle behaviors after a cancer diagnosis? *Am J of Health Behav* 2003; 27(3): 246-256. <http://dx.doi.org/10.5993/AJHB.27.3.6>
- [12] Blanchard C, Courneya K, Stein K. Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *J of Clin Onc* 2008; 26(13): 2198-2204. <http://dx.doi.org/10.1200/JCO.2007.14.6217>
- [13] Labelle L, Campbell T, Faris P, Carlson L. Mediators of Mindfulness-Based Stress Reduction (MBSR): assessing the timing and sequence of change in cancer patients. *J of Clin Psy* 2015; (1): 21.
- [14] Davis C. Psychosocial needs of women with breast cancer: how can social workers make a difference? *Health & Social Work* 2004; 29(4): 330-334. <http://dx.doi.org/10.1093/hsw/29.4.330>
- [15] Mello S, Tan A, Armstrong K, Sanford Schwartz J, Hornik R. Anxiety and Depression Among Cancer Survivors: The Role of Engagement With Sources of Emotional Support Information. *Health Comm* 2013; 28(4): 389-396. <http://dx.doi.org/10.1080/10410236.2012.690329>
- [16] Glajchen M, Blum D, Calder K. Cancer pain management and the role of social work: barriers and interventions. *Health & Social Work* 1995; 20(3): 200-206.
- [17] Fialka-Moser V, Crevenna R, Korpan M, Quittan M. Cancer Rehabilitation. *Journal of Rehabilitation Medicine* 2003; 35(4): 153-162. <http://dx.doi.org/10.1080/165019703006129>
- [18] Pirl W, Roth A. Diagnosis and treatment of depression in cancer patients. *Oncology (Williston Park, N.Y.)* 1999; 13(9): 1293-1301.
- [19] Savard J, Morin C. Insomnia in the context of cancer: a review of a neglected problem. *J of Clin Onco* 2001; 19(3): 895-908.
- [20] Aguado Loi C, Baldwin J, McDermott R, McMillan S, Martinez Tyson D, VandeWeerd C, *et al.* Risk factors associated with increased depressive symptoms among Latinas diagnosed with breast cancer within 5 years of survivorship. *Psycho-Oncology* 2013; 22(12): 2779-2788. <http://dx.doi.org/10.1002/pon.3357>
- [21] Mustian K, Sprod L, Palesh O, Peppone L, Janelins M, Carroll J, *et al.* Exercise for the Management of Side Effects and Quality of Life Among Cancer Survivors. *Current Sports Med Reports (American College Of Sports Medicine)* 2009; 8(6): 325-330. <http://dx.doi.org/10.1249/JSR.0b013e3181c22324>
- [22] Lengacher C, Johnson-Mallard V, Barta M, Fitzgerald S, Moscoso M, Kip K, *et al.* Feasibility of a mindfulness-based stress reduction program for early-stage breast cancer survivors. *J of Holistic Nursing* 2011; 29(2): 107-117. <http://dx.doi.org/10.1177/0898010110385938>
- [23] Addy C, Wilson D, Kirtland K, Ainsworth B, Sharpe P, Kimsey D. Associations of perceived social and physical environmental supports with physical activity and walking behavior. *Am J of Pub Health* 2004; 94(3): 440-443. <http://dx.doi.org/10.2105/AJPH.94.3.440>
- [24] Gunnarsson O, Judge J. Exercise at midlife: how and why to prescribe it for sedentary patients. *Geriatrics* 1997; (5): 71.
- [25] Oweis P, Spinks W. Biopsychological, affective and cognitive responses to acute physical activity. *J Sports Med Phys Fitness* 2001; 41(4): 528.
- [26] Pate R, Pratt M, Blair S, Haskell W, Macera C, Wilmore J, *et al.* Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA, The J of The Am Med Assoc* 1995; (5): 402. <http://dx.doi.org/10.1001/jama.1995.03520290054029>
- [27] Kabat-Zinn J. Some reflections on the origins of MBSR, skillful means, and the trouble with maps. *Contemporary Buddhism* 2011; 12(1): 281-306. <http://dx.doi.org/10.1080/14639947.2011.564844>
- [28] Witek-Janusek L, Albuquerque K, Chroniak K, Chroniak C, Durazo-Arvizu R, Mathews H. Effect of mindfulness based stress reduction on immune function, quality of life and coping in women newly diagnosed with early stage breast cancer. *Brain Behav an Imm* 2008; 22:969-981.
- [29] Baer R. Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice* 2003; 10(2): 125-143. <http://dx.doi.org/10.1093/clipsy.bpg015>
- [30] Bonadonna R. Meditation's impact on chronic illness. *Holistic Nursing Practice* 2003; 17(6): 309-319. <http://dx.doi.org/10.1097/00004650-200311000-00006>
- [31] Brown D. A model for the levels of concentrative meditation. *Meditation: classic and contemporary perspectives* [monograph on the Internet]. Hawthorne, NY: Aldine Publ Co; 1984. p. 281-316.
- [32] Matchim Y, Armer J, Stewart B. Mindfulness-Based Stress Reduction Among Breast Cancer Survivors: A Literature Review and Discussion. *Oncology Nursing Forum* 2011; 38(2): E61-71. <http://dx.doi.org/10.1188/11.ONF.E61-E71>
- [33] Ott MJ. Mindfulness meditation: a path of transformation & healing. *J Psychosoc Nurs Ment Health Serv* 2004; 42(7): 22.
- [34] Valentine E, Sweet P. Meditation and attention: a comparison of the effects of concentrative and mindfulness meditation on sustained attention. *Mental Health, Religion & Culture* 1999; 2(1): 59. <http://dx.doi.org/10.1080/13674679908406332>
- [35] Azulay J, Smart C, Mott T, Cicerone K. A pilot study examining the effect of mindfulness-based stress reduction on symptoms of chronic mild traumatic brain injury/postconcussive syndrome. *The J of Head Trauma Rehab* 2013; (4): 323.
- [36] Jedel S, Merriman P, Hoffman A, Swanson B, Fogg L, Keshavarzian A. Relationship of mindfulness, quality of life, and psychiatric symptoms among patients with ulcerative colitis. *Mindfulness* 2013; 4(4): 296-300. <http://dx.doi.org/10.1007/s12671-012-0128-z>
- [37] Kearney D, McDermott K, Malte C, Martinez M, Simpson T. Association of participation in a mindfulness program with measures of PTSD, depression and quality of life in a veteran sample. *J of Clin Psy* 2012; (1): 101.
- [38] Lauche R, Cramer H, Dobos G, Langhorst J, Schmidt S. Review: A systematic review and meta-analysis of

- mindfulness-based stress reduction for the fibromyalgia syndrome. *J of Psychosomatic Research* 2013; 75500-510. <http://dx.doi.org/10.1016/j.jpsychores.2013.10.010>
- [39] Pbert L, Madison J, Druker S, Olendzki N, Magner R, Carmody J, *et al.* Effect of mindfulness training on asthma quality of life and lung function: a randomised controlled trial. *Thorax* 2012; 67(9): 769-776. <http://dx.doi.org/10.1136/thoraxjnl-2011-200253>
- [40] Gotink R, Chu P, Busschbach J, Benson H, Fricchione G, Hunink M. Standardised Mindfulness-Based Interventions in Healthcare: An Overview of Systematic Reviews and Meta-Analyses of RCTs. *Plos ONE* 2015; 10(4): 1-17. <http://dx.doi.org/10.1371/journal.pone.0124344>
- [41] Armes J, Crowe M, Colbourne L, Morgan H, Murrells T, Richardson A, *et al.* Patients' supportive care needs beyond the end of cancer treatment: a prospective, longitudinal survey. *J of Clin Onc* 2009; 27(36): 6172-6179. <http://dx.doi.org/10.1200/JCO.2009.22.5151>
- [42] Baker F, Denniston M, Smith T, West M. Adult cancer survivors: how are they faring? *Cancer* 2005; 104(11 Suppl): 2565-2576. <http://dx.doi.org/10.1002/cncr.21488>
- [43] Deimling G, Bowman K, Sterns S, Wagner L, Kahana B. Cancer-related health worries and psychological distress among older adult, long-term cancer survivors. *Psycho-Oncology* 2006; 15(4): 306-320. <http://dx.doi.org/10.1002/pon.955>
- [44] Hodges L, Humphris G. Fear of recurrence and psychological distress in head and neck cancer patients and their careers. *Psycho-Oncology* 2009; 18(8): 841-848. <http://dx.doi.org/10.1002/pon.1346>
- [45] Humphris G, Rogers S, McNally D, Lee-Jones C, Brown J, Vaughan D. Fear of recurrence and possible cases of anxiety and depression in orofacial cancer patients. *Intl J of Oral & Maxillofacial Surgery* 2003; 32486-491. <http://dx.doi.org/10.1054/ijom.2002.0399>
- [46] Llewellyn C, Weinman J, McGurk M, Humphris G. Can we predict which head and neck cancer survivors develop fears of recurrence? *J of Psychosomatic Research* 2008; 65(6): 525-532. <http://dx.doi.org/10.1016/j.jpsychores.2008.03.014>
- [47] Matthews B. Role and gender differences in cancer-related distress: a comparison of survivor and caregiver self-reports. *Oncology Nursing Forum* 2003; 30(3): 493-499. <http://dx.doi.org/10.1188/03.ONF.493-499>
- [48] Mehta S, Lubeck D, Pasta D, Litwin M. Clinical Urology: Original Articles: Fear Of Cancer Recurrence In Patients Undergoing Definitive Treatment For Prostate Cancer: Results From CaPSURE. *The J of Urology* 2003; 1701931-1933.
- [49] Simard S, Savard J, Ivers H. Fear of cancer recurrence: Specific profiles and nature of intrusive thoughts. *J of Cancer Survivorship* 2010; 4(4): 361-371. <http://dx.doi.org/10.1007/s11764-010-0136-8>
- [50] Lee-Jones C, Humphris G, Dixon R, Hatcher M. Fear of Cancer Recurrence — A Literature Review and Proposed Cognitive Formulation to Explain Exacerbation of Recurrence Fears. *Psycho-Oncology* 1997; 6(2): 95-105. [http://dx.doi.org/10.1002/\(SICI\)1099-1611\(199706\)6:2<95::AID-PON250>3.0.CO;2-B](http://dx.doi.org/10.1002/(SICI)1099-1611(199706)6:2<95::AID-PON250>3.0.CO;2-B)
- [51] Fish J, Ettridge K, Sharplin G, Hancock B, Knott V. Mindfulness-based Cancer Stress Management: impact of a mindfulness-based programme on psychological distress and quality of life. *Eur J of Cancer Care* 2014; 23(3): 413-421. <http://dx.doi.org/10.1111/ecc.12136>
- [52] Carlson L, Specia M, Faris P, Patel K. One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain Behav and Imm* 2007; 211038-1049.
- [53] Sephton S, Spiegel D. Circadian disruption in cancer: a neuroendocrine-immune pathway from stress to disease? *Brain Behav and Imm* 2003; 17(5): 321-328. [http://dx.doi.org/10.1016/S0889-1591\(03\)00078-3](http://dx.doi.org/10.1016/S0889-1591(03)00078-3)
- [54] Sephton S, Sapolsky R, Kraemer H, Spiegel D. Diurnal cortisol rhythm as a predictor of breast cancer survival. *Journal of The National Cancer Institute* 2000; 92(12): 994-1000. <http://dx.doi.org/10.1093/jnci/92.12.994>
- [55] Joynt K, Whellan D, O'connor C. Review article: Why is depression bad for the failing heart? a review of the mechanistic relationship between depression and heart failure. *J of Cardiac Failure* 2004; 10258-271.
- [56] Anisman H, Merali Z. Cytokines, stress, and depressive illness. *Brain Behav and Imm* 2002; 16513-524.

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