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Ozan Bahcivan

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Ph.D. candidate: Ozan Bahcivan

Ph.D. supervisors: Dr. Tania Estapé / Dr. José Gutiérrez Maldonado

Department of Clinical Psychology and Psychobiology

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Faculty of Psychology

University of Barcelona

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Author notes

Corresponding authors: Ozan Bahcivan, University of Barcelona, Department of Clinical Psychology and Psychobiology, Passeig de la Vall d'Hebron, 171, 08035 Barcelona, Spain. E-mail address: obahciba7@alumnes.ub.edu /bahcivanozan@yahoo.com.au

Dr. Tania Estapé, FEFOC Foundation, Carrer de Marc Aureli, 14, 08006, Barcelona, Spain.E-mail address: testape@fefoc.org

Prof. Dr. José Gutiérrez-Maldonado, University of Barcelona, Department of Clinical Psychology and Psychobiology, Passeig de la Vall d'Hebron, 171, 08035 Barcelona, Spain. E-mail address: jgutierrezm@ub.edu

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Abstract

Stress, anxiety, and hopelessness are found to be the most common reasons for psychological counselling for breast cancer patients. Due to the complexity of the medical treatment of cancer, patients often lose hope and consequently their treatment drop-out rate increases. In fact, these patients usually require shorter and briefer psychological interventions as their medical treatment hinders patients to attend longer psychological sessions. Therefore, shorter psychological intervention targeting specifically for breast cancer patients is needed in the current psycho-oncology clinical practice.

This research project consists of two different independent studies and three articles, two of them published in a scientific journal. The main objective of this research is to investigate the efficacy of this short new mindfulness intervention called the Mindfulness Based Swinging Technique (MBST). The MBST intervention combines a breathing exercise and a particular guided imagery for swinging activity inspired by t'ai chi and qigong motions that could make it possible to support women with breast cancer; for combating their anxiety, stress as well as increase their self-efficacy and hope. In order to assess its efficacy, the MBST intervention was compared with the Cognitive Disputation (CD) technique, a form of Cognitive Behavioural Therapy (CBT). In the initial study, MBST was conducted to measure its immediate (within 20mins) efficacy among breast cancer patients who were in active oncology treatment. On the other hand, in the final study, MBST's 8-week efficacy among breast cancer patients who were in active oncology treatment was tested. That includes bio-indicators, such as Heart Rate (HR) in beats-per-minute (bpm) and saturation/oxygen levels of the patients were measured.

The results of these studies provided insights about its clinical suitability, efficaciousness, and time savings in clinical interventions among breast cancer patients in oncology treatment. The efficacy of the MBST intervention was assessed with a randomised controlled clinical trial in which patients were evaluated before starting the MBST intervention, at the end of the intervention, and after 8-week follow-up. Based on our immediate efficacy results, MBST was found to be efficacious among women with breast cancer for tackling stress, anxiety, hopelessness, and increase in self-efficacy. In the 8-week follow-up, MBST was not shown to be more effective than the control condition (CD).

The current project provides another example of how mindfulness techniques can be applied to breast cancer patients. This brief mindfulness-based intervention can enhance traditional psychotherapy techniques. Particularly for cognitive behavioural therapies which is combined with third-wave therapy approaches to improve the emotional, and psychological responses of patients to cancer as well as support them to better cope with their cancer illness and diagnosis. Therefore, indirectly MBST can assist a patient's adherence to their medical treatment.

RESUMEN

Estrés, ansiedad y desespero, son los motivos más comunes de demanda de tratamiento psicológico para pacientes con cáncer de mama. Debido a la complejidad del tratamiento médico las pacientes a menudo pierden la esperanza y, en consecuencia, aumenta su tasa de abandono del tratamiento. De hecho, estas pacientes suelen requerir intervenciones psicológicas más cortas y breves, ya que su tratamiento médico les impide asistir a sesiones psicológicas demasiado prolongadas en el tiempo. Por lo tanto, en la práctica clínica psicooncológica actual se necesita una intervención más breve dirigida específicamente a pacientes con cáncer de mama.

Este proyecto de investigación consta de dos estudios independientes y tres artículos, dos de ellos publicados en una revista científica. El objetivo principal de este proyecto es investigar la eficacia de esta nueva y breve intervención de atención plena llamada "Técnica de balanceo basada en la atención plena (MBST, del acrónimo en inglés)". La intervención MBST combina un ejercicio de respiración y una visualización guiada específica para una actividad de balanceo inspirada en los movimientos de tai chi y qigong que podrían ayudar a las mujeres con cáncer de mama a combatir su ansiedad, estrés, así como aumentar su autoeficacia y esperanza. Para evaluar su eficacia, la intervención MBST se comparó con la técnica de Reestructuración Cognitiva (RC), una forma de Terapia Cognitivo Conductual (TCC). En el estudio inicial, se realizó MBST para medir su eficacia inmediata (en 20 minutos) entre pacientes con cáncer de mama que estaban en tratamiento oncológico activo. Por otro lado, en el estudio final se probó la eficacia de MBST durante 8 semanas entre pacientes con cáncer de mama que se encontraban en tratamiento oncológico activo. Se incluyeron biomarcadores, como la frecuencia cardíaca (FC) en latidos por minuto (lpm) y los niveles de saturación/oxígeno de las pacientes.

Los resultados de estos estudios proporcionaron información sobre su idoneidad clínica, eficacia y ahorro de tiempo en intervenciones entre pacientes con cáncer de mama en tratamiento oncológico. La eficacia de la intervención MBST se evaluó mediante un ensayo clínico controlado aleatorizado en el que las pacientes fueron evaluadas antes de iniciar la intervención MBST, al final de la intervención y después de un seguimiento de 8 semanas. Según nuestros resultados de eficacia inmediata, se halló que MBST era eficaz entre las mujeres con cáncer de mama para abordar el estrés, la ansiedad, la desesperanza y aumentar la autoeficacia. En el seguimiento de 8 semanas, MBST no demostró ser más eficaz que la condición de control (CD).

El proyecto actual proporciona una muestra de cómo se pueden aplicar técnicas de atención plena a pacientes con cáncer de mama. Esta breve intervención basada en la atención plena puede mejorar las técnicas de psicoterapia tradicionales. Nos referimos, en especial, a las terapias cognitivo-conductuales combinadas con enfoques de terapia de tercera generación para mejorar las respuestas emocionales y psicológicas de los pacientes respecto al cáncer, así como para ayudarlos a afrontar mejor su enfermedad y diagnóstico de cáncer. Por lo tanto, indirectamente MBST puede ayudar a la adherencia del paciente a su tratamiento médico.

RESUM

L'estrès, l'ansietat i la desesperança són els motius més comuns de demanda de tractament psicològic per a pacients amb càncer de mama. A causa de la complexitat del tractament mèdic del càncer, els pacients sovint perden l'esperança i, en conseqüència, augmenta la seva taxa d'abandonament del tractament. De fet, aquestes pacients solen requerir intervencions psicològiques més curtes i breus, ja que el seu tractament mèdic dificulta que assisteixin a sessions de psicologia més llargues. Per tant, es necessita una intervenció més curta dirigida específicament als pacients amb càncer de mama en la pràctica clínica psicooncològica actual.

Aquest projecte de recerca consta de dos estudis independents i tres articles, dos d'ells publicats en una revista científica. L'objectiu principal d'aquest projecte és investigar l'eficàcia d'aquesta nova intervenció breu d'Atenció plena anomenada "Tècnica de balanceig basada en l'atenció plena (MBST, de l'acrònim en anglès))". La intervenció MBST combina un exercici de respiració i una de imatgeria guiada per a l'activitat de balanceig inspirada en els moviments de tai-txi i qigong que podrien facilitar donar suport a les dones amb càncer de mama; per combatre la seva ansietat, estrès i augmentar la seva autoeficàcia i esperança. Per avaluar-ne l'eficàcia, es va comparar la intervenció MBST amb la tècnica de la Reestructuració Cognitiva (RC), una forma de teràpia cognitivoconductual (TCC). En l'estudi inicial, es va dur a terme MBST per mesurar la seva eficàcia immediata (en un termini de 20 minuts) entre pacients amb càncer de mama que estaven en tractament oncològic actiu. D'altra banda, en l'estudi final, es va provar l'eficàcia de 8 setmanes de MBST entre pacients amb càncer de mama que estaven en tractament oncològic actiu. Això inclou biomarcadors, com ara la freqüència cardíaca (FC) en batecs per minut (bpm) i els nivells de saturació/oxigen dels pacients.

Els resultats d'aquests estudis van proporcionar informació sobre la seva idoneïtat clínica, eficàcia i estalvi de temps en les intervencions clíniques entre pacients amb càncer de mama en tractament oncològic. L'eficàcia de la intervenció MBST es va avaluar amb un assaig clínic controlat aleatoritzat en el qual es van avaluar els pacients abans d'iniciar la intervenció MBST, al final de la intervenció i després de 8 setmanes de seguiment. Segons els nostres resultats immediats d'eficàcia, es va trobar que MBST era eficaç entre les dones amb càncer de mama per fer front a l'estrès, l'ansietat, la desesperança i l'augment de l'autoeficàcia. En el seguiment de 8 setmanes, no es va demostrar que MBST fos més eficaç que la condició de control (CD).

El projecte actual ofereix un altre exemple de es poden aplicar a les pacients amb càncer de mama les tècniques d'atenció plena. Aquesta breu intervenció basada en la consciència pot millorar les tècniques tradicionals de psicoteràpia. En particular, per a les teràpies cognitivoconductuals que es combinen amb enfocaments de teràpia de tercera generació per millorar les respostes emocionals i psicològiques dels pacients al càncer, així com ajudar-los a afrontar millor la seva malaltia i el seu diagnòstic. Per tant, indirectament, MBST pot ajudar a l'adherència d'un pacient al seu tractament mèdic.

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Abbreviations

ACT – Acceptance and Commitment Therapy

ANOVA – Analysis of Variance

BC – Breast Cancer

BHS – Beck's Hopelessness Scale

BPD – Borderline Personality Disorder

BPM – Beats per Minute

CBT – Cognitive Behavioural Therapy

CD – Cognitive Disputation

CG – Control Group

CONSORT – Consolidated Standards of Reporting Trials

COVID-19 – Coronavirus Disease 2019

DBT - Dialectical Behaviour Therapy

***ε*2** – Epsilon *Squared*

ET – Emotion Thermometer

GI – Guided Imagery

HADA – Hospital Anxiety and Depression Scale Anxiety

HADD – Hospital Anxiety and Depression Scale Depression

HADS – Hospital Anxiety and Depression Scale

HR – Heart Rate

IG – Intervention Group

MBCBT – Mindfulness Based Cognitive Behavioural Therapy

MBCT – Mindfulness Based Cognitive Therapy

MBI – Mindfulness Based Intervention

MBSR – Mindfulness Based Stress Reduction

MBST – Mindfulness Based Swinging Technique

MQ – Medical Qigong

NICE – National Institute for Health and Clinical Excellence

PMR – Progressive Muscle Relaxation

QOL – Quality of Life

RCT – Randomised Controlled Trial

SCT – Social Constructivist Theory

SD – Standard Deviation

SEMCD – Self Efficacy for Managing Chronic Disease

SET - Supportive-Expressive Therapy

SpO2 – Oxygen saturation

SPSS – Statistical Package for the Social Sciences

STAI – State Trait Anxiety Inventory

WHO – World Health Organisation

1. A BRIEF INTRODUCTION. NEW POSSIBLE HORIZON IN MINDFULLNESS FOR WOMEN WITH BREAST CANCER

According to the WHO (2020), breast cancer incidences have been increasing dramatically over the past years. This increasing number of patients means more demand for mental health professionals as it has been shown that cancer patients often seek psychological support for stress, anxiety and depression (Castanhel & Liberali, 2018; Hwang et al., 2015). In fact, it is now known that cancer causes more physical constraints which results in depression and anxiety (Fabi et al., 2017; Ledesma & Kumano, 2009; Li et al., 2020) among oncology patients. According to Lorca et al. (2019), psychological burdens start as early as during the diagnostic procedures, such as mammography, and magnetic resonance imaging (MRI) which cause distress and anxiety among cancer patients. Jasemi et al. (2016) stated that it is crucial to identify the stress that is experienced by cancer patients when taking part in an image diagnostic service, and then treat it before the medical intervention where possible. According to Norr et al. (2015), their results show that anxiety sensitivity such as anxiety driven sensations are more common among females than male cancer patients (Trotman et al., 2019). Therefore psycho-oncological interventions that target female breast cancer patients can be important. Due to such concerns, developing evidence based short psycho-oncological interventions are needed (Bahcivan et al., 2022; Hulbert-Williams et al., 2015).

There is some evidence that mindfulness interventions and medical disease management complete each other in treating individuals with physical illness by comforting psychological distress and improving wellbeing (Janusek et al., 2019; Russo, 2019; Zimmermann et al., 2020). Mindfulness interventions delivered from ontological philosophies; when it comes to accomplishing oneness, Eastern philosophies support different ways compared to Western philosophies which involve meditation (Lama, 2012) and unconditional observation

(Krishnamurti & Blau, 2002). The meditation activity is described as observing activities of daily living with every moment in an unconditional manner (Krishnamurti & Blau, 2002; Van Dam et al., 2018). Throughout the years, mindfulness interventions evolved and combined with other psychological techniques (Stefan & Hofmann, 2019; Lynn et al., 2016).), such as cognitive behavioural therapy. There are several systematic reviews as well as meta-analyses in the current field which agree with the fact that MBIs are efficient in reducing psychological distress, symptoms of depression and anxiety (Cillessen et al., 2019; Haller et al., 2017). Furthermore, participants proposed that delivering a relaxing inducement promoted the effectiveness of their overall treatment (Sloman, 2002), that includes breast cancer patients (Charalambous et al., 2015; Toneti et al., 2019; Xunlin et al., 2020).

Mental health is diverse, therefore individual differences should be taken into account when assessing psychological symptoms (Würtzen et al., 2015). That plays an important role in identifying one's functioning (Van Dam et al., 2018). Yet, identifying such a condition could be difficult for the therapist to bring out the client's pattern in a short period of time, as a 10 to 20-minute-long session may not be adequate. This may be because, maladaptive patterns are likely to be inflexible, and ineffective (Van Dam et al., 2018). However, considering the medical drop-out rates for cancer patients and their lack of following medical advice may derive from many reasons and psychological wellbeing can be considered as one of them. As a result, evidence based psychological methods, such as cognitive behavioural therapy could be utilised to tackle such concerns among breast cancer patients.

2. COMMON PSYCHOLOGICAL CONCERN EXPERIENCED BY WOMEN WITH BREAST CANCER

Women with breast cancer face multiple psychological problems such as anxiety, depression, stress, hopelessness, anger, and feeling of guilt (Refaee Saeedi et al., 2019). These problems may be experienced from the early stages of diagnosis to disease progression, and they may continue even after completing their cancer treatment (Akyuz et al., 2019). A meta-analysis conducted by Refaee Saeedi et al. (2019) stated that, particularly breast cancer patient's anxiety and stress result from uncertainty, fear, and lack of self-confidence. In fact, anxiety might be a cause of fatigue, decrease the efficacy of therapeutic effect and may also have an impact on their immune system (Janusek et al., 2019). It is important for therapists who work with breast cancer patients to familiarise themselves with the common psychological concerns for providing better psychosocial support (Lederberg, Greenstein & Holland, 2015). These concerns should not be generalised to all cancer population, such as cancer patients who have never had a breast mastectomy operation may not experience significant sexual disturbances or/and body image related anxiety (Koçan & Gürsoy, 2016), yet fear of death can be experienced by most cancer patients (Valikhani et al., 2018). Therefore, therapists need to tailor the skills necessary to provide patient-focussed approaches. For this reason, therapists should utilise the relevant interventions that are the most suitable and beneficial for the breast cancer patient (Getu et al., 2021). Although anxiety, stress and hopelessness are often experienced by cancer patients, the deeper research into these psychological concerns among breast cancer patients suggest that body image concerns (Todorov et al., 2019), fear of death (Bahrami et al., 2013), fear of cancer recurrence and uncertainty (Maheu et al., 2021) would be considered as the main underlying causes of these problems.

The reason why body image related difficulties might be more common among breast cancer patients may be due to the direct side effects of the physiological treatment of breast cancer, such as breast surgical operations (Brandão et al., 2017; Todorov et al., 2019). Permanent physical changes are expected after a breast extraction also known as mastectomy (Türk & Yılmaz, 2018). The negative body image could be the result of loss of breast(s) or hair, scarring, visible changes in body weight, and/or muscle weakness (Brunet et al., 2022; Koçan & Gürsoy, 2016; Paterson et al., 2016). Yet it is important to understand breast cancer patients' feelings towards their body image as they can reduce their quality of life after diagnosis by the triggering of unhealthy behavioural patterns and emotions (Davis et al., 2020; Paterson et al., 2016). Indeed, psychological problems, such as self-acceptance and sexuality are also associated with body image (Martins et al., 2021; Kolodziejczyk & Pawlowski, 2019).

Breasts are sexually sensitive organ, therefore any surgical operation on breasts may adversely affect the sexual life of the patients including low sexual excitement and decreased orgasm (Elmas et al., 2020). In fact, Koçan & Gürsoy (2016) reported that, in the case of breast mastectomy, patients may feel a loss of identity which therefore results in dissatisfaction with their own look, perceived loss of femininity, or even avoiding seeing themselves naked in the mirror. Although mastectomy induces sexual problems all reproductive functions are generally worth to consider when supporting women with breast cancer, yet Chang et al. (2019) reported that such sensitivity towards loss of breasts is not the biggest concern for elderly patients. Nonetheless, the abovementioned physical changes and losses of women with breast cancer affects their self-esteem (Ljungman et al., 2018). This may be because for many women, self-esteem is perceived as solely based on their own body image, which therefore causes lower self-esteem (Bratovcic et al., 2015; Morales-Sánchez et al., 2021). In this respect, it is not unusual for these patients who have undergone mastectomy to manifest emotional instability,

feeling less attractive, reduction in their self-esteem, low in tolerance for others and disturbed romantic relationships (Bardot et al., 2018). Further to these impacts, it is inevitable for these women to adapt to a new life which incorporates new routines and activities. In fact, according to the observational longitudinal study conducted by Liu et al. (2017) showed that, higher levels of body image related anxiety were observed in breast cancer patients who reported lower levels of hope. As a result, in order to accomplish an adequate adaptation for the changes, it is essential to promote intended actions within their support system (Nardin et al., 2020).

The body image should be considered in many dimensional concepts, such as *attitudinal* (e.g., non-objective happiness of their body), *perceptual* (e.g., the estimate understanding of their own body rather than their true body-size), *cognitive (*e.g., investment in their belief(s) about how their body seem), *behavioural* (e.g., compensating like behaviours such as exercising or dieting) and *affective* (e.g., mood(s) related to their own body) (Brunet et al., 2022; Cash & Smolak, 2011). This can be explained further with an example; positive feelings can be experienced by a woman toward her body (e.g., gratitude for its functioning ability), and in the meantime, also she can have negative feelings (e.g., being repulsed by the look of her scars). Physical appearance is a huge concern for breast cancer patients that, they constantly think and observe about how other people may see their body (Hunter, 2015; Sebri et al., 2021). Therefore, body image not only affects the patient themselves alone but also affects patients within their social surroundings (Male et al., 2016). Finally, it should be known by psycho-oncologists that, physical changes in one's body is beyond matter of "self-appreciation" for women with breast cancer. It is more about experiencing and feeling incomplete, having to feel about betrayal that comes from their very own body as well as to perceive themselves as more masculine (Rubin & Tanenbaum, 2011; Triberti et al., 2019).

Finally, the fear of death may also cause anxiety, stress, and hopelessness among cancer patients including women with breast cancer (Mahdavi et al., 2019). The reality of death is inevitable to every living-being (Taghizadeh Karati et al., 2011). Facing death is common by patients who have been diagnosed with an incurable illness (Soleimani et al., 2017). In 2018, the World Health Organization reported that, cancer was the second leading cause of death world-wide (WHO, 2020). Therefore, regardless of its survival rate it is not surprising to see breast cancer patients to experience the fear of death (Bahrami et al., 2013). Further, Mahdavi et al. (2019) concluded that feelings of grief, fear of death and confusion can be considered as natural responses in the process of diagnosis and treatment for women with breast cancer. It is known that no one can precisely estimate the time of death, thus most people have some level of concern about it at some time in their lives (Hashemi et al., 2019). Grossman et al. (2018) suggested that it is possible to have positive outcomes for cancer patients when psycho-oncologists consider, and tailor death anxiety related psychological interventions. Due to the aforementioned reasons, it is highly significant to study about death and its implication within patients, where it has direct impact both in their oncological care and treatment progress (Sharif Nia et al., 2020; Van Channell, 2017). Cancer patients who experience death anxiety may be influenced by personal, cultural, and social factors (Peters et al., 2013). Soleimani et al. (2020) found that socio-demographic factors, such as type of cancer, sex, and marital status moderately influence death anxiety in cancer patients. Indeed, breast cancer women were reported to have more death anxiety than patients who were diagnosed with other types of cancers (Soleimani et al., 2020).

According to Mahdavi et al. (2019) they stated that religion can play a role in reducing anxiety, this is due to the belief that there is life after death. Therefore, patients' well-being may be increased as religion potentially provides a psychological haven and hope for a hereafter

(Mahdavi et al., 2019). Substantial fear and anxiety might be experienced by all human beings at some point in their lifetime (Valikhani et al., 2018), yet everyone's approach and coping mechanisms towards death can vary (Soleimani et al., 2020).

While the current study does not aim to delve into the subjects of body image and fear of death in detail, there is a widespread empirical consensus that identifies these factors as significant contributors to anxiety, stress, and a sense of hopelessness, which are among the primary underlying issues in the breast cancer population, particularly among women.

3. COMMON PSYCHOLOGICAL INTERVENTIONS FOR WOMEN WTTH BREAST CANCER

There are evidence-based psycho-oncological interventions specifically designed and developed for breast cancer patients. The most common interventions utilised among breast cancer patients are considered to be Cognitive Behavioural Therapy (Getu et al., 2021), Acceptance and Commitment Therapy (Guarino et al., 2020), Dialectical Behaviour Therapy (Azhar & Ardakani, 2020) and Guided imagery (Sinha et al., 2021).

3.1. Cognitive Behavioural Therapy (CBT) for Breast Cancer Patients

In contemporary clinical practices, Cognitive Behavioural Therapy (CBT) interventions have become one of the most widely preferred psychotherapy techniques, (Craske, 2010). CBT aims to break patterns of automatic and dysfunctional thoughts resulted from cognitive factors, then enable patients to have more adaptative emotions, thoughts and behaviours (Cobeanu & David, 2018).

Receiving a cancer diagnosis will potentially create many negative thoughts which will have detrimental effect for people's lives. In fact, these thoughts may often be dysfunctional and have a lowering impact in their quality of life (May et al., 2021). Their negative thoughts may vary due to the surgical procedures and other complicated treatments that they may go through (Brandão et al., 2017; Todorov et al., 2019). In fact, particularly for breast cancer patients who had no cancer history in their family might create additional anxiety driven thoughts which may affect their everyday functioning (Holst-Hansson et al., 2017).

In order to improve the effective state and coping with the breast cancer diagnosis, CBT regulates the maladaptive cognitive patterns (Cobeanu & David, 2018). CBT consists of various strategies to improve breast cancer patients' quality of life, and it is proven to be effective in reducing anxiety and depression level, reforming patients' negative automatic cognitive patterns, and increasing positive thinking, which help to improve the quality of life of patients with breast cancer (Lantheaume et al., 2019; Ye et al., 2018).

CBT is found to be an effective intervention among breast cancer patients for managing multiple psychological [anxiety and depression (Ren et al., 2019), mood (Jassim et al., 2023) and physiological (insomnia (Aricò et al., 2016), fatigue (Abrahams et al., 2017)] concerns. The aim of the CBT for insomnia is to eliminate the vicious cycles of dysfunctional beliefs about sleep that potentially trigger insomnia (Thakral et al., 2020). May et al. (2021) said that CBT targets sleep hygiene, stimulus control, sleep restriction, and relaxation training which consists of weekly treatment sessions, yet each session may vary depending on the needs of the patient. The unrealistic expectations and dysfunctional cognitions of the breast cancer patients could be identified as part of the cognitive restructuring, which could potentially avoid

lengthening the duration of insomnia along with Socratic questioning that enables patients to learn about their very own thinking patterns (May et al., 2021).

Getu et al. (2021) reported that the effect size of the CBT can differ based on the therapist's skill, yet Guarino et al. (2020) suggested that CBT can be more effective if it is provided by therapist who are more skilful in their support of breast cancer patients. The meta-analysis and the systematic review conducted by Cobeanu & David (2018) reported that CBT is shown to be efficacious both at the post-treatment and at the follow up.

3.2. Third wave interventions

Acceptance and Commitment Therapy (ACT) is part of the third wave interventions that is often applied for breast cancer patients to tackle their emotional difficulties (Bai et al., 2020). Pain is one of the unavoidable major side effects caused by oncological treatment for cancer patients which reduces their quality of life (Feliu-Soler et al., 2018). According to the meta-analysis done by Öst (2017) and Bai et al. (2020), ACT is one of the well-established treatment options for chronic pain. ACT can be applied as not in support of a patient's urge to fight with the pain, but rather increase their acceptance level through "psychological flexibility" (Fernández-Rodríguez et al., 2023). Psychological flexibility can be explained as having control of one's own behaviour in an uncomfortable or other unpleasant experiences which can be guided by possible future achievements and values (González-Fernández & Fernández-Rodríguez, 2019).

The six core pillars of ACT are often referred as a "hexaflex" (see Figure 1). Further, Grégoire et al. (2018) explained the "hexaflex" that there are number of interrelated and overlapping courses in ACT: acceptance (e.g., willingness to be open about discussing difficult feelings and

experiences), being in the moment (e.g., being aware of one's experiences), cognitive dissemination (e.g., to be able to unwind and let go of unwanted experiences), taking action willingly (e.g., interfering with what is important in one's life), and values (e.g., to be able to stay connected with values or areas of life that are important to one's self) (Hayes, 2004).

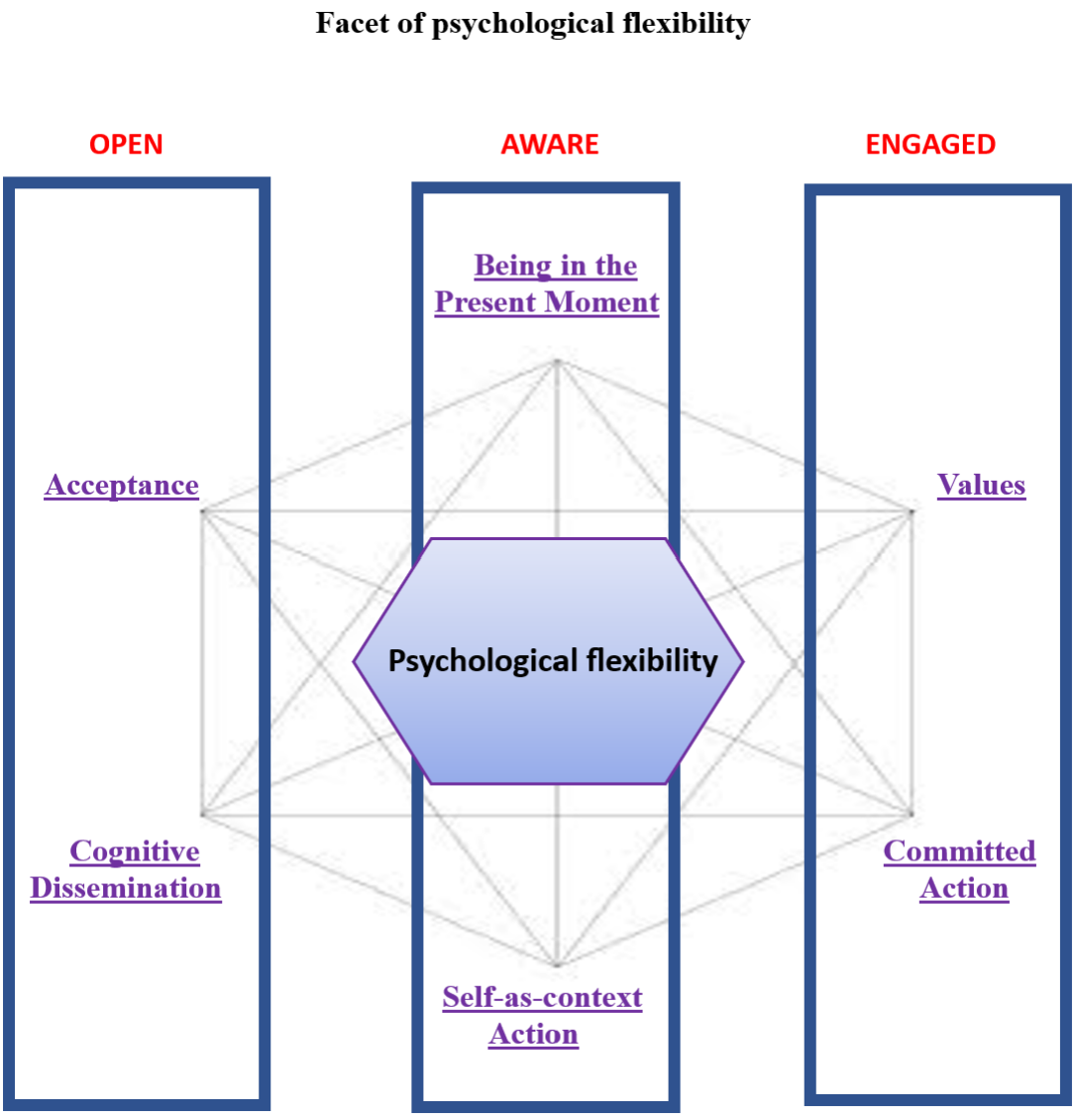

Figure 1. The ACT Model of Hexaflex for Psychological Flexibility and vice-versa (adapted from Feliu-Soler et al., 2018; Hayes, 2004).

Facing unexpected or any unpleasant medical results may cause hopelessness in women with breast cancer, and it is proven that ACT can be applied to those fragile individuals for tackling

hopelessness (Mahmoodi & Karbalaee Bagheri, 2020). Further, Johns et al. (2020) stated that reducing or eliminating experiential avoidance as well as increasing adherence to patients' treatments are often the target of ACT. It is known that CBT's main purpose is to change or shift the unhelpful negative thoughts and feelings, whereas ACT aims to support patients' acceptance of the situation while living mindfully and meaningfully (Fernández-Rodríguez et al., 2023). In fact, the main focus of the ACT is to enhance an individual's psychological resilience in the face of life's challenges, potentially reducing maladaptive coping patterns and facilitating adaptive management of a breast cancer diagnosis. (Johns et al., 2020).

Dialectical Behaviour Therapy (DBT) was primarily developed as a third wave therapy formed from cognitive-behavioural intervention to treat symptoms of emotion dysregulation for people who suffer from borderline personality disorder (BPD) (Harvey et al., 2019; Linehan, 1987). BPD has been specified by the American Psychiatric Association (APA, 2013) as a condition of persistent emotion dysregulation that consequently affects daily living. People who are diagnosed with BPD generally suffer from forming social relationships, that is often highly unstable (Harvey et al., 2019). Moreover, those with BPD have struggled to establish a sense of self awareness, and they might show highly impulsive behaviours and face unexpected consequences (Zamani et al., 2015). Even though not all women with breast cancer receive the diagnosis of BPD, yet they might show some similar symptoms of BPD particularly when forming intimate relationship. This may be due to the oncological treatment, that includes surgical operations (Bardot et al., 2018).

It is known that the most cognitive behavioural techniques solely focus on behaviour changes without validating people's social environment (Faraji, 2015). It is important to acknowledge a cancer patient's social surroundings, since after receiving the cancer diagnosis their social

duties will be interrupted and their social roles might change in various levels (Male et al., 2016). Thus, DBT tries to adopt emotional dysregulating features of the individuals utilising an integrated and synthesised method that mainly focuses on validating their experience of themselves, others, and the world around them (Azhar & Ardakani., 2020). In fact, DBT does that by employing Zen Eastern philosophical techniques and principles of acceptance (Harvey et al., 2019). Zen integrated DBT introduces on four main component: (1) "core mindfulness" skills to assist people to become more familiar to their own experiences in a legitimate, non-judgmental way; (2) adhere the skills of emotion regulation to recognise emotional states in an adaptive way; (3) having the skills of tolerating distress to recognise difficult circumstances and control emotional states in order to ease the situation (e.g., by avoiding impulsive behaviours); and (4) having the skills of "interpersonal effectiveness" to respond to necessary requirements and address any possible conflicts assertively (Valentine, Bankoff, Poulin, Reidler, & Pantalone, 2015). These are also considered to be the skills for breast cancer patients to increase their quality of life and possibly motivate patients to be more adhering to their medical treatment (Baziliansky & Cohen, 2020; Riis et al., 2020; Schandl, Johar, Malberg, & Lagergren, 2018).

Furthermore, Faraji, (2015) said that the ultimate purpose of DBT is to establish a life that one sees as worth living. While women with breast cancer receive the oncological treatment, they often face life-limiting side effects, such as fatigue (Abrahams et al., 2017) and nausea (Samami et al., 2022) which result in more pessimism towards life and living (Sagaonkar & Pattanshetty, 2021). The DBT intervention could be effective by receiving the necessary training of emotional regulation skills as well as learning CBT and mindfulness-based strategies through psychoeducation to tackle such cancer treatment induced side effects (Azhar & Ardakani., 2020; Harvey et al., 2019; Zamani et al., 2015).

In summary, DBT is one of the third wave of therapies that endures acceptance about thoughts of women with breast cancer, and their impulses when they experience emotional pain, as well as it guides through evidence-based strategies and techniques a direction which assists in the change of risky behaviours.

3.3. Guided Imagery (GI) Interventions for Breast Cancer Patients

Guided imagery (GI) can be explained as replacing unpleasant memories with pleasant mental imageries that result in alleviated stress and anxiety (Sanadgol et al., 2020). GI and relaxation are suggested cognitive-behavioural approaches as complementary interventions (Nguyen & Brymer, 2018). These mental images are guided through instructions that stimulate and trigger the sensory experiences and physiological responses (Breitbart et al., 2021). Within the GI intervention, the main focus will be given to sensory and contextual engagement of patients. The more focussed the patients are with the guided instructions, the more engaged they become which therefore enhances their perceptual and realistic details of the images during the GI intervention (Nguyen & Brymer, 2018).

Many studies pointed out to the effectiveness of guided imagery techniques mainly for relaxing when regulating the symptoms of physical and psychological discomfort (Sinha et al., 2021). The scientific evidence supports the effectiveness of GI interventions for breast cancer patients in the reduction of their stress and anxiety (Shahriari et al., 2017; Toussaint et al., 2021). This is an important clinical problem as breast cancer patients display common clinical symptoms in anxiety and depression (Breitbart et al., 2021; Mahmoodi & Karbalaee Bagheri, 2020). Yet as brief as a 20min GI practice has shown to be efficacious in reducing the anxiety and cortisol levels of patients (Felix et al., 2018). In fact, GI is also found to be effective in reducing death

anxiety particularly during the COVID-19 pandemic (Sanadgol et al., 2020), which was often experienced by breast cancer patients who were under-going medical treatment (Breitbart et al., 2021). Felix et al. (2018) reported on controlled clinical trials, which used guided imagery as a treatment for regulating the side effects of chemotherapy, have produced positive outcomes.

It should be noted that, mental health practitioners should be cautious when utilising GI interventions with breast cancer patients as it might leave people with unclear expectations regarding about its usefulness. This is because, the common relaxation interventions may be known better than guided imagery interventions by cancer patients which needs clarification via psychoeducation (Breitbart et al., 2021).

3.4. Other approaches

The supportive-expressive and psycho-educational therapies are considered to be among conventional psychological techniques applied in treatment for women with breast cancer (Guarino et al., 2020; Pei-Hua et al., 2018). Patients' existential concerns, emotional expression and growth of their social support can be addressed by Supportive-Expressive Therapy (SET) which is an emotion-focused cognitive therapy (Ho et al., 2016). According to the randomised control trial conducted by Ho et al. (2016), SET found to be effective in reducing the emotional discomfort caused from breast cancer. On the other hand, psycho-educational therapy can be considered as one of the interdisciplinary approaches, which includes educational programs, such as providing necessary information related to the disease and its concerning treatments, and an emotional intervention, such as providing evidence based cognitive skills to assist patients to express more details about their cancer-illness related experiences (Cipolletta et al., 2019).

4. UTILISED AND COMBINED PSYCHOLOGICAL TECHNIQUES WITHIN THE MBST

Since mindfulness practice was first introduced for its psychological benefit as an intervention (Kabat-Zinn, 2011), it evolved and combined with other psychological techniques throughout the years (Stefan & Hofmann, 2019; Lynn et al., 2016), such as cognitive behavioural therapy (Hunot et al., 2010), and guided imaginary. In fact, research suggests that medical qigong can be integrated with guided imagery (Kapogiannis et al., 2018) for a more flexible practice (Will, 2013).

4.1. Cognitive Behavioural Therapy – Cognitive Disputation (CD)

Cognitive Disputation (CD) can be defined as a type of cognitive intervention, that targets primarily to raise realisation of once's irrational thinking pattern by using reasoning and logic (Sperry & Binensztok, 2019). There are different methods of disputation that can be used to deal with irrational beliefs (Perangin-Angin et al., 2021). Cognitive disputation is one of the methods that is distinguished above other cognitive techniques. In this method, the client is supported by the therapist in defiance of their own rational and irrational beliefs based on experience, logic and pragmatism (Moorey, 2023). There is a very clear argument between 'what works' and 'what is true', which puts forward the logical-empirical methods of science, (David et al., 2019). Functional emotions play an important role in adaptive behaviours and also healthy physiological reactions which can be crucial for breast cancer patients' behaviour pattern (Salerno et al., 2021). On the other hand, dysfunctional emotions cause poor adjustment for behaviour as well as unhealthy physiological reactions (David & Cramer, 2010). Therefore, cognitive restructuring comprises educating and training the individual so that they are able to assess the possibility and intensity of their feared results (Otto et al., 2012). Or in cancer patients these could often be about fear of cancer recurrence, health related anxiety, adaptation

related concerns and adherence to their medical treatment. Among the early diagnosed breast cancer patients, it seems that mostly patients failed to come up with sufficient evidence that back-up their automatic thoughts and irrational beliefs (Salerno et al., 2021).

According to Sperry and Binensztok (2019), when it comes to the treatment of various psychological disorders, such as depression, anxiety and marital distress, cognitive disputation can be very effective. Furthermore, the psychotherapist can prefer disputing the thoughts directly, (David et al., 2019). This approach is centred on identifying one's irrational beliefs; believing that things should be done in a specific and unrealistic way of thinking that everything is unendurable. Once the client's pattern is identified, it would be easier for the psychotherapist to thoroughly lead the treatment in the right direction, along with avoiding relapse. The description of "pattern" is the affirmable, steady and self-perpetuating manner in which a person thinks, feels, behaves, overcomes as well as advocates for themselves (Sperry, 2006; Sperry et al., 1996).

Over the past several years, Cummings & O'Donohue (2008) have supported the notion that, as psychotherapists, they should have the ability to assess, diagnose and apply the right treatment with their patients in about 15-minutes (Coren, 2020; Thomas, 2010). According to Carona et al. (2021), the Socratic method is the type of questioning that aims to encourage the patient to explore and find the answers on their own. The goal of the psychotherapist is to ask questions in order to expose information that the patient is already familiar with but has not absorbed yet (Carona et al., 2021; Younis et al., 2021). Such method can be utilised within very short, around 10 to 20-minutes or less, interventions during a particular session (Sperry & Binensztok, 2019).

4.2. Combining Guided Imaginary with Swinging Motion and Medical Qigong

Medical Qigong (MQ) includes movement, breathing and meditation (Will, 2013). MQ can be practiced with different actions, such as t'ai chi in the field of supportive oncology (Jahnke et al., 2010; Oh et al., 2012). In fact, MQ practices could decrease depression, anxiety, and complaints of fatigue (Sagaonkar & Pattanshetty, 2021). Due to the qigong practice, patients' who undergo chemotherapy have displayed better improvement in their cognitive functioning, such as improvement in their negative thinking patterns (Oh et al., 2012). Will (2013) reported that MQ can be performed by cancer patients during their medical treatment. This shows that, a repetitive movement of swinging motion has been associated with relaxation and tranquillity (Osypiuk et al., 2020). It is important to utilise such techniques in a flexible manner, such as through guided imaginary (GI).

In terms of GI, it can help patients to grow a personal sense of control over side effects of medical treatment for cancer (Cole, 2021). Guided instructions, active participation, a comforting voice tone, providing distraction and relaxation are observed in common GI practices (Turner et al., 2007). It is especially vital for the instructions to be easy to follow for patients who are not very familiar with this kind of intervention (Toneti et al., 2019). Yet, Post-White (2002) added that there is not only one standard technique or script for GI treatment. Moreover, there is no proof in the current field to indicate that a single form of GI has more efficacy compared to others. Therefore, integrating MQ within the GI may be possible. Contemporary research supports guided imagery's efficacy in patients for treating medical, psychological, and psychiatric disorders (Amir et al., 2022; Sinha et al., 2021; Toussaint et al., 2021; Utay & Miller, 2006). Relaxation can be useful in distracting patients from the side effects of chemotherapy discomfort as well as comforting muscle tension and leading relaxing thoughts with the use of GI (Zainal et al., 2013).

It is advisable to teach cancer patients such effective techniques as patients would be better equipped with self-care strategies throughout their treatment, which would result in changing the locus of control from the health professional to the patient (Schulman-Green et al., 2018; Younis et al., 2021). Orem's self-care model of nursing practice (Dejange et al., 2018; Orem, 1985) implies that, patients were educated to be able to practice muscle relaxation and GI techniques that can be practiced by themselves (Kwekkeboom et al., 2008). This could make MQ practices more accessible. To do that, soft music usually complements GI sessions in the background to help individuals sustain a calm state, to free and keep the mind away from other thoughts (Roffe et al., 2005).

To sum up, MQ is an acceptable practice for cancer patients who are in active cancer treatment. It's swinging motion associated with providing tranquillity (Osypiuk et al., 2020). Therefore, it is understood that MQ can be integrated with GI. In fact, its applicability may be easier through GI among cancer patients particularly to tackle anxiety, hopelessness and self-efficacy related concerns (Cole, 2021).

5. MORE INSIGHTS ABOUT SELF-EFFICACY AND HOPEFULNESS AMONG WOMEN WITH BREAST CANCER

'Self-efficacy' is defined as a belief that an individual can control difficult environmental necessities by acting decisively to adjust to the situation (Bandura et al., 1999). According to Bandura et al. (1999), individuals with high self-efficacy possess the confidence to effectively manage and control stressful situations, leading to reduced stress levels and improved well-being. Consequently, this suggests that breast cancer patients should develop self-efficacy skills.

A growing body of evidence in the current literature demonstrates that the notion of self-efficacy and hopefulness plays a role in mental health (Hu et al., 2013). Tahmassian and colleagues stated that hopefulness, self-efficacy, depression, as well as anxiety are significantly related (Tahmassian & Moghadam, 2011). It is not surprising that self-efficacy was positively associated with active coping while negatively associated with passive coping approaches, for example self-blame and behavioural detachment (Rottmann et al., 2010). On the other hand, it was reported by Duggleby et al. (2014) that the absence of hope has been equally related with psychological discomfort, and anxiety among oncology patients (Revier et al., 2012). Therefore, delivering a psycho-oncological intervention, which targets to alleviate the psychological impact, such as hopelessness, anxiety and decreased self-efficacy caused by cancer treatment (Wolanin, 2021) are highly crucial aspects of integrated and holistic breast cancer care (Jacobsen & Wagner, 2012). In fact, reduced hope may result in decreased self-efficacy (Duggleby et al., 2014).

Moreover, it has been identified that self-efficacy is a main predictor of self-care attitude for chronic disease management such as cancer (Hu et al., 2013). According to findings from exploratory analysis of factors of self-efficacy, individuals who had higher self-efficacy had a

better health condition and lower psychological distress (Cross et al., 2006). Further, self-efficacy can be improved by enabling patients' skills of critical thinking, being independent and taking responsibility for self-management choices (Altshuler et al., 2016). Life altering events, such as a cancer diagnosis may have an influence on individuals' self-concept, their relationships, and values. This can lead to reforming one's life priorities as the person aims to attain a better and healthier life (Rettger et al., 2015). It should be known that patients might use self-efficacy as an internal resource for coping during the cancer illness trajectory (Shen et al., 2020).

According to Vadaparampil et al. (2017) self-efficacy level varies at a low to moderate level among breast cancer patients. Indeed, in order to improve quality of life self-efficacy can act as a shield to protect patients from stressful life events that include receiving a breast cancer diagnosis. Cancer disease management and illness adjustment related challenges can be controlled better through self-efficacy which may lead to better quality of life (Merluzzi et., 2019; Chirico et al., 2017). For instance, concepts such as self-efficacy will assist patients to live a meaningful life by overcoming cancer related emotional difficulties, and fatigue (Taylor, Lyubomirsky & Stein., 2017; Marszalek et al., 2017). Additionally, body image and sexuality concerns are common among women with breast cancer, and self-efficacy in the concept of self-care should be addressed and then improved to enable them to better manage these problems. Uncertainty plays a role in self-efficacy, in other words, self-efficacy might be impacted by unknown or unfamiliar circumstances which may cause patients to feel loss of control over their own lives (Zhang, Kwekkeboom & Petrini, 2015). This may be exacerbated due to the duration of breast cancer treatment procedures and have direct influence on self-efficacy. In fact, Arıkan et al. (2020) reported higher sexual functioning and self-efficacy among women with breast cancer who did not receive radiotherapy.

Mindfulness interventions often integrate relaxation techniques which have been used as a non-invasive procedure to improve self-efficacy of cancer patients (Masmouei et al., 2019). In fact, Kumar & Bhardwaj (2017) suggested that muscle relaxation might enhances patient's sleep hygiene. Therefore, better sleep quality may positively correlate with the reduction of oncological treatment induced side effects; muscle relaxation technique provides calmness and enhancement in one's quality of life, which might result in better self-efficacy for the cancer patient (Masmouei et al., 2019).

In the literature, there is one frequently used definition for hope given by Dufault and Martocchio (1985) that, "a multidimensional and dynamic life force characterized by a confident yet uncertain expectation of achieving a good future, which is realistically possible and personally significant". Interventions targeting for stress in breast cancer patients are highly crucial, since the research suggests higher levels of perceived stress means patients will be more likely to experience low levels of hope (Abdollahi et al., 2019). Hope is important in all phases of cancer patients starting from its diagnosis, might extend for 5 years into survivorship (Robinson et al., 2013) to terminal stages (Nierop-van Baalen et al., 2019). Van Oers and Schlebusch (2021) stated that, during the adjustment process many cancer patients experience higher level of hopelessness. However, Akyuz et al. (2019) believe that the main cause of hopelessness may result from the uncertainty of their disease progression. It should be noted that, hopelessness can be triggered by various reasons for women with breast cancer, such as receiving the cancer diagnosis itself, fear of mastectomy and social devaluation (Holst-Hansson et al., 2017; Mansano-Schlosser et al., 2017).

Personal appraisal and coping mechanisms have direct association with hope which can be considered as an important resource particularly in the event of stressful or life-threatening situations (Shen et al., 2020). According to Chirico et al. (2017) and Xia et al. (2018) in order to better cope with the cancer diagnosis hope is a necessity which empowers confidence. Breast cancer patients who receive hope oriented psychological interventions tend to have a better quality of life even during oncology treatments (Shen et al., 2020; Berg et al., 2020).

A systematic review conducted by Nierop-van Baalen et al. (2020) stated that the concept of hope is closely related with quality of life, spiritual wellbeing, and social support. Indeed, their results indicated hope may assist alleviating oncological treatment burden, stress, and low mood regardless of their demographic and clinical variables. Although hope is positively related with higher spirituality and religious upbringing among women with breast cancer (Sharif et al., 2021), Barton et al. (2018) discovered that patients who did not report for spiritual or religious beliefs still maintained sense of hope for their life. In fact, some religious views among breast cancer patients might hinder of being hopeful, such as that cancer illness was a punishment from God (Tabrizi et al., 2016). Yet other religious beliefs may consider the illness as a method of cleansing from their sins (Baeke et al., 2012) which potentially increase the level of hope. Therefore, religious beliefs should not be generalised among breast cancer patients for hope and should be evaluated on a case-by-case basis.

Hope is considered as a dynamic force that we all experience from time to time, although it is not a permanent condition it strengthens one's adaptation to the future, motivates them to be interested in the future and life, and allows them to have a positive outlook on life (Kavradim & Özer, 2014). On the other hand, hopelessness can be defined as an emotional state in which individuals have no options or interest to solve problems or to take-action for their wishes or

fulfil their goals respectively (Akyuz et al., 2019). Usually, patients feel more hopelessness in the beginning of their oncology treatment, and this could persist throughout the treatment trajectory, and even persist in the case of cancer recurrence or metastasis (Fekih-Romdhane et al., 2020). It is suggested that evaluation of hopelessness should not be neglected as it is found to be an important predictor of depression or other self-harm related behaviours (Baczewska et al., 2020). Furthermore, Gheihman et al. (2016) and McFarland et al. (2019) indicated that, it is highly important to identify and treat hopelessness, as it may have an impact in physiological symptoms of oncology patients and might result in delaying their medical treatment.

Hopelessness can be a result of body image concern among patients. Wu et al. (2021) reported that hopelessness is experienced more frequently among women who pay more attention to their body image. Further, women who had a bilateral mastectomy reported higher levels of hopelessness (Wu et al., 2021). In fact, gender is reported to be a determinant of hopelessness, as Religioni et al. (2020) and Şahin et al. (2013) disclosed that women showed a greater hopelessness score than men. Luo et al. (2022) suggested that women with breast cancer who receive psycho-oncological interventions that target hopelessness might show greater benefit in increasing hope. Systematic review conducted by Hernandez & Overholser (2021) suggested that hopefulness can be treated with psychotherapy in adult population. Indeed, Bauereiss et al. (2018) said, psycho-oncological interventions that target existential needs and concerns of oncology patients had a better impact in alleviating hopelessness. It is possible for women with breast cancer to open-up to their therapist about their negative thoughts and emotions in psychotherapy due to its provision of a safe environment (Chan, Wong, & Lee, 2019). Through psychotherapy, cancer patients might gain new perspectives and a better look-out for their illness therefore leading into the engagement of more positive goals (Luo et al., 2022), which therefore increase their level of hope.

Fekih-Romdhane et al. (2020) shown that there are multiple socio-psychological and physiological influences that are linked with hopelessness which was experienced by breast cancer patients such as sleep related concerns, and lack of perceived social support (Madani et al., 2018). It is reported in a longitudinal study of breast cancer patients before they had surgery conducted by Mansano-Schlosser, Ceolim & Valerio (2017) that, sleep quality and hope influence each other.

Another hopelessness determinants can be seen as marital status which can act as a social support system. Yet Sahin et al., (2013) reported, it showed perceived hopelessness scores were higher among married patients than those of single patients. This could be interpreted as married patients worrying more about their partners. Due to fears of their passing away should treatment not be successful, which may lead them to more feeling of hopelessness. However, more recent studies conducted by Tasan & Citlik-Saritas (2022) and Buursma et al. (2020) reported that hopelessness levels were observed more in single cancer patients than married patients, meaning that patients who have better social support system showed less hopefulness.

Certain age groups could be more vulnerable for hopefulness as a result study conducted by Tasan & Citlik-Saritas (2022) showed that hopelessness was reported more among the 34–49 age group of cancer patients. Further, several research indicated that the older the patients show more hopelessness (Serafini et al., 2020; Karakurt et al., 2018; Efstathiou et al., 2018). This may be due to the fact that older patient's resilience against cancer might be lower and physically their willingness to fight against cancer might be more difficult than younger patients, which may hinder them feeling more hopeful about their illness and living meaningfully (Tasan & Citlik-Saritas., 2022). Indeed, it is reported by Gillespie et al. (2007)

that resilience is highly related with self-efficacy and hope, which means the concept of resilience will be formed and developed by self-efficacy, and hope. Wu et al. (2021) stated that even though self-efficacy and hope are closely related with resilience, hope and self-efficacy should be assessed individually in the clinical setting when supporting patients with cancer.

The income level of cancer patients is reported also as a determinant of hopelessness (Tasan & Citlik-Saritas., 2022). Cancer patients with lower income showed a higher level of hopelessness. Karakurt et al. (2018) also said that cancer patients with more financial freedom reported less hopelessness (Religioni et al., 2020). The increase in financial burden resulting from cancer treatment may exacerbate the patients' level of hopelessness. Possibly, patients who feel hopelessness as a result of cancer related financial burden may have the urge to choose cheaper, different or alternative methods for their oncological treatments; yet hopelessness should not be accepted as a stand-alone reason for patients to choose complementary or alternative methods of treatment (Akyuz et al., 2019).

To sum up, coping with cancer can result in positive changes that can develop unexpectedly or be produced through appropriate psychological intervention which integrates hope and targets self-efficacy among breast cancer patients.

6. BIO-INDICATORS: HEART RATE (bpm) AND SATURATION LEVEL (SpO2)

Changes in Heart Rate (HR) in beats-per-minute (bpm) and blood oxygen saturation level (SpO2) can be accepted as bio-indicators of psychological discomfort and anxiety (Thayer et al., 2012; Trotman et al., 2019). During the mindfulness practice, imagining themselves in a calm place may play a role in the shift of HR (Lorca et al., 2019). Additionally, Xue et al. (2020) stated that, mindfulness interventions could have an impact in increasing blood oxygen the saturation level (SpO2) of patients. In fact, there are RCT studies which were conducted by Beng et al. (2019) and Ng et al. (2016) that used psychophysiological signs, such as blood oxygen saturation levels as an indicator for cancer patients' perceived stress and anxiety symptoms which were significantly diminished after a quick breathing-exercise based mindfulness therapy. Further, a study conducted by Mallorqui-Bague, et al. (2016) argued that there is an association between interpreting an event as stressful which potentially could be combined with changes in cardiovascular activity, for example an increasing heart rate – and increases in their anxiety level. Therefore, according to Thayer et al. (2012) mental health practitioners should regularly check the HR and SpO2 of the patients.

Finally, a patient's saturation (SpO2) levels and also their HR may become normalised and perhaps stabilised through regular mindfulness practice. In fact, patient's HR and SpO2 rates can be seen as an indication for changes in patient's anxiety and stress level.

7. MBST PROJECT: RATIONALE AND OBJECTIVES

Hopelessness, anxiety, stress and lack of self-efficacy often begins at the time of a cancer diagnosis, then continue during the treatment and persist into progression of the disease. Unlike other psychological concerns, there is no evidence-based immediate efficacious treatment of choice that specifically targets cancer related anxiety, stress, self-efficacy or hopefulness. This includes mindfulness, which often requires the cancer patient to attend regular and lengthy sessions to achieve modest results. Therefore, there is a need to develop new efficacious interventions that improve the psycho-oncological treatment lengths with the ability to overcome anxiety, hopefulness and stress as well as improve their self-efficacy. Mindfulness interventions, such as Mindfulness-Based Cognitive Therapy (MBCT) or Mindfulness Based Cognitive Behavioural Therapy (MBCBT), have been proposed as an effective technique for reducing anxiety and stress response to the cancer diagnosis. However, other studies discussed in the previous sections, showed that more research is needed to assess their efficaciousness for cancer patients. In fact, previous studies support the efficaciousness of using these techniques as a second-line intervention in breast cancer patients along with CT based interventions. Since it has been previously revised, women with breast cancer show high levels of hopefulness, health related anxiety and lower self-efficacy. Patients' experience of higher levels of anxiety and stress usually lead to fluctuations in their heart rate and drop in their saturation level. Therefore, one way to overcome this challenge could be to apply breathing exercise, yet this should be done by distracting the patient from their cancer illness related thoughts.

Women with breast cancer associate their diagnosis with uncertainty and often with death. Consequently, it is important to elaborate on patient’s unrealistic thinking patterns such as

cancer related death which potentially increase their anxiety and stress levels. However not every cancer patient is ready to talk about their fears and concerns. This makes it impossible to conduct CBT based therapies to confront their illogical and unrealistic thinking pattern at such times. Therefore, one possible technique would be to use GI techniques. However, GI techniques have important limitations, such as difficulty in maintaining visualisation during the intervention. For this reason, another possibility to confront the cancer related anxiety, stress and hopelessness could be by utilising MBST. This technique allows patients to distract their negative thoughts by GI with a swinging exercise which will be stimulated and integrated with their breathing. Such breathing exercise will directly influence patients' heart rate and therefore oxygen saturation level. For instance, its efficaciousness does not depend on the patient's ability to visualise. This is because breathing exercise directly distract patient's negative thoughts and by trying to focus on swinging exercise it will stimulate more conscious thinking pattern (Bahcivan, Estape & Gutiérrez- Maldonado, 2018).

The main novelty that MBST offers to combine GI with breathing exercise integrated with swinging motion which easily assist patients to distract them from negative thinking patterns.

i. First, it allows the patient to imagine themselves swinging in a peaceful environment.

ii. Second, MBST allows patients to follow the specific instructions which result in less thinking about the cancer related consequences, such as every time they imagine their swing goes up, patient physically takes a deep breath (taking breath will be actually done, not imagining), and when going down patient physically release their breath (releasing breath will be actually done, not imagining which combines GI and breathing exercise through swinging activity).

iii. Lastly, it allows a progressive increase or regulation of the saturation level (SpO2), as well as regulation of the heart rate (bpm).

The main objective of this research is to investigate the efficacy of this brief new mindfulness intervention called the Mindfulness Based Swinging Technique (MBST) among women with breast cancer who actively receive cancer treatment. It is expected that health related anxiety, stress and hopelessness symptoms will be lowered by MBST practice at a very short time, and therefore their self-efficacy will be improved. As a result, in overall, breast cancer patients will experience an improved emotional and cognitive response to the cancer diagnosis.

7.1. Hypotheses for the studies

The following hypothesis are set in relation to evaluate the immediate (1st study) and 8-week follow-up (2nd study) efficaciousness of MBST intervention among women with breast cancer for hopelessness, anxiety, depression, self-efficacy, oxygen saturation level, and heart rate.

Hypothesis for study 1.

- The 20-min long MBST intervention would immediately alleviate patient's anxiety and stress symptoms.
- The 20-min long MBST intervention would immediately increase patient's management of their chronic illness (perceived self-efficacy).
- The 20-min long MBST intervention would immediately boost patient's oxygen saturation level and slow down their heart rate.

Hypothesis for study 2.

- The 20-min long MBST intervention would have continuous efficaciousness, to alleviate patient's anxiety and stress symptoms at the 8-week follow up.

- The 20-min long MBST intervention would have continuous efficaciousness, this would increase patient's management of their chronic illness (perceived self-efficacy) at the 8-week follow up.
- The 20-min long MBST intervention would have continuous efficaciousness, which should boost patient's oxygen saturation level intensity and slow down their heart rate at the 8-week follow up.

8. PUBLISHED STUDIES

8.1. Article 1: The swinging effect intervention: CBT based guided imagery and breathing technique integrated with mindfulness therapy for cancer patients

Ozan Bahcivan[1,3], Tania Estape[2], Jose Gutierrez-Maldonado[3]

[1]OZ Psychological Consultancy, Izmir, Turkey; psikoonkoloji@yahoo.com

[2]Psycho-Social Oncology, FEFOC Foundation, Barcelona, Spain; testape@fefoc.org

[3]Department of Clinical Psychology and Psychobiology, University of Barcelona, Spain; jgutierrezm@ub.edu

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Year of Publication: 2018

There are number of effective evidence-based therapies used in treating common psychological symptoms such as sadness, emptiness, and irritable mood (Ogden, 2012). The Cognitive Behavioural Therapy (CBT) is the most well-known treatment option for common psychological disorders. Nonetheless, the CBT shows greater effectiveness when it is used in long term treatments (Hayes & Hofmann, 2017; Arch et al.,2017). This is one of its reasons that many practitioners use "third wave/generation" interventions, such as CBT in conjunction with other evidence-based therapies, particularly dealing with cancer patients (Hunot et al., 2010; Roth & Pilling, 2008). The Mindfulness based CBT (MBCBT) is one of the examples that is commonly used for patients who were presented with anxiety and depression symptoms. Further, mindfulness showed some promising results for increasing self-efficacy and its positive effect on cancer patients (Branstrom et al., 2010). Self-efficacy beliefs may affect perception of the situation; increased self-efficacy results in decreased anxiety among cancer patients (Williams & Rhodes, 2016; Mystakidou et al., 2013). Being in the present moment is one of the mindfulness therapy's fundamental principles. This is a common problem for many oncology patients, who tend to focus on negative aspects of their illness and ignore the world

around them (Ainuddin et al., 2016; Hoffman, Lent & Raque-Bogdan 2013). For this reason, it is important for practitioners to assist patients shifting their patient's focus. In fact, this will be possible by integrating the guided imagery into mindfulness technique (Chen et al., 2013).

On the other hand, excessive stress, anxieties, and obsessive thoughts may adversely affect heart rate and possibly oxygen saturation level of patients (Thayer et al., 2012, Bennett & Lengacher, 2008). The lower oxygen saturation may be one of the indirect causes of sleep disturbances, particularly among cancer patients. This urges the need of development of a comprehensive psycho-oncological clinical intervention which will enable practitioners to target anxiety, stress and oxygen saturation level. Considering that many oncology patients suffer from side effects of their cancer treatment, such as pain. However, it is possible to combat chronic pain using MBCBT in combination with breathing technique (Cusens et al., 2010). Therefore, this signifies the use of breathing technique integrated into MBCT to aid depression, anxiety and saturation level as well.

Since it has been proven with overwhelming evidence that combined/integrated mindfulness-based interventions are effective to alleviate some degree of depression, anxiety, hopelessness and increase self-efficacy. Consequently, a specific mindfulness approach can be designed by combining cognitive behavioural therapy integrated with guided imagery and breathing techniques called "the Swinging effect" for cancer patients against anxiety, depression, self-efficacy, hopelessness, and oxygen saturation.

The mechanism of the "Swinging effect": The directives will be given to patient/s to imagine themselves swinging in a green peaceful environment where they will face no harm but healing and full of wellness. Every time they imagine their swing goes up, patient physically takes a

deep breath (taking breath will be actually done, not imagining), and when going down patient physically release their breath (releasing breath will be actually done, not imagining (Fig. 2). Focusing on an action (swinging) will assist patients to shift their preoccupied thoughts to focus on the present moment. Considering breathing and relaxation techniques found to be effective in combating anxiety and depression symptoms (Brown & Gerbarg, 2012); by following the swinging motion, patients will synchronise and regulate their breathing to elevate some level of anxiety and depression symptoms respectively. Since the breathing will be regulated by allowing patient to take deep breaths; as a result, patients' oxygen saturation level will be at better pace and level. That way a guided imagery will be combined with breathing technique. Further, since there is a great support for utilising music therapies within oncology settings, as well as previous hypothesis supports the effectiveness of the music therapy (Bahcivan & Altundag, 2017; Lesiuk, 2016) a slow-instrumental classical music would be ideal while implementing the "the Swinging effect" technique to increase its possible effectiveness. It might be possible that the self-efficacy for managing chronic disease (Lorig et al., 1996), Spielberger State-Trait Anxiety Inventory (STAI) (Marteau & Bekker, 1992), hospital and depression scale (Zigmond & Snaith, 1983), emotion thermometer (Mitchell et al., 2010), Beck's hopelessness scale (Beck et al., 1974) could be used to assess this particular intervention's validation respectively.

It is hypothesised that the Swinging Effect intervention will assist cancer patient's management of their chronic illness (self-efficacy) and adherence to their medical treatment by increasing their hope about their treatment and alleviate anxiety and depression as well as increase patient saturation level and self-efficacy. Therefore, enabling patients to continue to their medical as well as psychological treatment will result longer life-span and better quality of life. It is known that mental health needs of cancer patients differ from people who do not suffer from a chronic

illness. As a result, it is anticipated that, this specific hypothesised intervention is for people who suffer from a chronic illness which will greatly contribute to the clinical health psychology practice and literature.

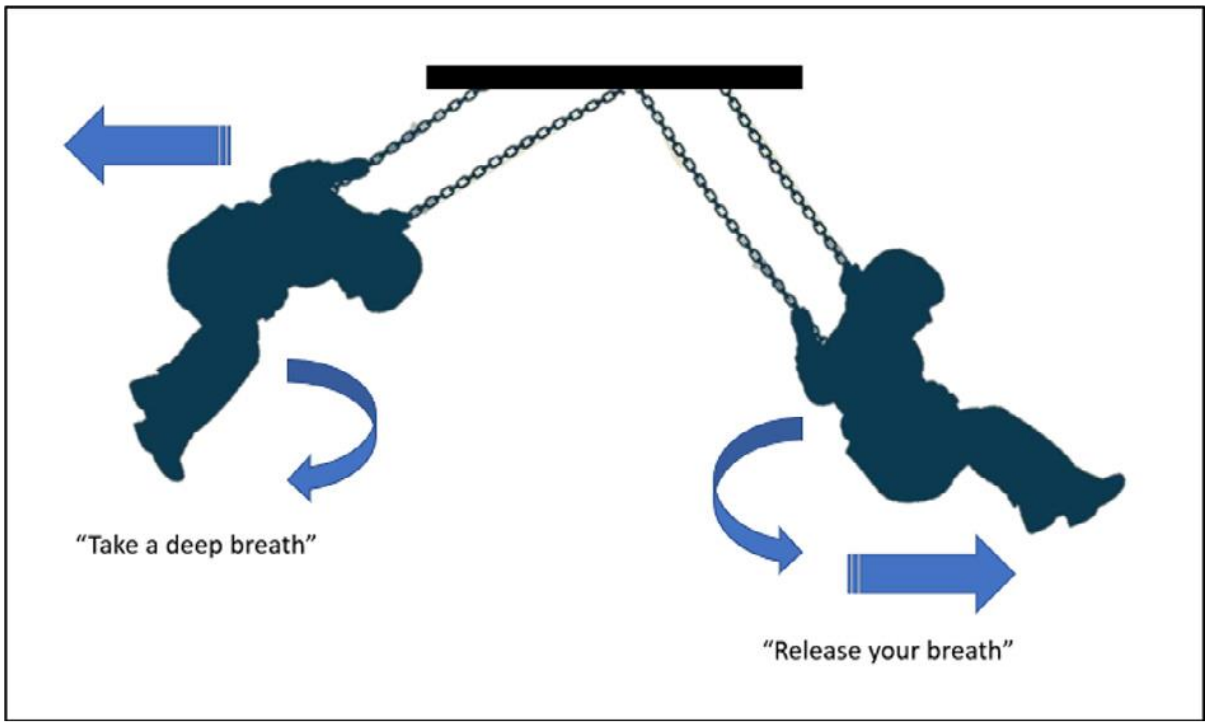

Figure 2. The Demonstration of Breathing Technique Integration into the "Swinging Effect" Intervention.

Conflict of interest
None.

8.2. Study 1 – Article 2: Efficacy of New Mindfulness-Based Swinging Technique Intervention: A Pilot Randomised Controlled Trial Among Women With Breast Cancer

Ozan Bahcivan[1,2], Tania Estape[3], Jose Gutierrez-Maldonado[2]

[1]Psiko-Onkologlar Dernegi (Turkish Psycho-Oncological Association), Izmir, Turkey; psikoonkoloji@yahoo.com

[2]Department of Clinical Psychology and Psychobiology, University of Barcelona, Spain; jgutierrezm@ub.edu

[3]Psycho-Social Oncology, FEFOC Foundation, Barcelona, Spain; testape@fefoc.org

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Abstract

Objective: Combining 3rd-wave-therapies with Cognitive-Behavioural-Therapy (CBT) has increased in recent years. Usually these therapies require longer sessions which therefore increases the psychotherapy drop-out rate for cancer patients for multiple medical reasons. This inspired intervention of a shorter 20 min-long mindfulness-therapy (MBST) to be developed for Breast-Cancer-patients (BC).

Method: This pilot randomised controlled trial was to assess the immediate-outcome of the MBST-intervention for its efficacy for BC-patients by using the Pearson Chi-square test, Fisher–Freeman–Halton exact test, and McNemar test for categorical variables; Mann–Whitney U and Wilcoxon test for the continuous variables. The Emotion Thermometer, State Trait Anxiety Inventory, Hospital Anxiety and Depression Scale, Self-Efficacy for Managing Chronic Disease, and Beck's Hopelessness Scale were used for measuring the intervention outcomes. One hundred seventy-three BC patients were randomly assigned in two-groups (equal-mean-age, $p = 0.417$). Control-Group (CG, $n = 82$) received cognitive-disputation-technique a form-of-CBT, and Intervention-Group (IG, $n = 74$) received MBST. The directives are given to IG: psychoeducation about Mindfulness, and to imagine themselves swinging-in a peaceful environment. When the patients imagine their swing going up, they physically take a deep-breath, and when going down they physically release their breath, and this process is repeated.

Result: Outcomes post-treatment showed significant higher-improvement in IG in all the assessed-measurements, with large-effect-size: anxiety ($p < 0,05$, $r = 0,67$) and depression-levels ($p < 0,05$, $r = 0,71$); anxiety-trait ($p < 0,05$; $r = 0,79$) reduced, it increases self-efficacy for managing-disease ($p < 0,05$, $r = 0,82$) as-well-as hopefulness ($p < 0,05$, $r = 0,61$) and saturation-level measured by pulse-meter/oximeter ($p < 0,05$, $r = 0,51$).

Conclusion: MBST is an efficacious intervention to reduce psychotherapy session time for immediate relief from clinical anxiety and hopelessness as well as increase self-efficacy and improve tranquillity for BC-women. It may have a particular clinical significance for supporting patient's adherence to treatment. Although in this pilot sample MBST was found to be effective for short-term-outcome, its efficacy for longer-term-outcome should be examined in future trials. Additionally, breathing laps can be increased possibly for a greater result on rise of saturation levels of patients.

Keywords: mindfulness, MBST®, breast cancer, self-efficacy, adherence to treatment, anxiety

INTRODUCTION

The most prevalent type of cancer among women in the world is breast cancer (Siegel, Miller, & Jemal, 2019; Bray et al., 2018), and it is no different in Turkey (World Health Organisation [WHO], 2020; Kilickap et al., 2017). Huang & Shi (2016) emphasised the fact that nearly 60% of patients with breast cancer reported high levels of anxiety and illness related stress (Youlden, Cramb, Yip, & Baade, 2014), yet 25.6% to 58% of the patients reported living with depression (Turon et al., 2019; Mitchell et al., 2011). Further, Duggleby et al. (2014) reported that lack of hope has been conversely associated with psychological distress, and anxiety among cancer patients (Revier, Meiers, & Herth, 2012). This may be because of the poor treatment adherence and a decrease in quality of life (QOL) that might lead to greater emotional distress (Baziliansky & Cohen, 2020; Riis et al., 2020; Schandl, Johar, Malberg, & Lagergren, 2018). Therefore, delivering a psycho-oncological technique, which aims to decrease the effect of cancer patients' emotional wellbeing, such as hopefulness and anxiety (Wolanin, 2021) are highly crucial fundamental aspect of integrated and holistic breast cancer care (Jacobsen & Wagner, 2012).

There are several interventions that support women with breast cancer to be able to manage physical and psychological negative effects throughout the diagnosis and treatment process (Wellisch, 2021; Fisher et al., 2019; Salsman et al., 2019). It has been stated by a number of studies that most cancer patients are interested in trying different adjunct techniques for several reasons, such as reducing stress, improving the immune system, or better spiritual upbringing (Bahcivan & Moss, 2018; Rehse & Pukrop, 2003). A growing body of evidence in the current literature has demonstrated that psycho-oncological interventions play an efficient role for cancer patients in enhancing their coping skill (Richardson, Schüz, Sanderson, Scott, & Schüz, 2017), self-efficacy skills (Merluzzi et al., 2019) and decreasing stress and emotional

discomfort (Wellisch, 2021). Self-efficacy is defined as the confidence needed to be able to accomplish difficult tasks or to handle challenging situations (Bandura, 2013). Additionally, the reduced hope was positively related to mood (Rottmann et al., 2010) psychological adaptation (Pourhosein & Farsham, 2021), emotional (Grealish et al., 2019), physical (Hoffman et al., 2009), and social wellbeing (Grealish et al., 2019) among a mixed group of people with cancer.

According to Kapogiannis, Tsoli, & Chrousos (2018), and Palesh et al. (2018), psychosocial treatment could be an option among cancer patients for tackling the side effects of cancer treatment. A large body of evidence has shown the success of Cognitive Behavioural Therapy (CBT); hence it is a highly suggested primary choice of psychological therapy approach in treating depression (Vanzeler, 2020; NICE, 2009). Nonetheless, the CBT shows greater effectiveness when it is used in long term treatments (Hayes & Hofmann, 2017; Arch et al., 2012). Therefore, Sperry & Binensztok (2019) strongly recommended the adaptation of ultra-brief interventions, such as cognitive disputation (CD) technique which can be delivered in 10 to 20 minutes. This is particularly applicable to patients who suffer from a chronic illness. The CD technique which is a form of CBT (CBT-CD) aims to support patients to understand their own thoughts and emotions as just assumptions, but not interpret them as facts, this therefore potentially results in decreased anxiety and increased coping (Sperry & Sperry, 2017). This may be one of the reasons why many practitioners use CBT integrated with other evidence-based interventions, such as “third wave/generation” therapies, particularly for cancer patients (Aksan, 2021; Hunot et al., 2010).

One of the well-known third wave approaches is considered as Mindfulness-Based Cognitive Therapy (MBCT) (Querstret, Morison, Dickinson, Cropley, & John, 2020; Garland et al.,

2014), and Mindfulness-Based Stress Reduction (MBSR), which has been proven to have a reducing effect on distress as well as increasing psychological health for both non-cancer (Querstret et al., 2020), and cancer patients (Tang, Hölzel, & Posner, 2015) including favourable changes to cerebral blood flow which results in reduced anxiety (Monti et al., 2012). Additionally, Mindfulness Based Swinging Technique (MBST) (Bahcivan, Estapé, & Gutierrez-Maldonado, 2018) intervention combines a particular guided imagery for swinging activity inspired by *t'ai chi* and *qigong* motions. A systematic review conducted by Zimmermann et al., (2018), stated that several mindfulness interventions showed high acceptance rate for their effectiveness in regard to easing cancer patients' anxiety and depression symptoms. Mindfulness is described as being aware of the moment with no prejudice, in fact it can be seen as being an ability that can be learned by practising (Crane et al., 2020).

Implementation of guided imagery (GI) with mindfulness technique is considered as an inseparable practice (Walker et al., 1999) that increases QOL (Charalambous, Giannakopoulou, Bozas, & Paikousis, 2015). Visualisation is a complementary technique that is widely used (Gawain, 2016; Walker et al., 1999). This technique is easy, suitable, and not restraint of cancer patients' activity levels (Chen, Wang, Yang, & Chung, 2015). Research in the current cancer literature has proven that GI techniques enable breast cancer patients to relax, which has been shown to be beneficial in alleviating the adverse side effects of chemotherapy, such as sickness, vomiting, (Samami, Shahhosseini, Hamzehgardeshi, & Elyasi, 2021), anxiety and stress (Mahdizadeh, Tirgari, Abadi, & Bahaadinbeigy, 2019).

On the other hand, while transferring such skills to breast cancer patients; it is important to integrate imagery that promotes hope as it has a positive effect on patient's stress level.

Reduced hope may result in decreased self-efficacy (Duggleby et al., 2014). In spite of the fact that self-efficacy is not a fundamental part of mindfulness theory, it might still be good to take it into account as a possible mechanism (Bogosian, Hughes, Norton, Silber, & Moss-Morris, 2016). Mindfulness gives individuals the confidence in order to promote a 'non-striving' attitude, which can produce better decisions (Bogosian et al., 2016).

Previous randomised (AhmadiQaragezlou, Boogar, Asadi, & Vojdani, 2020; Compen et al., 2019) and non-randomised (Cheli, De Bartolo, & Agostini, 2020; Elimimian et al., 2020) mindfulness studies have demonstrated that cancer patients who received medical treatment displayed less symptoms of stress and psychological distress after mindfulness interventions (Branstrom, Kvillemo, & Moskowitz, 2012). Heart Rate (HR) in beats-per-minute (bpm) can be seen as a bio-indicator of psychological distress and anxiety (Thayer, Ahs, Fredrikson, Sollers, & Wager, 2012), that should be monitored regularly even by mental health practitioners. During the mindfulness practice, imagining themselves in a peaceful environment may play a role in the change of HR (bpm) (Lorca et al., 2019). Additionally, Xue et al. (2020) stated that, such interventions play role in increasing saturation level (SpO2) of individuals. In fact, RCT studies conducted by Beng et al., (2019) and Ng, Lai, Tan, Sulaiman, & Zainal (2016) used psychophysiological indicators, such as saturation level as an indicator for cancer patients' perceived stress and anxiety symptoms which were significantly lessened after a short duration of breathing-exercise based mindfulness intervention.

One of the common reported findings were that; the mindful practice results in weakening the amygdala in regard to its response for emotional (Lutz et al., 2014) and resting state (Desbordes et al., 2012), meaning a calmer emotional stimulation (Tang et al., 2015). Similarly, preliminary evidence in the current field suggests that prefrontal cortex can be activated by

meditation, and it could also arouse enhanced HR (bpm) (Xue et al., 2020; Nolan et al., 2005). Intervention that used deep breathing is efficient in decreasing the HR (bpm) among essential hypertension patients (Kaushik, Kaushik, Mahajan & Rajesh, 2006) and provides relief from chemotherapy induced nausea (Aybar, Kılıc, & Çınkır, 2020). Several research in the current field that had the intension to ease the symptoms experienced by cancer patients utilised relaxation techniques including qigong (Oh et al., 2012) and Progressive Muscle Relaxation (PMR) (Demiralp, Oflaz, & Komurcu, 2010

Medical Qigong (MQ) comprises movement, breathing and meditation (Will, 2013). MQ is practiced with various activities, such as t'ai chi in the area of supportive oncology research and practice (Oh et al., 2012; Jahnke, Larkey, Rogers, Etnier, & Lin, 2010). In fact, MQ practices has the capacity to decrease depression, anxiety, and complaints of fatigue (Sagaonkar & Pattanshetty, 2021). Due to the qigong practice, patients' who receive chemotherapy have shown development of better cognitive functioning (Oh et al., 2012). Will (2013) reported that MQ can be practiced by cancer patients during their treatment. This shows that, a repetitive movement of swinging motion has been linked with relaxation and calming (Osypiuk et al., 2020).

There were consistent findings from other randomised studies showing that there was an association between practicing mindfulness for 6 weeks (El-Deeb, El-Sheredy, & Mohammed, 2016; Lengacher et al., 2009) or 8 weeks (Carlson & Garland, 2005) and improvement in the symptoms of depression and anxiety. However, Tang et al. (2015) suggested that future research should focus on the length of the mindfulness interventions; the RCT study assessing the immediate efficacy of mindfulness practices are needed in the psycho-oncology literature.

In fact, Teo, Krishnan, & Lee (2019) recommended that shorter psychological interventions are more likely to assist patient's adherence to their medical treatment.

The primary purpose of our study was to investigate the efficacy of this short brand-new mindfulness intervention called the Mindfulness Based Swinging Technique (MBST) (Bahcivan, Estapé, & Gutierrez-Maldonado, 2018). The MBST intervention combines a breathing exercise and a particular guided imagery for swinging activity inspired by *t'ai chi* and *qigong* motions that could make it possible to support women with breast cancer; for combating their anxiety, stress as well as increase their self-efficacy and hope. It is hypothesised that; this intervention which is as-short-as 20-minutes will increase patients perceived self-efficacy and their hope about their treatment and alleviate anxiety as well as increase patient's oxygen saturation (SpO_2) level and decrease heart rate (bpm).

MATERIALS AND METHODS

Design

This is a pilot randomised controlled trial to test the immediate efficacy of Mindfulness Based Swinging Technique (MBST). The term "immediate" refers to no follow-up analysis has been done, days or weeks after the MBST intervention, the only follow up has been done only immediately after the MBST. This trial registered at the U.S. National Library of Medicine Registry, *ClinicalTrials.gov identifier* NCT03985267. This pilot randomised controlled trial was conducted by closely following the *CONSORT* (Consolidated Standards of Reporting Trials) *2010 guidelines statement extension to randomised pilot and feasibility trials* (Eldridge et al., 2016) respectively. All patients included in this pilot study have signed an informed consent.

Participants

The study sample consisted of 173 women who met the following inclusion criteria: (a) women diagnosed with breast cancer, (b) who can consent, (c) native Turkish speakers, (d) currently under cancer treatment, score at least 16 points for Hospital Anxiety and Depression scale (8 for anxiety, 8 for depression), (f) score maximum 7 points for Self-Efficacy for Managing Chronic Disease (in overall), (g) score at least 4 points for the Beck's Hopelessness Scale (in overall), (h) score at least 40 points for State Trait Anxiety Inventory.

84 participants were allocated into a control group, and 89 participants allocated into an experimental group. There were 7 participants who discontinued the intervention from the experimental group. The discontinuation of the intervention means participants who completed the pre-tests but did not complete the MBST intervention. Yet, 10 participants from the control group lost-to-post-treatment. Lost-to-post-treatment means, participants who completed pre-tests and participated in the CBT-CD intervention but did not complete the post-tests (Figure 3). These total of 17 participants were not included in the analysis, and an additional drop-out analysis was not performed. In fact, participants who were included in the analyses completed all the required questionnaires. The participants were enrolled from March 2019 to August 2021, the intervention and the post-treatment periods began at the same time of the enrolment of the study.

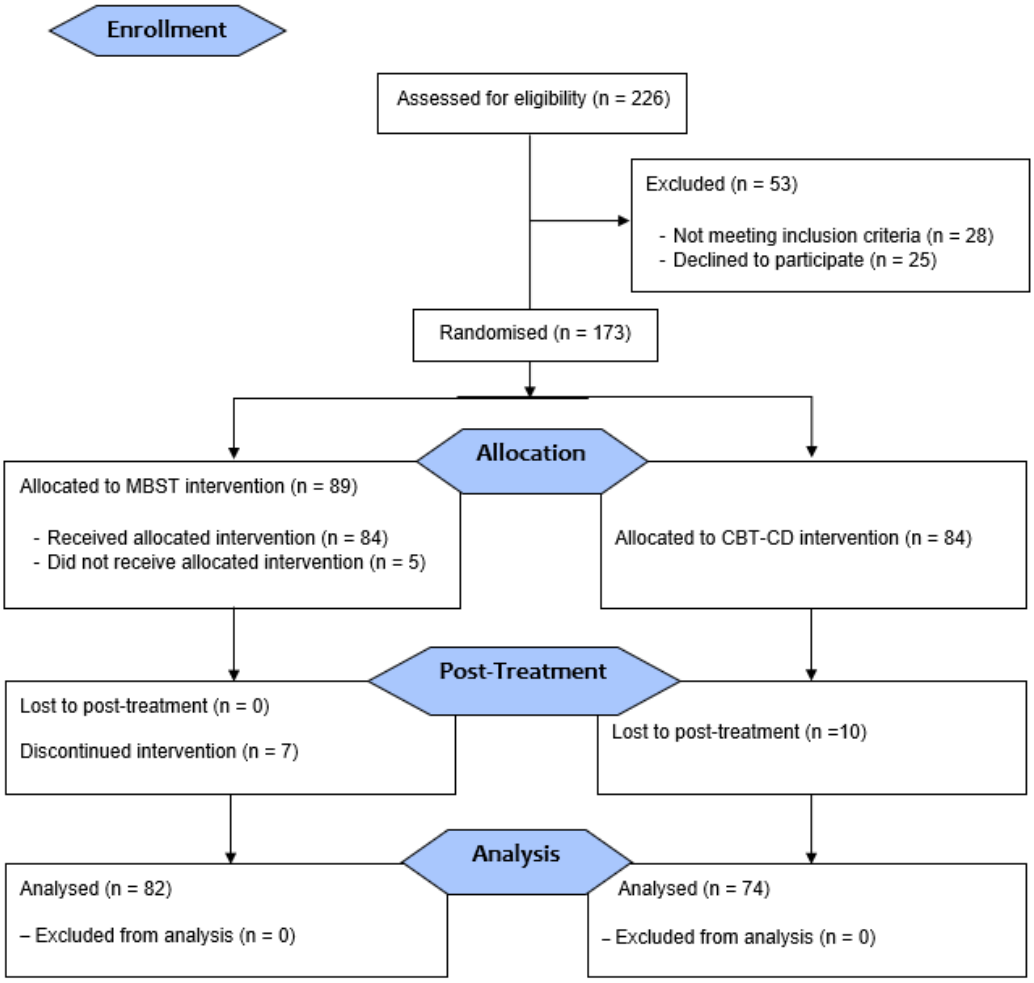

Figure 3. Flow Diagram Showing the Participants' Selection, Allocation and Post-treatment.

Intervention

The Mindfulness Based Swinging Technique (MBST) intervention was administered to the eligible participants right after the self-administered psycho-social assessment for 20minutes by the instructor. The MBST intervention session included a breathing exercise and a particular guided imagery for swinging activity as previously described (Bahcivan, Estapé, & Gutierrez-Maldonado, 2018). Additionally, a 5-minute brief psychoeducation about the nature of mindfulness, and instructions for the intervention were provided before the MBST intervention began by the instructor. Participants in the control group have taken the same self-administered psycho-social assessment but did not take part in the MBST, instead they received 20minutes

of CBT-CD which was formerly described (Sperry, & Binensztok, 2019; Horne & Watson, 2011). Further treatment protocol about CD is explained by Sperry & Sperry (2017). There was no time interval for participants' allocation and taking part in the intervention as it happened in the same day.

Intervention Instructor

The Mindfulness Based *Swinging Effect* Technique (MBST) intervention instructed and applied by a culturally competent researcher who is a professionally qualified and experienced *Health Psychologist* with an additional training in *"Mindfulness in Therapeutic Practices"* and *"Mindfulness Based Cognitive Behavioural Therapy".*

Outcome assessment

Participants were first randomised and then completed the psycho-social instruments about distress, anxiety, depression symptoms, self-efficacy, and hopefulness, as well as received measurements of heart rate (bpm) and oxygen saturation (SpO_2) level right before commencing the intervention, and right after completing the intervention. The questionnaires were self-administered at the hospital and psychological consultancy centre on both occasions.

Primary Outcome

Distress and Anxiety Symptoms

The Emotion Thermometer (ET) and State Trait Anxiety Inventory (STAI) were used for assessing the distress and anxiety symptoms. The ET developed by Mitchell, Baker-Glen, Granger, and Symonds (2010) which consists of 5-visual analogue scales that measure four emotional domains including distress, anxiety, depression, anger and one outcome domain which is "need for help" utilised among cancer population. Each of the four emotional area

scales is rated from 0 (none) to 10 (extreme). Mitchell et al. (2010) found an optimal balance between sensitivity and specificity. Participants were requested to pick the number that best reflects their level of emotion.

The Turkish adaptation of ET was done by Bahcivan and Eyrenci (2018). The adaptation reported the overall Cronbach's alpha of .87. The optimal cut-off score of 4 for depression thermometer of ET, and 5 for both anxiety and distress thermometers of ET yielded the optimal sensitivity and specificity values (sensitivity scores: .86, .75, .73 and specificity scores: .70, .68, .67 respectively). They concluded that the scale is an acceptable and practical tool for psychological distress screening among cancer patients.

The STAI consisted of two 20-item subscales measures state anxiety and trait anxiety (Spielberger, Gorsuch, & Luschene, 1983). The STAI is self-administered on a four-point scale for each item, the patients were asked to indicate about how they feel for each of the 40 items. Each of the subscale score ranged from minimum 20 to maximum 80, the higher scores indicate the greater psychological anxiety. The internal consistency was .95. The Turkish adaptation of the STAI was done by Oner and Le Compte (1983). It is found to be a valid and reliable psychometric tool to use among patients. They indicated the internal reliability as .72, and test-re-test reliability as .86.

Secondary Outcomes

Depression Symptoms

Hospital Anxiety and Depression Scale (HADS) was used for assessing depression and anxiety symptoms. HADS was developed by Zigmond and Snaith (1983) consists of 14-questions and is used to measure detecting states of depression and anxiety in clinical settings. The validity

and reliability of the Turkish-language version were established by Aydemir, Guvenir, Kuey, and Kultur (1997). The items are scored on a Likert scale ranging from 0 (strongly disagree) to 3 (strongly agree). Measuring cut-off points of 8 for both anxiety and depression were used respectively to adapt the cultural norms (Miljanović et al., 2017). Many oncology settings use HADS instrument for its validity and reliability reasons (Clover et al., 2020).

Self-Efficacy

Self-Efficacy for Managing Chronic Disease (SEMCD) was used for assessing self-efficacy specifically targeting the management of chronic diseases. The 6-item version of the SEMCD was developed and validated by Lorig, Sobel, Ritter, Laurent, and Hobbs (2001). SEMCD consists of 10 sub-dimensions on a 10-point Likert-type scale "1" being the "not at all confident" and "10" being the "totally confident". The higher score indicates increase management in self-efficacy about their chronic disease. The 6-item version was adapted to the Turkish language and culture by Incirkuş and Ozkan-Nahcivan (2020). According to this study, they indicated the Cronbach alpha values for the reliability as .95 for the SEMCD-total score and reported that it is a reliable and valid tool for clinical practice among Turkish patients.

Hopefulness

Beck's Hopelessness Scale (BHS) was used for assessing hopefulness. The initial scale developed by Beck, Weissman, Lester & Trexler (1974), the internal consistency of their study found to be high with Cronb'ch's alpha being .85, this shows its reliability. The adaptation of the scale to Turkish language was performed by Durak & Palabiyikoglu (1994). According to the studies done, Cronbach alpha internal consistency coefficient of scale was .85, two-half reliability coefficient was .85 and test-retest reliability was .74.

Sample Size

The sample size was obtained during the study planning (see supporting information). The necessary subjects' numbers were determined as minimum of 45 for each group to be able to reject the null hypothesis that the population means of the experimental and control groups are equal with probability (power) 0,9. The Type-I error probability associated with this test of the null hypothesis is 0,05.

Randomisation, allocation, and concealment

The participants who met the eligibility requirements and signed the informed consent were randomly assigned either to the experimental (MBST intervention) or the control group (CBT-CD intervention) (Figure 3). The random allocation sequence and assigning as well as the eligible 81-participants from the EgeMed Hospital in Aydin, Turkey and 75-participants were recruited from Ozel Oz Psikoloji Aile Danisma Merkezi (Oz Psychology Family Counselling Centre) in Izmir, Turkey, then generated by authorised staff of the recruiting institution. The numbers represent the patients' admission sequence. Randomisation was performed through computer-generated list of random numbers. The study outcomes were assessed by self-administered questionnaires after the randomisation with the support from the researcher psychologist.

Statistical analysis

The results of this study were presented first by the sample descriptive, using mean and standard deviation for quantitative analysis, and frequencies for qualitative data (Table 1). The CONSORT guidelines were followed for describing the study flow (Figure 3). The dependence between the categorical variables were tested with the Pearson Chi-square test when the

prerequisites (the expected number of observations in each cell must be 5 or greater than) were met, and otherwise the Fisher-Freeman-Halton exact test was used. Comparison of pre- and post-categorical variables within the control and experimental groups were performed by McNemar test. Then, pre- and post-measurements were compared within each group (in the control and intervention groups themselves). McNemar-Bowker Test was conducted for categorical variables. Since the assumption of normality was violated for continuous variables, all were tested with Wilcoxon test. Scores of pre and post differences were then calculated (by subtracting the pre-measures from the post measures for each patient), and Mann-Whitney U was tested (or Kruskal–Wallis analysis of variance [ANOVA]) to see if there were any differences in the distribution of the differences. Spearman's rank order correlation was calculated for main variables. We used SPSS version 24 software packages to its statistical analysis and $p < 0.05$ was considered statistically significant. For multiple comparisons, Bonferroni correction was used to control the type I error rate (the significance level was determined by simply dividing the original significance level by the number of tests which was performed). In addition, *r* and *epsilon*-squared (ε^2) effect sizes were calculated for each interaction; Z values divided by squared root the number of observations and chi-square are divided by one minus the number of observations. Effect size of $r = 0.10 - < 0.30$ and $\varepsilon^2 = 0.01 - < 0.08$ are considered small, $r = 0.30 - < 0.50$ and $\varepsilon^2 = 0.08 - < 0.26$ are considered medium and $r \geq 0.50$ and $\varepsilon^2 \geq 0.26$ are considered large (Cohen, 1988).

RESULTS

The descriptive characteristics of the breast cancer patients are summarised in Table 1. There were not statistically significant ($p > .05$) differences between the intervention and control groups in terms of all demographic variables except the current city.

Table 1. Demographic data of the two study groups.

Variable	Control n (%)	Intervention (MBST) n (%)	*Total*	*p* value
Age (years)	52.92 (SD 9.62)	51.39 (SD 9.15)	52.29 (SD=9.18)	.417[a]
Marital Status				
Single	28 (37.8%)	25 (30.5%)	53	.333[b]
Married	46 (62.2%)	57 (69.5%)	103	
Current City				
Izmir	28 (37.8%)	52 (63.4%)	80	< .001[b]
Aydin	31 (41.9%)	12 (14.6%)	43	
Manisa	15 (20.3%)	18 (21.9%)	33	
Treatment Center				
Hospital	39 (52.7%)	42 (51.2%)	81	.853[b]
Psychological Consultancy Centre	35 (47.3%)	40 (48.8%)	75	
Living Status				
Alone	12 (16.2%)	15 (18.3%)	27	.732[b]
W/someone	62 (83.8%)	67 (81.7%)	129	
Education Level				
Elementary	13 (17.6%)	15 (18.3%)	28	.112[b]
High School	27 (36.5%)	42 (51.2%)	69	
Bachelor or higher	34 (45.9%)	25 (30.5%)	59	
Employment Status				
Employed	38 (51.4%)	30 (36.6%)	68	.063*[b]
Unemployed	36 (48.6%)	52 (63.4%)	88	
Smoking Habit				
Smoker	19 (25.7%)	23 (28.0%)	42	.739[b]
N/Smoker	55 (74.3%)	59 (72.0%)	114	
Learning Diagnosis				
1 month <	2 (2.7%)	4 (4.9%)	6	.060[c]
1-3 Months	14 (18.9%)	8 (9.8%)	22	
3-6 Months	15 (20.3%)	15 (18.3%)	30	
6 Months- 1year	20 (27.0%)	13 (15.9%)	33	
1 year >	23 (31.1%)	42 (51.2%)	65	
Metastasis				
Yes	41 (55.4%)	35 (42.7%)	76	.112[b]
No	33 (44.6%)	47 (57.3%)	80	

Note.
SD = Standard Deviation
HR = Heart Rate
a Mann-Whitney U test
b $\chi 2$ test.
c Fisher-Freeman-Halton exact test

Within the scope of the primary outcome of the pilot study, pre-and post-measurements scores (within groups), the pre-measurements scores (between groups), and the differences between pre and post measurement scores (between groups) were analysed. These results listed in Table

2 and 3. The pre-measurements of the groups are similar for most, with significant differences in three variables: *anxiety* (only STAI scores) and *need help* (ET) of the control group is higher than the intervention group, vice versa for self-efficacy level. Pre- and post- measurements were compared in both groups. The method in the control group (CBT-CD intervention) has no significant effect on SpO_2 level, HADD scores, and depression level (ET). On the other hand, there was significant difference between pre and post-tests for all variables in the MBST intervention group. In addition, the post-test scores of the groups were compared, it was seen that, there were significant differences between control and intervention groups. A similar difference was also seen in the categories of the hope variable in favour of the experimental group (Table 2).

Table 2. Frequency for hope and comparing the control and intervention groups.

Variable	Control n(%)	Intervention (MBST) n(%)	*Total*	*p* value
Hope (pre)				
Hopeful	8 (10.8%)	10 (12.2%)	18	.421[a]
Hopeless	30 (40.5%)	25 (30.5%)	55	
Unsure	36 (48.6%)	47 (57.3%)	83	
Hope (post)				
Hopeful	21 (28.4%)	71 (86.6%)	92	< .001[a]
Hopeless	16 (21.6%)	3 (3.7%)	19	
Unsure	37 (50.0%)	8 (9.8%)	45	
The comparison pre- and post-measurements *p* value	< .05[b]	< .001[b]		

Note.
[a] χ^2 test.
[b] McNemar-Bowker Test.

Since pre-tests scores differed between control and intervention groups, the groups were compared with gain scores calculated by subtracting the pre-tests scores from the post-tests scores within each group to be compared (Hegde & Salvatore, 2021). As seen in Table 3, large,

significant differences were observed for the intervention group on HR (bpm), SpO_2 level, the distress level (ET), HADA, STAI, anxiety level (ET), HADD scores, depression level (ET), self-efficacy level, hopelessness level, and anger level. Only small, significant differences were observed on need help level (ET). According to these results, HR (bpm), anxiety, depression (for all depression measurements), hopelessness, anger and need help scores significantly decreased, SpO_2 and self-efficacy levels significantly increased in the intervention group compared to control group.

Table 3. Means (SD) and summary statistics (Mann-Whitney U and Wilcoxon test) for pilot study variables comparing control and intervention group across pre- and post-measures.

	Control Group				Intervention Group				Pre-measurement comparison		Post-measurement comparison		Gain Scores comparison	
	Pre	Post	Z†	r	Pre	Post	Z†	r	Z‡	r	Z‡	r	Z‡	r
	M (SD)	M (SD)			M (SD)	M (SD)								
HR (bpm)	94.43 (3.29)	92.65 (4.03)	-4.78*	0.39	94.21 (3.76)	85.98 (3.46)	-7.87*	0.61	-0.11	0.01	-8.55*	0.68	-8.98*	0.72
Oxygen saturation (SpO2)	94.50 (2.97)	94.60 (3.16)	-0.51	0.04	95.15 (2.48)	97.11 (1.85)	-6.73*	0.53	-1.46	0.12	-5.10*	0.41	-6.42*	0.51
DISTREES (ET)	6.30 (1.21)	5.26 (1.01)	-6.92*	0.57	6.28 (1.83)	2.72 (1.67)	-7.68*	0.60	-0.30	0.02	-8.56*	0.69	-8.19*	0.66
ANXIETY														
HADA	12.15 (2.39)	11.39 (1.69)	-3.70*	0.30	12.23 (3.01)	7.15 (3.06)	-7.69*	0.60	0.00	0.00	-8.19*	0.66	-8.42*	0.67
STAI	48.94 (5.24)	45.01 (6.05)	-5.82*	0.48	43.13 (5.16)	25.73 (5.88)	-7.79*	0.61	-4.48*	0.36	-10.51*	0.84	-9.83*	0.79
ANXIETY (ET)	6.28 (1.01)	5.51 (1.17)	-5.27*	0.43	6.50 (1.65)	3.01 (1.68)	-7.67*	0.60	-0.62	0.05	-8.40*	0.67	-8.60*	0.69
DEPRES.														
HADD	12.00 (1.80)	11.55 (2.17)	-1.95	0.16	11.26 (2.20)	6.49 (2.49)	-7.69*	0.60	-1.80	0.14	-9.42*	0.75	-8.91*	0.71
DEPRES. 2(ET)	5.72 (0.97)	5.65 (1.05)	-0.57	0.05	5.79 (1.57)	3.51 (1.43)	-7.27*	0.57	-0.17	0.01	-9.05*	0.72	-8.48*	0.68
SELF-EFFICACY	5.64 (0.77)	5.94 (0.79)	-5.93*	0.49	5.96 (0.89)	8.10 (1.27)	-7.87*	0.61	-2.32*	0.19	-8.95*	0.72	-10.22*	0.82
HOPELESNESS	10.08 (2.32)	8.81 (2.30)	-5.57*	0.46	10.51 (3.60)	6.02 (4.20)	-7.69*	0.60	-0.59	0.05	-5.23*	0.42	-7.60*	0.61
ANGER (ET)	5.78 (1.17)	5.49 (1.41)	-2.45*	0.20	5.18 (2.81)	3.09 (1.96)	-6.70*	0.52	-1.25	0.10	-7.11*	0.57	-6.58*	0.53
HELP (ET)	6.88 (1.36)	5.22 (1.67)	-5.52*	0.45	5.84 (2.58)	3.67 (2.09)	-7.39*	0.58	-2.60*	0.21	-4.95*	0.40	-2.06*	0.16

Note.
* $p < .05$
† Wilcoxon signed rank test
‡ Mann-Whitney U test

In order to test the first of secondary outcomes, correlations coefficient among the main variables separately for breast cancer patients in control and intervention groups were calculated in Table 4. As it can be seen for the intervention group's post measures, self-efficacy had moderate significantly negative correlations with two anxiety measures; HADA scores, STAI scores, hopelessness, and weak negative correlations with one of the anxiety measures; anxiety level (ET), and depression measurements; HADD scores and depression level (ET). In addition, moderate significantly positive correlations were found between self-efficacy and SpO_2 levels. Moreover, the correlation values for the intervention group in the last measurements increased in absolute value from the pre-test. Once the last measurements were compared with the control groups, the correlation values obtained for the intervention group were greater in absolute value.

Table 4. Spearman's rank order correlations of self-efficacy with hopelessness, anxiety, depression, and saturation level (SpO_2) among cancer patients.

			1	2	3	4	5	6	7
CONTROL GROUP	1. SELF EFFICACY	Pre	-						
		Post	-						
	2. HADA	Pre	0.29*	-					
		Post	0.05	-					
	3. STAI	Pre	-0.12	0.08	-				
		Post	-0.25*	0.01	-				
	4. ANXIETY (ET)	Pre	0.13	0.33**	0.24*	-			
		Post	0.19	0.32**	0.09	-			
	5. HOPELESNESS	Pre	0.16	0.14	0.16	0.25*	-		
		Post	0.18	0.56**	-0.09	0.45**	-		
	6. HADD	Pre	0.27*	0.31**	0.28*	0.14	0.13	-	
		Post	0.05	0.39**	0.12	0.03	0.11	-	
	7. DEPRESSION (ET)	Pre	0.21	0.03	0.23	0.31**	0.17	0.17	-
		Post	0.20	0.11	0.25*	0.35**	0.09	0.15	-
	8. SpO2	Pre	-0.06	0.01	0.14	0.30**	0.09	-0.05	0.32**
		Post	0.06	0.03	0.08	0.27*	0.12	-0.07	0.33**
INTERVENTION GROUP	1. SELF EFFICACY	Pre	-						
		Post	-						
	2. HADA	Pre	-0.39**	-					
		Post	-0.48**	-					
	3. STAI	Pre	-0.41**	0.23*	-				
		Post	-0.54**	0.31**	-				
	4. ANXIETY (ET)	Pre	-0.29**	0.34**	0.03	-			
		Post	-0.36**	0.39**	-0.02	-			
	5. HOPELESNESS	Pre	-0.17	0.16	-0.14	0.24*	-		
		Post	-0.48**	0.71**	0.41**	0.45**	-		
	6. HADD	Pre	-0.26*	0.55**	0.27*	-0.04	0.1	-	
		Post	-0.30**	0.49**	0.17	0.22	0.43**	-	

7. DEPRESSION (ET)	Pre	-0.25*	0.36**	0.04	0.40**	0.01	-0.1	-
	Post	-0.38**	0.50**	0.1	0.43**	0.22*	0.47**	-
8. SpO2	Pre	0.26*	-0.08	-0.35**	-0.12	0.09	-0.26*	-0.05
	Post	0.45**	-0.30**	-0.17	-0.26*	-0.07	-0.24*	-0.42**

Note. * $p < .05$
** $p < .01$
Pre: Pre-measurement
Post: Post-measurement
ET: Emotion Thermometer
HADA: Hospital Anxiety and Depression Scale (Anxiety)
HADD: Hospital Anxiety and Depression Scale (Depression)
STAI: State Trait Anxiety Inventory
SpO2: Oxygen Saturation Level

In order to test the other secondary outcome; Kruskall-Wallis and Mann-Whitney-U test were used (see Table 5 and 6). For the control group, *education level*, *marital status*, *treatment centre*, *living arrangement* and *metastatic status* of the breast cancer patients had no significant impact on depression, anxiety, self-efficacy, and hopefulness except those two measurements of anxiety: STAI scores and anxiety (ET) for education level, STAI scores for *marital status* and self-efficacy for *metastatic status*. On the other hand, significant differences were found between the *time for leaning their diagnosis* scores on one of the anxiety measurements; HADA scores and all depression measures.

Table 5. The impact of demographic variables "a" on anxiety and depression scores, self-efficacy, and hopefulness.

	Education Level			Marital Status			Living Arrangement		
	$\chi^{2\dagger}$	ε^2	Post-hoc	$Z^{\ddagger}$	*r*	Post-hoc	$Z^{\ddagger}$	*r*	Post-hoc
Control Group									
ANXIETY									
HADA	0.41	0.00	-	-0.13	0.01	-	-0.21	0.02	-
STAI	13.21*	0.09	Hs < Bd	-2.55*	0.20	S > M	-0.65	0.05	-
ANXIETY (ET)	9.36*	0.06	Hs < Bd	-0.42	0.03	-	-0.06	0.00	-
DEPRESSION									
HADD	1.81	0.01	-	-0.09	0.01	-	-0.36	0.03	-
DEPRES. (ET)	3.73	0.02	-	-0.64	0.05	-	-0.37	0.03	-
SELF EFFICACY	0.44	0.00	-	-0.77	0.06	-	-1.34	0.11	-
HOPELESNESS	3.17	0.02	-	-0.61	0.05	-	-1.15	0.09	-
Intervention Group									
ANXIETY									
HADA	0.82	0.01	-	-3.78*	0.30	S < M	-3.72*	0.30	A < WS
STAI	2.79	0.02	-	-0.97	0.08	-	-0.24	0.02	-
ANXIETY (ET)	5.11	0.03	-	-3.73*	0.30	S < M	-3.14*	0.25	A < WS
DEPRESSION									
HADD	7.83*	0.05	Ps > Bd	-1.96*	0.16	S < M	-2.60*	0.21	A < WS
DEPRES. (ET)	23.31*	0.15	Ps < Hs,Bd	-1.49	0.12	S < M	-0.42	0.03	-
SELF EFFICACY	5.34	0.03	-	-5.29*	0.42	S < M	-3.82*	0.31	A < WS
HOPELESNESS	7.64*	0.05	Ps > Hs,Bd	-1.06	0.08	-	-2.20*	0.18	A < WS

Note. * $p < .05$
** Bonferroni corrected p value set at $p < 0.017$
† Kruskal-Wallis H test; ‡ Mann-Whitney U test
ε^2 Effect size for Kruskal-Wallis H test; *r* Effect size for Mann-Whitney U test
PS: Primary School; HS: High School; BD: Bachelor's degree
S: Single; M: Married
A: Alone; WS: With Someone

Table 6. The impact of demographic variables "b" on anxiety and depression scores, self-efficacy, and hopefulness.

	Treatment Centre			Time for learning their diagnosis			Metastatic Status		
	Z‡	*r*	Post-hoc	$\chi^{2\dagger}$	ε^2	Post-hoc	Z‡	*r*	Post-hoc
Control Group									
ANXIETY									
HADA	-0.38	0.03	-	20.28*	0.13	1-3 m < 3-6m, 6m-1y,1 y>	-0.63	0.05	-
STAI	-1.27	0.10	-	6.87	0.04	-	-0.36	0.03	-
ANXIETY (ET)	-0.11	0.01	-	3.77	0.02	-	-0.10	0.01	-
DEPRESSION									
HADD	-0.39	0.03	-	10.18*	0.07	1-3 m < 1 y>	-1.02	0.08	-
DEPRES. (ET)	-1.48	0.12	-	9.83*	0.06	<1 m > 6m-1y	-0.34	0.03	-
SELF EFFICACY	-0.60	0.05	-	4.03	0.03	-	-3.03*	0.24	Y > N
HOPELESNESS	-1.08	0.09	-	8.63	0.06	-	-0.41	0.03	-
Intervention Group									
ANXIETY									
HADA	-0.45	0.04	-	5.14	0.03	-	-1.74	0.14	-
STAI	-0.32	0.03	-	4.10	0.03	-	-1.20	0.10	-
ANXIETY (ET)	-0.34	0.03	-	13.71*	0.09	<1 m, 1-3m > 3-6m	-1.91	0.15	-
DEPRESSION									
HADD	-0.35	0.03	-	18.05*	0.12	1-3m > 3-6m, 6m-1y; 6m-1y < 1y>	-1.28	0.10	-
DEPRES. (ET)	-0.62	0.05	-	11.71*	0.08	<1 m < 6m-1y	-1.38	0.11	-
SELF EFFICACY	-1.07	0.09	-	23.94*	0.15	3-6m < 1-3m, 6m-1y, 1y>	-3.30*	0.26	Y < N
HOPELESNESS	-0.22	0.02	-	12.37*	0.08	3-6m < 1y>	-3.68*	0.29	Y < N

Note. * $p < .05$
** Bonferroni corrected p value set at $p < 0.005$
† Kruskal-Wallis H test; ‡ Mann-Whitney U test
ε^2 Effect size for Kruskal-Wallis H test; *r* Effect size for Mann-Whitney U test
<1 m: less 1 month; 1-3m: 1-3 month; 3-6m: 3-6 month; 6m-1y: 6 month – 1 year; 1y >: more than 1 year
Y: Yes; N: No

In the intervention group; depression, anxiety, and self-efficacy scores differ significantly according to *education level*, *marital status*, *treatment centre*, *living arrangement* and *metastatic status* of the breast cancer patients, but there are some exceptions: all measurements of anxiety for *education level*, STAI scores, depression level (ET) for *marital status*, STAI

scores and depression level (ET) for *living arrangement*, two measurements of anxiety; HADA scores and anxiety level (ET) for *metastatic status*. Furthermore, significant differences were found between *time for learning their diagnosis* for anxiety (except for HADA and STAI scores) and all the depression measurements. For hopelessness, education level, *time for learning their diagnosis* ($X^2(3) = 17.47$; $p < 0.05$; $\varepsilon^2 = 0.31$), and *metastatic status* have significant impact, except for *marital status* and *living arrangement*.

Acceptability of the Pilot Study

There are no significant differences between the centres (hospital or private clinic) where both MBST and CBT-CD were applied among breast cancer patients (p=.853). The MBST and CBT-CD can be applied to any breast cancer patients who are at the age of 18 and above (p>.05). The breast cancer patients who smoke also benefit from MBST (p>.05). The patients who learned about their cancer diagnosis within the 3-months of time showed greater results in efficaciousness for MBST than patients who learned about their diagnosis for more than 3-months. On the other hand, CBT-CD seems to be more efficacious for patients who learned their diagnosis for more than 3 months. Having any metastasis has no impact in conducting MBST nor CBT-CD for breast cancer patients (p>.05). In terms of acceptability rating for MBST intervention, the hope scores were increased by 74.4% (p<.001).

DISCUSSION

This is the first pilot randomised controlled trial examined the immediate efficacy of Mindfulness Based Swinging Technique (MBST). The current findings suggest that 20minutes long MBST intervention may have immediate efficacy for women with breast cancer. The "immediate" means there were no follow-up analysis has been done, days or weeks after the intervention, only immediately after it. The participants who received MBST reported

significantly reduced perceived stress, anxiety and depression scores, and increased hopefulness and perceived self-efficacy, which has similar outcomes with the earlier randomised (Shao et al., 2020; Compen et al., 2019; Lorca et al., 2019; Kenne-Sarenmalm et al., 2017) and non-randomised (Monti et al., 2012; Witek-Janusek et al., 2008) mindfulness studies, except MBST has a greater reduced length in intervention time.

Lemanne & Maizes (2018) claim that there are mixed findings regarding the usefulness of guided imagery for alleviating stress, anxiety, and depression in cancer patients (Redd, Montgomery, & Du-Hamel, 2001). The measurement tools which were utilised in this research have similarities with other psycho-oncological research, (Kenne-Sarenmalm et al., 2017; Montazeri, 2008) as these studies also employed HAD for measuring anxiety and depression scores among cancer patients. Gawain (2016) argue, there are still gaps in the literature in respect of the efficacy of relaxation and imagery techniques for comforting anxiety and depression symptoms among cancer patients. Fortunately, these techniques have been evaluated in the current pilot study, as we aimed to contribute to the efficacy of guided-imagery intervention among breast cancer patients. For this matter, the guided-imagery has been an integrated part of the MBST intervention (Bahcivan, Estapé & Gutierrez-Maldonado, 2018), which showed immediate efficacy for the abovementioned areas of psychological discomfort.

The CBT-CD was found efficacious in various levels between low to middle in Heart Rate (HR), anxiety, and hopelessness, whereas; the MBST had shown much higher immediate efficacy in these domains. Thus far, the CBT-CD has no immediate efficacy on depression symptoms, anger, and SpO2 level, whilst MBST had shown better immediate efficacy. Yet, it should be noted that, there is a greater chance that patients' attitude toward the intervention could have been an influence in order to make improvements in their overall mental health

(Lederberg, Greenstein, & Holland, 2015; Ledesma & Kumano, 2009). Nevertheless, pre-post comparison tests of the MBST results showed immediate efficacy in all domains including hopelessness, SpO2 level and HR (bpm). In fact, our results indicated that conducting the MBST in different centres had the similar efficaciousness.

Further, being hopeful can be explained as a psychosocial domain that quite possibly exists when the level of self-efficacy is high, and sorrow is low. This can be interpreted as hopefulness may influence physical and mental health in a positive way (Duggleby et al., 2014; Kabat-Zinn, 2011). The studies conducted by Duggleby et al. (2014), Merluzzi et al. (2019) favour our findings, as their results indicated that there was a positive correlation between patients' self-efficacy, level of hopefulness and being diagnosed with breast cancer (Merluzzi et al., 2019; Duggleby et al., 2014) therefore, these correlations could be seen as predictors in patient's general wellbeing for mental health professionals.

Unsimilar to CBT-CD intervention, the MBST intervention can be used at any time regardless of when the patients learn about their cancer diagnosis in order to reduce scores for their immediate depression and anxiety symptoms. However, in this pilot study, it has shown that CBT-CD seems to be superior, particularly for increasing self-efficacy and hopefulness of breast cancer patients regardless of when the patients learned about their cancer diagnosis. On the other hand, Rottmann et al. (2010) argued that education level can be considered as a predictor of socioeconomic status of patients. Meaning that, patients who have received better education showed higher self-efficacy and physical functioning (Rottmann et al., 2010). Furthermore, their results indicated patients who had a better education level perceive themselves more resilient in stressful situations and have better coping skills with stress compared to patients who received lower education. This supports Peuckmann et al., (2007)'s

findings which discovered that among Danish breast cancer survivors, low quality of life and shorter education were associated respectively. In fact, Schandl et al. (2018) concluded that, particularly female cancer patients who have received lower education may be more vulnerable in regard to have a better quality of life. However, in our pilot study the MBST found to be an efficacious intervention immediately in lessening the depression scores regardless of education level of the patients, yet CBT-CD only found to be an efficacious intervention for easing the anxiety symptoms for all educational backgrounds. In fact, it should be noted that, according to anxiety scores obtained from STAI measurement, both CBT-CD and MBST interventions support alleviation in trait and state anxiety. However, when compared to each other, MBST has proven itself to be superior to CBT-CD considering the state and trait anxiety of the patients within 20minutes of time. Grepmair et al. (2007) argued that therapist's general clinical and mindfulness-based experiences should be considered separately. This proposes that; the experience level of the therapist may have a direct or an indirect effect on participating patients' clinical outcome (Norcross, Pfund & Prochaska, 2013; Grepmair et al., 2007). Khoury et al. (2013) reported that many studies lack in providing information about the treatment moderator's professional background or the number of treatment moderators that were included in their study. However, in our pilot study the treatment moderator's professional and educational background, as well as mindfulness-based training transparently specified for better indication to the readers.

In terms of the physical measures, CBT-CD showed only for little immediate improvement for HR (bpm) and displayed no efficacy for SpO_2 level. This was explained by Ledesma and Kumano (2009), as one of the elements that could have caused a small mean effect size may be due to determining the physical measurements after a very short period of time from the post intervention. Some mindfulness studies included physical health measurements in their

research (Monti et al., 2006). Ledesma & Kumano (2009) stated that, there would be only a very small enhancement in the physical component, this might be due to the patients who are actively undergoing chemotherapy, radiotherapy, or different types of cancer treatment. Nevertheless, the MBST showed immediate better outcome for HR (bpm) and SpO_2 level amongst breast cancer patients.

The present pilot study offers several theoretical, practical, and clinical contributions to the emerging field of psycho-oncology practice. For example, women with breast cancer who are in active cancer treatment can benefit from MBST as their stress, and anxiety symptoms may be immediately alleviated in some levels. This is particularly significant, because psychological interventions that targets oncology patients usually requires longer and multiple sessions to see a noticeable results. Moreover, our research supports guided imagery technique which was inspired by *t'ai chi* and *qigong* motions as an efficacious method to be used in psycho-oncological practice which plays a role in closing the gap in the current literature. Additionally, the MBST not only supports psychological, but also aids physical wellbeing by increasing the SpO_2 level and taken part in regulating the HR (bpm) for women with breast cancer.

Limitations, Strengths, and Future Research Implications

This study has some limitations. First, patients' attitude toward a mindfulness intervention was not tested, and patients were still randomised regardless. Second, the therapist had multiple roles, such as implemented the intervention, administered the questionnaires, and analysed the data. On the other hand, the dropout rate was low in both the experimental and control groups, but lower in the experimental group as expected, since the MBST treatment was in a single session and lasted only for 20 minutes. This indicates the strength of the MBST intervention and shows its acceptability.

Since our results showed some promising immediate efficacy for one-on-one MBST among breast cancer patients, further research evaluating the MBST's long-term efficacy should be conducted for both in group and one-one-one sessions. In fact, during the COVID-19 pandemic, it will be particularly significant to increase online psycho-oncological techniques; therefore, the MBST should be evaluated for its efficacy as an e-health intervention in further research.

Ethics Statement

All procedures performed in studies involved in human participations were in accordance with the ethical standards of the Research Ethics Committee of Nigde University (Decision Number: 2018/14-01) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

CONFLICT OF INTEREST

The authors have declared that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

OB has made a substantial, direct, and intellectual contribution, TE and JG-M have equally supervised the entire work and approved it for publication.

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8.3. Study 2 – Article 3: A Single-Session Mindfulness-Based Swinging Technique (MBST) versus Cognitive Disputation (CD) Intervention Among Women with Breast Cancer (BC): A Pilot Randomised Controlled Study Examining the Efficacy at 8-week Follow-up

Ozan Bahcivan[1,2], Jose Gutierrez-Maldonado[2,] Tania Estape[3]

[1]Psiko-Onkologlar Dernegi (Turkish Psycho-Oncological Association), Izmir, Turkey; psikoonkoloji@yahoo.com

[2]Department of Clinical Psychology and Psychobiology, University of Barcelona, Spain; jgutierrezm@ub.edu

[3]Psycho-Social Oncology, FEFOC Foundation, Barcelona, Spain; testape@fefoc.org

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Abstract

Objective: Previously Mindfulness-Based Swinging Technique (MBST)'s immediate efficacy for overcoming psychological concerns has recently received empirical support, yet its longer-term efficacy needed to be evaluated among women with breast cancer. The objective of this study was to assess and report the efficacy of MBST intervention among breast cancer patients for hopelessness, anxiety, depression, self-efficacy, oxygen (SpO_2) intensity, and heart rate-beats per minute (HR-bpm) at an 8-week period.

Method: The State-Trait Anxiety Inventory, The Emotion Thermometer, Hospital Anxiety and Depression Scale, Self-Efficacy for Managing Chronic Disease, and Beck's Hopelessness Scale were used for assessing the intervention's outcome; 149 BC patients were randomly assigned into two groups (equal-mean-age, $p = 0.262$). The participants in the control group (CG, $n = 73$) received Cognitive Behavioural Therapy (CBT)-Cognitive-Disputation (CBT-CD) for 20 min, and intervention group (IG, $n = 76$) received MBST intervention. No additional psychological interventions were given between week-1 and week-8.

Result: Outcomes of the 8-week post-treatment follow-up exhibited significantly higher improvements in all evaluated-measurements for CG, and some for IG with large effect size in the following: anxiety (CG $p < 0.05$, r = 0.57; IG $p < 0.05$, r = 0.44) and depression levels (CG $p < 0.05$, r = 0.43). It increased self-efficacy for managing disease (CG $p < 0.05$, r = 0.49; IG $p < 0.05$, r = 0.41) and hopefulness (CG $p < 0.05$, r = 0.59; IG $p < 0.05$, r = 0.46), and saturation levels measured by pulse-meter/oximeter (CG $p < 0.05$, r = 0.49; IG $p < 0.05$, r = 0.32).

Conclusions: Both CBT-CD and MBST have been found to be efficacious interventions to shorten the psychotherapy duration for reducing clinical anxiety and hopelessness as well as increase self-efficacy for BC women. This may have a distinct clinical importance for supporting BC patient's adherence-to-treatment since CBT-CD could be an alternative technique to MBST as a brief intervention. In future studies, the effectiveness of MBST through adapting to virtual reality and other online delivery methods should be examined.

Keywords: mindfulness, MBST®, Mindfulness-Based Swinging Technique, cognitive disputation, breast cancer, anxiety, self-efficacy, adherence-to-treatment

INTRODUCTION

Cancer is accepted as one of the main global public health concerns and is listed as the second prominent cause of death (Siegel et al., 2021). In 2020, 2.3 million women were diagnosed with breast cancer with a total of 685,000 deaths worldwide (Sung et al., 2021). In fact, breast cancer is reported as the most prevalent cancer type among women, and the statistics are similar in Turkey (Kilickap et al., 2017; World Health Organisation, 2020). The coronavirus disease 2019 (COVID-19) adversely affected psycho-oncological and medical treatmentof breast cancer patients (Cheli et al., 2022). This is mainly because of the reduced access or temporary closure of health care facilities to avoid the spread COVID-19 (Yabroff et al., 2022) or patients delayed their psychological and physical treatment or/and check-ups due to their personality traits (Cheli et al., 2022). According to Ping et al. (2020), mental health professionals at research institutions primarily sought and developed brief psychological interventions to reduce patient's contact and hospital visit times during the pandemic. Studies in the current field demonstrated that 40–50% of patients with breast cancer were identified to have mental health disorders, which involved mood disorder, anxiety disorder, adjustment disorder, and mental disorders that were caused by medical conditions (Youlden et al., 2014; Sun et al., 2019). Therefore, providing effective psycho-oncological techniques to alleviate anxiety, stress, and hopelessness is highly desirable among breast cancer patients (Wolanin, 2021).

Kapogiannis et al. (2018) and Palesh et al. (2018) stated that psychosocial interventions can be utilised in order to ease the side effects of medical treatment of cancer. Yet, the mental and behavioural health clinicians came across various difficulties which needed extensive alterations in the area of health care, such as the duration of the psychotherapy session (Sperry & Binensztok, 2019). They stated that many individuals who need medical care also

had psychological conditions that were induced, worsened, or prolonged by their medical status which required a better treatment model. Therefore, longer and lengthy therapy sessions may not be practical for breast cancer patients who receive oncological treatments (Teo et al., 2019).

On the other hand, heart rate (HR) is largely under the control of peripheral nerve system activity during relaxation, activated by deep breathing (Palma et al., 2020). A study conducted by Mallorqui-Bague et al. (2016) argued that there is an association between interpreting an event as stressful that changes in cardiovascular activity, for example, increasing HR beats per minute (bpm) and the density of anxiety. Moreover, the results show that anxiety sensitivity is more common among females than males (Norr et al., 2015; Trotman et al., 2019). Therefore, HR may be considered as a suitable psychophysiological indicator to measure anxiety and stress (Lorca et al., 2019). There is a continuously growing body of literature on mindfulness that demands up-to-date reviews regularly for breast cancer population (Cifu et al., 2018).

Brief mindfulness-based interventions

There has been a great increase in the development of mindfulness-based interventions (MBI), which are still being developed even today, starting from the beginning of the 2000's (Van Dam et al., 2018). Mindfulness is a term covering a wide range of subjects that identify many practises, processes, and attributes. Mindfulness is mainly described concerning the content of attention, awareness, retention, and acceptance (Van Dam et al., 2018). Yet, Analayo (2019) stated that the definitions of mindfulness are subject to debate and are diverse. Contemplative traditions and scientific disciplines of psychology, medicine, and education are combined in mindfulness-based practises (Baer, 2019; Birtwell et al., 2019).

There has been a significant change in the period of MBIs in order to correspond with short training programs, which could consist of only four 20-min-long sessions (Zeidan et al., 2015). Shorter psychological treatments mean a reduction in health care expenses. Present psychotherapy protocols are prone to guide treatments concerning the best price in the treatment of anxiety disorders (Otto et al., 2012). Sanada et al. (2017) stated that utilising different mindfulness techniques, which involve short interventions and/or a 15-min recording of mindfulness- based exercise positively affects cancer patients significantly (Tang et al., 2015). These form crucial improvements in many health indicators (Lorca et al., 2019). Results indicated that MBIs provide multiple health benefits over a short period of time in clinical participants (Solhaug et al., 2019). These benefits include enhanced well-being and decreased depression, anxiety, stress, and burnout (Burton et al., 2017). There is some evidence that mindfulness interventions and medical disease management complete each other in treating individuals with physical illness by comforting psychological distress and improving wellbeing (Janusek et al., 2019; Russo, 2019; Zimmermann et al., 2020). Yet, individuals who were on the course of active cancer treatment had difficulty with mindfulness practise. This is due to the possible side effects of the treatment which resulted in fatigue, which made mindfulness practise more difficult (Toivonen et al., 2020).

According to a systematic review in mindfulness (Xunlin et al., 2020) as well as another systematic review in Tai Chi/qigong (Wayne et al., 2018) among cancer patients, it was found that there were remarkable enhancements in their anxiety and depression symptoms. The perceived stress and anxiety experienced among cancer patients are observed through saturation level (SpO2), which is considered as a psychophysiological indicator (Ng et al., 2016; Beng et al., 2019). In fact, a study conducted by Xue et al. (2020) indicated that after

breathing-based mindfulness practises, the saturation level (SpO2) increased among participants. Yet, it is noted by Carlson et al. (2014), taking individuals' choices into consideration plays a role in autonomous decision-making, allowing for higher perceived control when it comes to health results. This brings about the best efficiency of the intervention (Oberoi et al., 2021). According to Social Constructivist Theory (SCT), one gains knowledge by means of social and individual group interactions (Conrad & Barker, 2010). From the social constructionist point of view in regard to illness, increasing the patient's participation and decreasing apprehension, the content of their illness as well as diagnosis by including patient's personal and cultural background is important. Thus, patients' participation, apprehension, and effort in handling their diagnosis may be positively affected (Oberoi et al., 2021).

Brief cognitive behavioural interventions

Cognitive Disputation (CD) can be defined as a cognitive behavioural intervention, which aims to achieve aiding individuals in recognising their irrational thinking pattern by using logic (Sperry & Binensztok, 2019). The whole aim of the provider is to train the patient by disputing their illogical beliefs by adopting a logical approach so that the patient can confront their thoughts on their own. One way of doing this is through Socratic questioning, which is on the basis of Aaron Beck's cognitive therapy, which involves detecting logical errors or cognitive distortions; that can be helpful for disputing thoughts in a shorter duration (Overholser, 2011). Often, they could be challenging as they are acceptable and automatic, precise and distinct, as well as unusual and useless (Beck, 1979). Despite the fact that these thoughts can make one's life quite difficult, patients see these thoughts as logical and reasonable, although they lead to emotional and behavioural disruptions (Lam & Cheng, 1998; Akkoyunlu & Turkcapar, 2013; Sperry & Binensztok, 2019).

Thus, the purpose of this randomised pilot study was to follow-up on those results reported in Bahcivan et al. (2022), and further report on MBST's efficacy at 8 weeks. Therefore, it is hypothesised that; the 20-min long MBST intervention will aid patients' perceived self-efficacy by improving their hope in regard to their cancer treatment and lessen anxiety as well as boost their oxygen (SpO_2) intensity and slow down their heart rate (bpm).

MATERIALS AND METHODS

Design

This is a pilot randomised controlled study trial registered in the United States (U.S.) National Library of Medicine Registry, ClinicalTrials.gov *identifier* NCT03985267. This pilot randomised controlled trial was performed by carefully following the *CONSORT* (Consolidated Standards of Reporting Trials) *2010 guidelines statement extension to randomised pilot and feasibility trials* (Eldridge et al., 2016). All patients included in this pilot study have agreed and signed informed consent.

Participants

Inclusion criteria were applied to women participants with breast cancer in this study, which was previously published by Bahcivan et al. (2022): (a) women diagnosed with breast cancer, (b) who can consent, (c) native Turkish speakers, (d) currently under cancer treatment,(e) score at least 16 points for Hospital and Depression scale (8 for anxiety, 8 for depression), (f) score maximum 7 points for Self-Efficacy for Managing Chronic Disease (in overall), (g) score at least 4 points for Beck's Hopelessness Scale (in overall), and (h) score at least 40 points for State-Trait Anxiety Inventory.

Among those 173 eligible participants in week-1, 84 were allocated to control group, and 89 were assigned to the experimental group. The follow-up period was 8 weeks from the post-treatment period. After the 8-week follow-up, a total of 149 participants were included and analysed (Figure 4). A total of 82 participants completed the MBST intervention in week-1, 76 participants completed the 8-week follow-up. Since 85.4% of the participants completed the MBST intervention, the dropout rate was very low (14.6%). The participants were registered from March 2019 to August 2021.

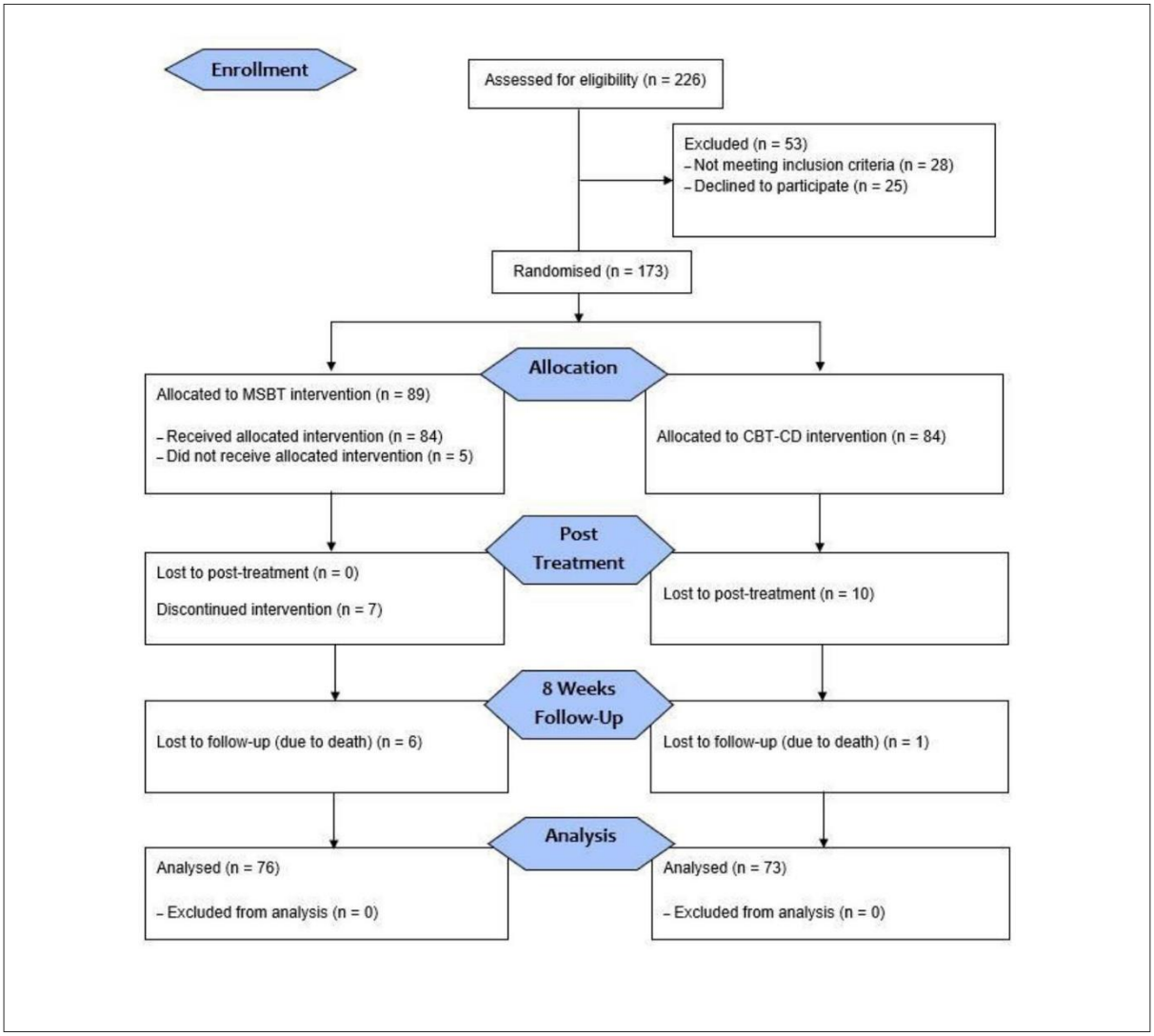

Figure 4. Flow Diagram Displaying the Participants' Selection, Distribution, Post-treatment, and Follow-up.

Intervention

The intervention called "Mindfulness Based Swinging Technique (MBST)" was applied by the instructor to the eligible participant's right after the psycho-social assessments which were approximately 20-min long. The MBST intervention period included a specific guided imagery for swinging practise and a breathing exercise as formerly explained (Bahcivan et al., 2018, 2022). Additionally, a brief psychoeducation about the nature of mindfulness and directives for the intervention was given for approximately 5-min by the instructor before the MBST intervention commenced. Participants carried out the same psycho-social assessment in the control group but did not take part in the MBST, instead they undertook 20 min of CBT-CD, which was previously described (Horne & Watson, 2011; Sperry and Binensztok, 2019; Bahcivan et al., 2022). The protocol of CBT-CD treatment is further described by Sperry & Sperry (2017). Since participants' allocation and taking part in the interventions happened on the same day, there was no time interval. After 8 weeks, the same participants from both groups were required to complete the equal follow-up psycho-social assessments, which were given in their initial participation but did not receive any of the above-mentioned interventions at this time.

Outcome assessment

The psycho-social measuring tools for anxiety, distress, self-efficacy, hopelessness, and depression symptoms were completed by the participants, as well as receiving measurements of heart rate (bpm) and oxygen saturation (SpO_2) level just before commencing the intervention, and just after completing the intervention. After 8 weeks from the initial participation, patients were invited once again to receive the same psycho- social assessments including measurement of heart rate (bpm) and SpO_2 level. All of the measuring tools were self- administered at the hospital and psychological consultancy centre on all occasions.

OUTCOMES

Distress and anxiety symptoms

Distress and anxiety symptoms were assessed by using the Emotion Thermometer (ET) and State-Trait Anxiety Inventory (STAI). The ET developed by Mitchell et al. (2010), which has 5-visual individual analogue scales that measure anxiety, distress, depression, and anger, and the final outcome domain called "need for help" was applied among cancer population; 0 (none) to 10 (extreme) ratings for each of the four emotional area scales were used. An optimal balance between specificity and sensitivity was found by Mitchell et al. (2010). Participants were asked to pick the best indicating number for their level of emotion.

Bahcivan & Eyrenci (2018) adapted the Turkish version of ET. The overall Cronbach's alpha of 0.87 was reported in their adaptation study. For depression thermometer, the optimal cut-off score was 4, and for anxiety and distress thermometers of ET, it was 5 for both which yielded the optimal sensitivity and specificity values (sensitivity scores: 0.86, 0.75, and 0.73 and specificity scores: 0.70, 0.68, and 0.67, respectively). The scale was found to be an acceptable and practical tool for psychological distress screening among cancer patients by Bahcivan & Eyrenci (2018).

The state anxiety and trait anxiety were measured by STAI, which consisted of two 20-item subscales measures (Spielberger et al., 1983). The STAI is self-administered on a four-point scale for each item, patients were required to indicate how they felt for each of the 40 items. The scores for each of the subscales ranged from a minimum of 20 to a maximum of 80, the higher scores suggest the greater psychological anxiety. An internal consistency was found to be 0.95. Oner and Le Compte (1983) adapted The STAI in Turkish language and culture. They found that STAI is a valid and reliable psychometric tool and appropriate for

the cancer population. The internal reliability was indicated as 0.72, and test–retest reliability was reported as 0.86.

Depression symptoms

The depression and anxiety symptoms were assessed by Hospital Anxiety and Depression Scale (HADS). Zigmond and Snaith (1983) developed the HADS that consisted of 14 questions. Aydemir et al. (1997) completed the Turkish adaptation studies for their validity and reliability. The scores ranged from 0 (strongly disagree) to 3 (strongly agree) on a Likert scale. The cut-off points of 8 for both anxiety and depression scores were used, respectively, to adapt to cultural norms (Miljanović et al., 2017). The HADS tool is commonly used in oncology settings for its validity and reliability reasons (Clover et al., 2020).

Self-efficacy

In order to assess self-efficacy, the Self-Efficacy for Managing Chronic Disease (SEMCD) scale was used. It is specifically designed to test for the management of chronic diseases. Lorig et al. (2001) developed and validated the 6-item version of the SEMCD. It consisted of a 10-point Likert-type scale with "1" being the "not at all confident" and with "10" being the "totally confident." The higher score suggests an increase in management in self-efficacy about their chronic disease. Incirkuş & Nahcivan (2020) adapted the 6-item version to the Turkish language and culture. The Cronbach alpha value for the reliability was reported as 0.95 for the SEMCD-total score and was found to be a reliable and valid tool for the clinical practise among Turkish cancer patients (Ozkaraman et al., 2019).

Hopefulness

To assess hopefulness, the Beck's Hopelessness Scale (BHS) was used. Beck et al. (1974) developed the initial scale, they found the internal consistency to be high with Cronbach's alpha being 0.85. Durak & Palabiyikoglu (1994) adapted BHS into the Turkish language. The Cronbach alpha internal consistency coefficient of scale was 0.85, two-half reliability coefficient was 0.85 and test–retest reliability was 0.74. According to Kavak Budak et al. (2021), BHS could be used among Turkish cancer patients.

Sample size

During the study planning, the sample size was calculated (see supporting information). A minimum of 45 participants for each group was determined for the necessary subjects' numbers to be able to reject the null hypothesis. The population means of the experimental and control groups are equal with probability (power) 0.9. The type-I error probability associated with this test of the null hypothesis is 0.05.

Randomisation, allocation, and concealment

Initially, the eligible participants signed the informed consent form and randomly registered either the experimental (MBST intervention) or the control group (CBT-CD intervention) (Figure 3). The registration and random allocation sequence, as well as the qualified 85 participants, were from the EgeMed Hospital in Aydin, Turkey, and 88 participants were recruited from Ozel Oz Psikoloji Aile Danisma Merkezi (Oz Psychology Family Counselling Centre) in Izmir, Turkey, then randomisation was generated by an authorised health care personnel from the recruiting centre. The numbers signify the patients' admittance sequence. Randomisation was completed through a computer-generated list of random numbers. The

study results were evaluated by self-administered questionnaires with the assistance of a researcher psychologist. The participants who lost to post-treatment were discontinued from the allocated intervention; this is due to their pre-existing medical discomfort. The 8-week follow-up procedure was conducted by re-inviting the participants *via* phone call which was provided in the initial intake by the participants. A total of 7 participants lost to follow-up due to death, reported by a next of kin of the patient.

Statistical analysis

This study is a continuation of the research conducted by Bahcivan et al. (2022). Although initially this study was carried out with a total of 156 patients (74 in control group, and 82 in intervention group) including pre-post comparisons results in the aforementioned research; while in this continuation study, it was carried out with a total of 149 patients (73 in control group, and 76 in intervention group) only who completed the follow up at 8 weeks. Therefore, the comparisons of pre- post and post-follow-up results are based on the completion of the 8-week point by the patients. The patient's characteristics in this current study were described with frequency and percentages. The Chi-square test was examined whether there was a difference among these categorical variables between the groups. In order to investigate the possible attrition bias, all surveys including psychometric questionnaires were compared to respondents who dropped out after baseline or the first follow- up measurement (n = 149) on all measurements included in this research.

Descriptive statistics (mean ± standard deviation) of both groups' pre-, post-, and follow-up test results were presented. For these repeated measures, in order to test intra-group differences among these repeated measures, the Friedman test was conducted since normality assumptions were violated. If this test indicated significant differences between the timelines,

post-hoc analyses were performed using the Wilcoxon signed- rank tests with the Bonferroni correction. Although T1 and T2 were compared over 156 patients in the first research conducted by Bahcivan et al. (2022), in this continuation study the comparisons were made over the remaining 149 patients who participated in the follow-up at 8 weeks. As a result, the differences in gain scores (calculated by subtracting the timelines scores of T2–T1, T3–T1, and T3–T2) between groups were tested using the Mann-Whitney *U* test. The SPSS 25 was utilised for running the analyses; 0.05 was used for the significance "*p"* values. The effect sizes were calculated (Kendall w for Friedman test, ε^2 for Kruskal–Wallis *H* test, and *r* for Wilcoxon and Mann–Whitney *U* test). The acceptable cut-off for effect size shown by "*w*" and "*r*" values is considered as small (0.10–<0.30), medium (0.30–<0.50), and large (≥0.50) effects. For ε^2, the values are considered as small (0.01–<0.08), medium (0.08–<0.26), and large (≥0.26) effects.

RESULTS

Participants' descriptive information can be found in Table 7. Intervention and control groups are of similar characteristics except for the *current city* ($p > 0.05$). In accordance with the main objectives of this study, pre (T1) post (T2) and follow-up (T3) scores were compared and analysed between each other (for intragroup). Later, each of the two measurement timelines was compared separately. The Friedman test found significant differences between these repeated measures in all variables with a generally large effect size for both control and intervention groups shown in Table 8 ($p < 0.05$). In the control group (CG), the *heart rate (HR), anxiety, depression, hopelessness, anger,* and *need help scores* had decreased; however, the *SpO2* and *self-efficacy* scores had increased from T1 to T2. Yet this trend is being maintained from T2 to T3. The *HR, anxiety, depression, hopelessness, anger,* and *need help* scores inclined from T2 to T3 (yet these scores were still lower when comparing with T1),

while the *SpO2* and *self- efficacy* scores had declined (yet scores were still higher when comparing with T1).

In order to test whether there were any significant differences, *post-hoc* comparison test was applied by using Wilcoxon test (see Table 8). Additionally, the descriptive statistics of the gain score and the Mann–Whitney *U* test results, which include the comparison of the groups based on the gain score, are presented in Table 9. T1 and T2 results were previously explained by Bahcivan et al. (2022). The comparison between T1 and T3 showed that the method (MBST) used in intervention group (IG) has a significant effect on *HR, SpO*2, *Hospital Anxiety and Depression Scale – Anxiety (HADA), ET (distress, anxiety, depression,* and *need for help)* except for *STAI, Hospital Anxiety and Depression Scale – Anxiety (HADD), ET(Anger)*; for the method (CBT-CD intervention) used in control group (CG) has a significant effect in all variables without any exception. Apart from the *HR* scores between 1T3 and T1, the overall progression was superior in the IG than in CG with small (*SpO2, distress, HADA, depression (ET), Self-efficacy, hopelessness;* $p < 0.05, 0.10 < r \leq 0.30$) and medium (*STAI, HADD, anger (ET),* and *need help*; $p < 0.05, 0.30 < r \leq 0.50$) effect.

Table 7. Demographic data of the two study groups.

	Control Group	Intervention Group		
Variable	*CBT-CD* $n = 73$	*MBST* $n = 76$	*Total*	*p* value
Age (years)	52.88 (SD 9.68)	51.22 (SD 8.68)	52.03 (SD=9.19)	.262[a]
Marital Status				
Single	28 (38.4%)	23 (30.3%)	51	.298[b]
Married	45 (61.6%)	53 (69.7%)	98	
Current City				
Izmir	28 (38.4%)	47 (61.8%)	75	< .001[b]
Aydin	31 (42.5%)	12 (15.8%)	43	
Manisa	14 (19.2%)	17 (22.4%)	31	
Treatment Centre				
Hospital	38 (52.1%)	39 (51.2%)	77	.913[b]

Psychological Consultancy Centre	35 (47.9%)	37 (48.7%)	72
Living Status			
Alone	12 (16.4%)	13 (17.1%)	25
W/someone	61 (83.6%)	63 (82.9%)	124
Education Level			
Elementary	13 (17.8%)	10 (13.2%)	23
High School	27 (37.0%)	41 (53.9%)	68
Bachelor or higher	33 (45.2%)	25 (32.9%)	58
Employment Status			
Employed	37 (50.7%)	28 (36.8%)	65
Unemployed	36 (49.3%)	48 (63.2%)	84
Smoking Habit			
Smoker	19 (26.0%)	22 (28.9%)	41
N/Smoker	54 (74.0%)	54 (71.1%)	108
Learning Diagnosis			
1 month <	2 (2.7%)	4 (5.3%)	6
1-3 Months	13 (17.8%)	8 (10.5%)	21
3-6 Months	15 (20.5%)	14 (18.4%)	29
6 Months- 1year	20 (27.4%)	13 (17.1%)	33
1 year >	23 (31.5%)	37 (48.7%)	60
Metastasis			
Yes	40 (54.8%)	33 (43.4%)	73
No	33 (45.2%)	43 (56.6%)	76

.732[b]	
.115[b]	
.089*[b]	
.690[b]	
.139[b]	
.165[b]	

Note.
SD = Standard Deviation
a Mann-Whitney U test
b $\chi 2$ test.

In comparison between T2 and T3, there were significant improvements in all variables except *STAI* and *ET (need for help)* for CG. However, for the IG, the *HR, anxiety, depression, hopelessness, anger,* and *need help* scores had increased; *SpO2* and *Self-efficacy* scores had decreased which was found to be significant ($p < 0.05$). When 1T3–T2 scores were compared between CG and IG groups, there were significant differences between all variables, and the improvement of CG compared to IG was statistically significant.

Table 8. Changes in study variables between control and intervention groups among repeated measures (pre, post, follow up).

Variables	Group	Pre test (T1) M (SD)	Post test (T2) M (SD)	Follow up (T3) M (SD)	Friedman test		T1 – T2 Wilcoxon test		T1 – T3 Wilcoxon test		T2 – T3 Wilcoxon test	
					χ^2	Kendall's W	Z	r	Z	r	Z	r

HR (bpm)	CG	94.45 (3.31)	92.75 (3.95)	91.40 (5.02)	24.73*	0.17	-4.67**	0.39	-5.14**	0.43	-2.50**	0.21
	IG	94.20 (3.86)	85.90 (3.42)	92.24 (4.23)	117.79*	0.78	-7.59**	0.62	-5.37**	0.44	-7.30**	0.62
SpO2	CG	94.53 (3.11)	94.66 (3.28)	96.48 (2.77)	47.85*	0.33	-0.60	0.05	-5.90**	0.49	-5.84**	0.48
	IG	95.21 (2.47)	97.13 (1.86)	96.25 (1.93)	52.60*	0.35	-6.38**	0.52	-3.90**	0.32	-3.78**	0.52
DISTRESS (ET)	CG	6.29 (1.22)	5.25 (1.01)	4.67 (0.83)	96.67*	0.66	-6.86**	0.57	-7.07**	0.58	-4.19**	0.35
	IG	6.26 (1.87)	2.71 (1.71)	5.28 (1.65)	120.38*	0.79	-7.38**	0.60	-5.08**	0.41	-7.15**	0.60
ANXIETY												
HADA	CG	12.14 (2.40)	11.37 (1.69)	10.03 (2.63)	32.12*	0.22	-3.70**	0.31	-5.01**	0.41	-3.79**	0.31
	IG	12.25 (2.89)	7.08 (3.05)	11.58 (3.42)	114.54*	0.75	-7.44**	0.60	-2.55**	0.21	-7.18**	0.60
ANXIETY (ET)	CG	6.29 (1.02)	5.52 (1.18)	4.77 (0.89)	83.49*	0.57	-5.20**	0.43	-6.94**	0.57	-5.31**	0.44
	IG	6.54 (1.60)	3.01 (1.72)	5.53 (1.60)	123.78*	0.81	-7.37**	0.60	-5.41**	0.44	-7.09**	0.60
STAI	CG	49.02 (5.23)	45.17 (5.93)	43.94 (5.25)	45.38*	0.31	-5.72**	0.47	-5.77**	0.48	-1.76	0.15
	IG	44.99 (5.21)	25.79 (5.95)	44.45 (8.94)	104.05*	0.69	-7.50**	0.61	-0.15	0.01	-7.46**	0.61
DEPRES.												
HADD	CG	12.03 (1.80)	11.55 (2.19)	10.10 (2.56)	23.30*	0.18	-2.12**	0.18	-4.57**	0.38	-3.35**	0.28
	IG	11.28 (2.17)	6.50 (2.49)	11.15 (2.67)	113.90*	0.75	-7.44**	0.60	-0.71	0.06	-7.32**	0.60
DEPRES. (ET)	CG	5.73 (0.98)	5.66 (1.06)	4.97 (0.85)	46.74*	0.32	-0.57	0.05	-5.14**	0.43	-4.98**	0.41
	IG	5.79 (1.59)	3.46 (1.47)	5.43 (1.36)	105.02*	0.69	-7.01**	0.57	-3.13**	0.25	-6.87**	0.57
SELF-EFFICACY	CG	5.64 (0.77)	5.95 (0.79)	6.57 (0.93)	71.48*	0.49	-5.71**	0.47	-5.96**	0.49	-4.95**	0.41
	IG	5.96 (0.90)	8.11 (1.30)	6.49 (1.12)	121.44*	0.80	-7.58**	0.61	-5.05**	0.41	-7.21**	0.61
HOPELESNESS	CG	10.11 (2.32)	8.80 (2.31)	5.90 (2.16)	103.02*	0.71	-5.75**	0.48	-7.15**	0.59	-6.03**	0.50
	IG	10.58 (3.64)	6.07 (4.21)	7.96 (4.47)	82.17*	0.54	-7.44**	0.60	-5.69**	0.46	-3.98**	0.60
ANGER (ET)	CG	5.80 (1.18)	5.45 (1.39)	4.84 (0.96)	33.78*	0.23	-2.81**	0.23	-5.28**	0.44	-3.25**	0.27
	IG	5.16 (2.87)	3.09 (2.01)	5.01 (2.33)	72.23*	0.48	-6.36**	0.52	-0.96	0.08	-6.22**	0.52
HELP (ET)	CG	6.85 (1.35)	5.27 (1.60)	5.15 (0.94)	70.61*	0.48	-5.43**	0.45	-6.86**	0.57	-1.17	0.10
	IG	5.82 (2.66)	3.62 (2.15)	5.11 (2.10)	100.86*	0.66	-7.07**	0.57	-4.53**	0.37	-6.47**	0.57

Note.
* $p < .05$

** Bonferroni corrected p value set at $p < 0.017$
HR (bpm): Heart Rate (Beats Per Minute)

SpO2: Oxygen Saturation Level
HADA: Hospital Anxiety and Depression Scale (Anxiety)
HADD: Hospital Anxiety and Depression Scale (Depression)
DEPRESS: Depression
STAI: State Trait Anxiety Inventory
ET: Emotion Thermometer
Pre: Pre-measurement
Post: Post-measurement
Follow Up: Follow up measurement

In order to observe T3–T1 scores whether they differed statistically using the demographic data that were compared with the Mann–Whitney *U* and Kruskal–Wallis *H* tests from intra-groups (separately for CG and IG) (see Tables 8, 9). Significant differences were observed in *HR, SpO2, hopelessness,* and *anger* variables for both CG and IG in accordance with the *education level*. For *CG, HADA, HADD,* and *IG, STAI* variables were found to have significant differences. According to participants' *marital status,* there is a significant difference in CG only for *self-efficacy* scores. *Living arrangement and treatment centres* have no significant impact on any variables. According to *time for learning their diagnosis,* a significant difference was observed in *SpO2, HADD, hopelessness,* and *need help* variables for both CG and IG. In addition to these, the gain scores of *HR* and *HADA* in CG; the *distress, anxiety (ET),* and *anger* scores were found to have a significant effect on IG. Among those results which were found to be significant, the *distress* and *hopelessness* results for IG have a large effect size, whereas the other variables have a medium effect size. Finally, while *metastatic status* caused a significant difference only in *hopelessness* gain scores for CG, it caused a differentiation in *SpO2, distress, anxiety (ET), hopelessness,* and *anger* gain scores for IG. Of these scores, *anxiety, hopelessness,* and *anger* for IG had a medium effect size, while the others had a minor effect size.

Table 9. Descriptive Gain Scores and Comparison Gains Scores between control and intervention groups using Mann-Whitney U.

Variables	Pre/post-test comp.			Pre/follow up test comp.			Post/follow up test comp.		
	CBT	MSBT	Mann-Whitney U	CBT	MSBT	Mann-Whitney U	CBT	MSBT	Mann-Whitney U

	Δ(T2-T1) M (SD)	Δ(T2-T1) M (SD)	Z	r	ΔT3-T1 M (SD)	ΔT3-T1 M (SD)	Z	r	ΔT3-T2 M (SD)	ΔT3-T2 M (SD)	Z	r
HR (bpm)	-1.70 (2.76)	-8.30 (4.16)	-9.05*	0.74	-3.06 (4.29)	-1.96 (2.83)	-0.51	0.04	-1.36 (4.70)	6.34 (4.45)	-8.23*	0.67
SpO2	0.12 (1.25)	1.92 (1.73)	-6.05*	0.50	1.95 (2.07)	1.04 (2.14)	-2.43*	0.20	1.82 (2.15)	-0.88 (1.92)	-6.92*	0.57
DISTREES (ET)	-1.62 (1.00)	-0.99 (1.35)	-7.85*	0.64	-1.62 (0.99)	-0.99 (1.35)	-3.55*	0.29	-1.04 (0.77)	-3.55 (2.09)	-9.43*	0.77
ANXIETY												
HADA	-0.77 (1.55)	-5.17 (3.24)	-8.35*	0.68	-2.11 (2.97)	-0.67 (2.37)	-3.66*	0.30	-1.34 (2.84)	4.50 (3.41)	-8.59*	0.70
ANXIETY (ET)	-0.77 (1.09)	-3.53 (2.10)	-8.35*	0.68	-1.52 (1.00)	-1.01 (1.32)	-3.32*	0.27	-0.75 (0.97)	2.51 (2.02)	-9.65*	0.79
STAI	-3.85 (4.61)	-19.20 (6.41)	-9.56*	0.78	-5.08 (5.90)	-0.54 (7.72)	-4.09*	0.34	-1.23 (6.87)	18.66 (9.25)	-9.42*	0.77
DEPRES.												
HADD	-0.48 (1.73)	-4.78 (2.68)	-8.72*	0.71	-1.93 (3.07)	-0.13 (2.11)	-4.15*	0.34	-1.45 (3.32)	4.65 (2.74)	-8.73*	0.72
DEPRES. (ET)	-0.07 (0.96)	-2.33 (1.67)	-8.36*	0.69	-0.75 (0.98)	-0.36 (0.95)	-3.26*	0.27	-0.69 (0.94)	1.97 (1.51)	-9.26*	0.76
SELF-EFFICACY	0.31 (0.37)	2.15 (0.90)	-10.02*	0.82	0.93 (0.96)	0.53 (0.82)	-3.45*	0.28	0.62 (0.98)	-1.62 (1.17)	-9.15*	0.75
HOPELESNESS	-1.32 (1.32)	-4.51 (2.62)	-7.42*	0.61	-4.21 (2.80)	-2.62 (3.28)	-3.54*	0.29	-2.89 (2.97)	1.90 (3.66)	-7.11*	0.58
ANGER (ET)	-0.34 (1.15)	-2.07 (1.94)	-6.16*	0.50	-0.96 (1.29)	-0.15 (1.19)	-4.05*	0.33	-0.62 (1.46)	1.92 (1.85)	-7.63*	0.63
HELP (ET)	-1.58 (2.14)	-2.20 (2.25)	-2.16*	0.18	-1.70 (1.32)	-0.71 (1.22)	-5.01*	0.41	-0.12 (1.55)	1.49 (1.84)	-6.31*	0.52

Note.
* $p < .05$
HR (bpm): Heart Rate (Beats Per Minute)
SpO2: Oxygen Saturation Level
HADA: Hospital Anxiety and Depression Scale (Anxiety)
HADD: Hospital Anxiety and Depression Scale (Depression)
DEPRESS: Depression
STAI: State Trait Anxiety Inventory
ET: Emotion Thermometer
Pre: Pre-measurement
Post: Post-measurement
Follow Up: Follow up measurement

Table 10. The impact of demographic variables "a" on anxiety and depression scores, self-efficacy, and hopefulness (ΔT3-T1 scores).

Variables	Group	Education Level			Marital Status			Living Arrangement		
		$\chi^{2\dagger}$	ε^2	Post-hoc	$Z^{\ddagger}$	*r*	Post-hoc	$Z^{\ddagger}$	*r*	Post-hoc
HR (bpm)	CG	23.21*	0.32	Ps,Hs < Bd [b]	-0.66	0.08	-	-0.64	0.07	-
	IG	13.40*	0.18	Bd < Hs [b]	-0.48	0.05	-	-1.07	0.12	-
SpO2	CG	7.46*	0.10	Bd < Ps [b]	-1.67	0.20	-	-0.51	0.06	-
	IG	17.87*	0.24	Bd < Ps, Hs [b]	-0.28	0.03	-	-1.43	0.16	-
DISTREES (ET)	CG	2.11	0.03	-	-1.41	0.17	-	-1.14	0.13	-
	IG	15.24*	0.20	Bd < Hs [b]	-0.24	0.03	-	-0.13	0.01	-
ANXIETY										
HADA	CG	24.44*	0.34	Ps,Hs < Bd [b]	-0.95	0.11	-	-1.23	0.14	-
	IG	1.26	0.02	-	-0.53	0.06	-	-0.99	0.11	-
ANXIETY (ET)	CG	3.06	0.04	-	-0.69	0.08	-	-0.13	0.01	-
	IG	3.35	0.04	-	-0.52	0.06	-	-0.91	0.10	-
STAI	CG	4.54	0.06	-	-1.62	0.19	-	-1.13	0.13	-
	IG	9.59*	0.13	Hs < Bd [b]	-0.90	0.10	-	-0.98	0.11	-
DEPRES.										
HADD	CG	11.03*	0.15	Bd < Ps [b]	-0.44	0.05	-	-0.59	0.07	-
	IG	2.18	0.03	-	-0.37	0.04	-	-1.05	0.12	-
DEPRES. (ET)	CG	9.88*	0.14	Bd, Hs < Ps [b]	-0.73	0.09	-	-0.79	0.09	-
	IG	0.89	0.01	-	-0.62	0.07	-	-0.33	0.04	-
	CG	2.25	0.03	-	-2.51*	0.29	S < M [b]	-1.33	0.16	-

SELF-EFFICACY	IG	1.06	0.01	-	-1.36	0.16	-	-0.54	0.06	-
HOPELESNESS	CG	17.60*	0.24	Bd < Ps, Hs [b]	-0.13	0.01	-	-0.18	0.02	-
	IG	17.69*	0.24	Bd < Hs [b]	-0.03	0.00	-	-0.54	0.06	-
ANGER (ET)	CG	6.02*	0.08	-	-1.50	0.18	-	-1.16	0.14	-
	IG	9.46*	0.13	Bd < Hs [b]	-1.59	0.18	-	-0.77	0.09	-
HELP (ET)	CG	1.04	0.01	-	-0.55	0.06	-	-1.08	0.13	-
	IG	5.66	0.08	-	-0.96	0.11	-	-0.15	0.02	-

Note.
* $p < .05$
[b] Bonferroni corrected p value
[†] Kruskall-Wallis H test; [‡] Mann-Whitney U test
PS: Primary School; HS: High School; BD: Bachelor's degree
S: Single; M: Married
HR (bpm): Heart Rate (Beats Per Minute)
SpO2: Oxygen Saturation Level
HADA: Hospital Anxiety and Depression Scale (Anxiety)
HADD: Hospital Anxiety and Depression Scale (Depression)
DEPRESS: Depression
STAI: State Trait Anxiety Inventory
ET: Emotion Thermometer

Table 11. The impact of demographic variables "b" on anxiety and depression scores, self-efficacy, and hopefulness (ΔT3-T1 scores).

Variables	Group	Treatment Centre			Time for learning their diagnosis			Metastatic Status		
		$Z^{‡}$	r	Post-hoc	$\chi^{2†}$	ε^2	Post-hoc	$Z^{‡}$	r	Post-hoc
HR (bpm)	CG	-0.50	0.06	-	17.95*	0.25	(1 y>) < 1-3 m, 3-6m, 6m-1y	-1.48	0.17	
	IG	-0.90	0.10	-	9.31	0.12	-	-1.18	0.14	
SpO2	CG	-0.26	0.03	-	10.49*	0.15	-	-0.44	0.05	
	IG	-0.36	0.04	-	9.75*	0.13	-	-2.01*	0.23	N < Y
DISTREES (ET)	CG	-0.68	0.08	-	1.88	0.03	-	-0.03	0.00	
	IG	-0.25	0.03	-	22.67*	0.30	(<1 m), 1-3 m < (1 y>)	-2.54*	0.29	Y < N
ANXIETY HADA	CG	-0.32	0.04	-	13.34*	0.19	3-6m < (1 y>)	-0.59	0.07	
	IG	-1.52	0.17	-	6.02	0.08	-	-1.58	0.18	
ANXIETY (ET)	CG	-0.15	0.02	-	6.23	0.09	-	-0.51	0.06	
	IG	-0.49	0.06	-	18.70*	0.25	1-3 m < 3-6m, 6m-1y, (1 y>)	-2.65*	0.31	
STAI	CG	-0.10	0.01	-	3.73	0.05	-	-0.42	0.05	
	IG	-0.37	0.04	-	6.31	0.08	-	-0.75	0.09	
DEPRES. HADD	CG	-0.95	0.11	-	16.06*	0.22	(<1 m) < 6m-1y, (1 y>)	-0.52	0.06	
	IG	-0.42	0.05	-	9.67*	0.13	1-3 m < 6m-1y, (1 y>)	-1.57	0.18	
DEPRES. (ET)	CG	-1.01	0.12	-	0.58	0.01	-	-1.08	0.13	
	IG	-1.60	0.18	-	0.62	0.01	-	-1.39	0.16	
SELF-EFFICACY	CG	-1.22	0.14	-	9.02	0.13	-	-1.61	0.19	
	IG	-1.42	0.16	-	5.88	0.08	-	-0.50	0.06	
HOPELESNESS	CG	-0.40	0.05	-	14.02*	0.19	(1 y>) < 1-3 m	-2.23*	0.26	N < Y
	IG	-0.32	0.04	-	32.51*	0.43	(<1 m), 1-3 m < (1 y>)	-3.33*	0.38	Y < N
ANGER (ET)	CG	-1.40	0.16	-	6.69	0.09	-	-1.28	0.15	
	IG	-0.43	0.05	-	17.92*	0.24	3-6m < 6m-1y, (1 y>)	-3.27*	0.38	Y < N
HELP (ET)	CG	-1.36	0.16	-	13.14*	0.18	1-3 m < 6m-1y	-1.05	0.12	
	IG	-1.27	0.15	-	8.05	0.11	-	-0.34	0.04	

Note.
* $p < .05$
** $p < .01$
[b] Bonferroni corrected p value
[†] Kruskall-Wallis H test; [‡] Mann-Whitney U test
ε^2 Effect size for Kruskall-Wallis H test; r Effect size for Mann-Whitney U test
<1 m: less 1 month; 1-3m: 1-3 month; 3-6m: 3-6 month; 6m-1y: 6 month – 1 year; 1y >: more than 1 year

Y: Yes; N: No
HR (bpm): Heart Rate (Beats Per Minute)
SpO2: Oxygen Saturation Level
HADA: Hospital Anxiety and Depression Scale (Anxiety)
HADD: Hospital Anxiety and Depression Scale (Depression)
DEPRESS: Depression
STAI: State Trait Anxiety Inventory
ET: Emotion Thermometer

Tolerability and acceptability of the intervention

There were no significant differences found between the hospital and the private clinic where both MBST and CBT- CD were applied among breast cancer patients (p = 0.913). The breast cancer patients who were 18 years old and over could receive both MBST and CBT-CD interventions ($p > 0.05$). The MBST intervention benefited women with breast cancer who actively smoked. Additionally, patients' marital status and living arrangements made no difference in receiving MBST (p> 0.05). The patients who learned about their cancer diagnosis within more than 1 year showed greater MBST efficaciousness for distress, anxiety (ET), depression (HADD), and hopefulness than patients who learned about their diagnosis for <1–3 months. Patients who had cancer metastasis had no impact on receiving MBST nor CBT-CD intervention (except for distress, hopelessness, and anger) ($p > 0.05$).

DISCUSSION

This is the first RCT pilot study that investigated the efficacy of Mindfulness-Based Swinging Technique (MBST) for 8 weeks. The present findings indicate that MBST for 20 min single session may be efficacious even after 8 weeks. The participants who received non-repetitive MBST reported significantly reduced perceived stress, anxiety scores, and increased hopefulness. Comparably, non-repetitive 20 min single session of Cognitive Distortion (CD) practise was found to be efficacious significantly for the above-mentioned variables even after 8 weeks. In fact, the CD also reduced depression and state-trait anxiety as well as anger scores for women with breast cancer. Similar to our research, in Solhaug et al. (2019) study, dispositional mindfulness was not measured; therefore, the follow-up results of their study were affected. Solhaug et al. (2016) stated that one's motivation, intention, and attitude in the process of learning mindfulness technique have an impact on the benefit of this intervention.

Meaning that, if it measured only the participants who were prone to mindfulness that would violate the randomisation. Perhaps this is why mindfulness practise seems less effective in state-trait anxiety and depression scores after 8 weeks of follow-up. Additionally, Morton et al. (2020) suggest that the objective of further research and clinical practice must focus on improvements in long-term practices, as well as determining the optimal dosage for significant impact on state and trait of mindfulness. Indeed, previous studies (Carlson et al., 2013; Oberoi et al., 2021) stated that patients' knowledge, experiences, and devotion to intervention, along with health- related results, were correlated.

According to Fox (2017), to plan the most suitable treatment for the patient, which ends in more accomplished results, a fully sufficient assessment of the patient's current concerns is the key. Norcross et al. (2013) predicted there would be a growth in short-term (5–12 sessions) and very short-term (1–3 sessions) therapy, in the course of a decrease in long-term (more than 20 sessions) therapy. Otto et al. (2012) stated that it could be difficult for the therapist to bring out the patient's psychological pattern in a short period of time, as 10- to 20-min-long sessions may not be adequate. However, currently, a number of university programs have begun to teach ultra-brief interventions in order to get their mental health students and interns ready, concerning work in mental health settings (Norcross et al., 2013; Sperry & Binensztok, 2019). Therefore, our study compliments such an initiative particularly considering the special needs for women with breast cancer, such as chemotherapy-induced fatigue and cognitive distortions. Thus, it is possible that shorter treatment can persuade more people into health care. Otto et al. (2012) discussed that shortness of treatment duration could be a valid reason why people are less likely to dropout in CBT, compared to different types of psychotherapy. Nonetheless, in our study, the participants' dropout rate was lower in MBST than in CBT- CD. Yet evidence shows that, during the period of tackling psychological challenges, cognitive

therapies have a positive impact on patients with breast cancer (Zhang et al., 2016; Xiao et al., 2017).

There are uncertain results when it comes to the effectiveness of mindfulness-based interventions (MBI) compared to CBT. Van Dam et al. (2018) stated that MBI can be effective, whereas Goldin et al. (2016) argue that CBT is superior in particular cases. Goyal et al. (2014) study that has a similar participant size to our study reported that outcomes of trials in breast cancer patients, including randomised and uncontrolled, have indicated that anxiety, depression, and perceived stress were positively affected due to MBI. Since our study's effect size for MBST had dropped after the follow-up, Fjorback et al. (2013)'s study shows similar results. They observed small effects in earlier clinical and non-clinical mindfulness studies that contained briefer follow- up durations. Therefore, a decrease in intervention effects and generally low effect sizes were anticipated (Solhaug et al., 2019). On the other hand, Solhaug et al. (2019) reported that 36% of participants attended in several different types of mindfulness training, such as qigong, yoga, tai chi, relaxation, and meditation, during the course of the follow-up period. Nevertheless, the outcomes were not dramatically changed even when these participants were eliminated. However, this could be true for the non-cancer participants, this is due to cancer patients who are in active medical treatment may suffer from fatigue that could adversely affect mindfulness practise (Toivonen et al., 2020). Katz & Toner (2013) argued that gender difference is a possible factor that may impact the larger effect sizes amongst female patients with breast cancer. Research shows that women are more prone to utilise mindfulness-based intervention than men (Xunlin et al., 2020). Therefore, this could be one of the possible reasons that our single session of MBST was found to be efficacious even after 8 weeks. Nonetheless, taking "trait and state" into account, there might be a probability that the correlations between independent and dependent

variables may be affected by gender as well (Trotman et al., 2019). Anyhow, Trotman et al. (2019) added and indicated that gender differences were not significant when analysing anxiety. It is clear that MBIs are efficacious, but they are not convenient for every person. Mindfulness practise can be difficult in terms of time, directing attention, and also paying full attention throughout meditation according to a systematic review conducted by Tate et al. (2018). Moreover, they discovered that practises may lead to bodily distress and that being a cancer patient resulted in a lot of stressful thinking instead of forgetting about their illness for a while. Therefore, mindfulness techniques can be improved by practise (Baer, 2011; Van Dam et al., 2018).

When it comes to the treatment of various psychological disorders, such as depression, anxiety, and distress, cognitive disputation can be very effective (Sperry & Binensztok, 2019). The concept of effective disputing is that the client gets support from the therapist in order to explore and examine their thinking process so that they are able to provide an acceptable explanation of their automatic thoughts (Lam & Cheng, 1998). This period of time allows them to gain experience, which gives them to an opportunity to understand the incongruity, as well as the illogic of their automatic thoughts, and then develop healthy alternatives (Beck, 2011; Akkoyunlu and Turkcapar, 2013). That might be the reason of single session of 20-min length CBT-CD intervention has efficacious result even after 8 weeks. This is perhaps during the 8-week time, patients have observed the exposed information which was delivered by the therapist (Carona et al., 2021).

The systematic review, conducted by Arab et al. (2016) which focused on HR and breast cancer, was to provide a brief summary of the side effects caused by quite a few breast cancer–related treatments; for instance, comparison of chemotherapy doses, negative effects

of the disease resulted exhaustion, low mood, and its connexion to HR. It appears that there was a positive association between mindfulness meditation and decreased post-intervention heart rate, which shows that the mindfulness was adequate (Lorca et al., 2019). That is similar to our MBST intervention where HR was lower in comparison to the post-treatment follow-up. Lastly, Trotman et al. (2019) suggested that it is worth looking into whether there is an association between actual HR or the way one perceives HR alteration and density of anxiety, besides one's perception of anxiety symptoms during the time of psychological stress.

The present pilot study suggests various theoretical, functional, and clinical donations to the developing field of psycho-oncology practise. For instance, a single non- repetitive 20-min session of MBST showed beneficial results in alleviating symptoms of anxiety and stress even after 8 weeks for women with breast cancer who currently receive cancer treatment. Although it was not our intention to test the efficacy of brief CBT-CD intervention; our study uncovered that alternatively breast cancer patients who are in active cancer treatment who were provided with 20-min CBT-CD intervention had 8-week long efficacy in decreasing anxiety, stress, and depression symptoms in some level. This result has a particular significance since psychotherapy sessions that are provided to oncology patients require regular attendance to see a visible outcome. Moreover, our research supports Socratic questioning that is utilised within brief CBT-CD intervention as an efficacious method to be used in psycho- oncological practise which plays a role in closing the gap in the current literature. Furthermore, both CBT-CD and the MBST interventions not only strengthen psychological but also supported physical wellbeing by improving the SpO_2 level and regulating the HR (bpm) of women with breast cancer. Considering our findings show some encouraging results for the efficacy of a single session of MBST and CBT-CD interventions for 8-week among

women with breast cancer. Further research should focus on evaluating these techniques' longer-term effectiveness.

Limitations, strengths, and future research implications

This study has few limitations. Primarily, patients' attitude about mindfulness or CBT-CD interventions were not measured and randomised regardless. Second, participants' satisfaction level about the MBST intervention is not tested and solely relied on their psychometric outcomes. Third, a researcher had several roles, such as the implementation of the intervention, administration of the questionnaires, and analysis of the data was done by the same person.

On the other hand, there are some strengths of this trial. Firstly, its low attrition rate, with a follow-up rate of 95.51%. The majority of the dropout rates were mainly deceased patients due to severity of their cancer illness (n = 7). Our results showed favourable efficacy for one-on-one MBST among women with breast cancer at 8 weeks; therefore, further research evaluating the MBST's longer-term efficacy should be performed for both in group and one-on-one sessions including male breast cancer population as well as patients who were diagnosed with different types of cancer. In fact, due to the possible reduced mobility among cancer patients as well as during the pandemic, it will be particularly valuable to increase online deliverable psycho- oncological interventions; in order to gain more evidence-based psycho-oncological e-health therapies, MBST should be assessed for its online efficacy in integration with virtual reality (VR) tools in future research.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary materials, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the Research Ethics Committee of Nigde University (Decision Number: 2018/14–01). The patients/participants provided their written informed consent to participate in this study.

Author contributions

OB has made a substantial, direct, and intellectual contribution. JG-M and TE have equally supervised the entire work and approved it for publication. All authors contributed to the article and approved the submitted version.

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Conflict of interest

Author TE was employed by FEFOC Foundation. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at:
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9. GENERAL DISCUSSION

The Mindfulness Based Swinging Technique (MBST) research project was successfully developed between April 2018 and July 2022, consisting of two studies and three articles published in scientific journals.

The first MBST study conducted on women with breast cancer was to measure MBST's immediate efficacy, which was observed within the 20mins timeframe noted changes in participants' anxiety, depression, self-efficacy, hopefulness and also their oxygen saturation (SpO2) and heart rate levels. The results of this study provided clinical insights about its efficacy among women with breast cancer. According to these results, mindfulness-based intervention in psycho-oncological practice improved significantly by reducing the duration of the psychotherapy session time.

One of the primary challenges encountered in this project was the recruitment of breast cancer patients to attend in-person sessions for either MBST or CBT-CD interventions. This proved difficult mainly due to patients' reduced mobility, nauseousness or any other physical side effects that was caused from their cancer treatment. However, due to the MBST being presented as a novel intervention for combining guided imagery of the swinging activity which includes breathing exercises; that potentially distracted patients' thinking pattern in regard to their cancer diagnosis and possibly their oncology induced side-effects for a short time. According to the results of the first study, participants at the MBST group reported lower anxiety, and depression scores. Also, their hopefulness and self-efficacy scores increased significantly. Previous randomised (Compen et al., 2019; Kenne Sarenmalm et al., 2017; Lorca et al., 2019; Shao et al., 2020) and non-randomised (Monti et al., 2012; Witek-Janusek et al.,

2008) mindfulness studies showed similar outcomes, except MBST has a reduced length in intervention time. This may be one of the reasons why our dropout rate was very low, which was of great benefit as patients were able to complete the entire intervention. Gawain (2016) argues, there are still gaps in the psycho-oncology literature in regard to efficacy of imagery techniques for tackling depression and anxiety symptoms among oncology patients. Fortunately, these techniques have been evaluated in our research study, as one of the objectives for our first study was to evaluate the efficacy of guided-imagery intervention among breast cancer patients. Consequently, the guided imagery has been integrated within the MBST intervention (Bahcivan et al., 2018), which showed immediate efficacy for the abovementioned psychological concerns experienced by breast cancer patients.

The MBST intervention can be applied to patients at any time regardless of when they learned about their cancer diagnosis, whereas in order to apply CBT-CD intervention therapist should clinically assess the patients' readiness to target their immediate depression and anxiety symptoms. This can be seen as one of the strengths of MBST. It is particularly significant because, often therapist prioritise the assessment of psychological concerns rather than assessing patient's clinical readiness (Sperry & Binensztok, 2019). Alternatively, therapist may not have just enough time to evaluate the readiness within the allocated session before applying specific interventions (Ping et al., 2020). In fact, when providing psycho-oncological support for patients, time that is spent in therapy can be crucial due to the severity of the side effects such as pain, fatigue or nausea (Arab et al., 2016).

Since comprehension requires cognitive development, this may indicate that, patients who have attained better education might show greater self-efficacy and cognitive ability (Rottmann et al., 2010). This strengthens Peuckmann et al. (2007)'s discoveries which they reported that

Danish breast cancer patients who received lower education linked with poorer quality of life. In fact, Schandl et al. (2018) said that, especially low-educated women who were diagnosed with breast cancer may be more prone to have a lower quality of life. Yet, in our first research (Bahcivan, Estape & Gutierrez-Maldonado, 2022) it is reported the MBST as an efficacious intervention immediately in lowering the depression scores regardless of patients' educational level. Whereas patient's educational backgrounds only played a role for the CBT-CD intervention which was found to be efficacious just for relieving the anxiety symptoms in the same research (Bahcivan, Estape & Gutierrez-Maldonado, 2022). Indeed, it is worth mentioning that within this research, the anxiety scores which were obtained from STAI measurement showed improvement in trait and state anxiety for CBT-CD and MBST interventions. Nevertheless, once compared to each other, MBST has demonstrated itself to be more efficacious than CBT-CD considering the state and trait anxiety of cancer patients within the duration of 20 minutes.

In terms of the physical assessment of bio-indications, minor immediate advancement for HR and no efficacy for SpO2 level were observed for patients who participated in the CBT-CD intervention. This was clarified by Ledesma and Kumano (2009), that one of the reasons why there was a low mean effect size occurred may have been due to verifying the results of the physical measurements after a very short interval of time from the post intervention. Yet it was stated by Ledesma and Kumano (2009) that, due to being an active recipient of chemotherapy, radiotherapy, or any other types of cancer treatment might be a possible reason why only a very small improvement was observed in their physical indicators. Finally, in terms of the bio-indicators, similar to our research, a mindfulness study conducted by Monti et al., (2006) utilised bio-indicators in their research for testing the intervention's efficacy. This showed that

it is not uncommon for mindfulness interventions like ours to use such bio-indicators for the purpose of testing its efficacy.

In our second research where we investigated the efficacy of Mindfulness Based Swinging Technique (MBST) over a period of 8 weeks, it indicated that a 20-minute-long single session of MBST continued to be efficacious for perceived stress, anxiety scores, and increased hopefulness. Even after 8-week, participants who received the 20minutes single session Cognitive Disputation (CD) intervention equally reported significant efficaciousness for the abovementioned variables. Additionally, those participants who received CBT-CD also stated reduced depression and anger scores. Similar to that of our research, patient's attitudes towards mindfulness was not tested in Solhaug et al. (2019) study. This therefore affected their follow-up results. They argued that in order to effectively benefit from mindfulness techniques, one's motivation and attitude toward the learning process of such interventions are crucial. If patients' attitude towards mindfulness were assessed prior to its application and only participants who were in favor of the mindfulness intervention were recruited, it would have compromised the randomization process. This might be a potential reason why the MBST practice showed less efficacy in improving state-trait anxiety and depression scores for some participants during the 8-week follow-up period. It is possible that if the selection process included only participants who were already familiar with mindfulness practices, better anxiety and depression scores could have been observed even after the 8-week follow-up.

Another reason why MBST was less efficacious after 8-week follow up could be due to the duration of the intervention which was not enough to bring out the patient's psychological thinking pattern (Otto et al., 2012). Therefore, 10 to 20-minute-long session may not be sufficient to see a satisfactory results in longer-term follow ups. Nonetheless, Norcross et al.

(2013) expected that short-term (5-12 sessions) and very short-term (1-3 sessions) therapy sessions may become more common practice among therapists, and of course on the contrary the long-term (more than 20 sessions) therapies may decrease and become unpopular. In fact, there is an increasing number of training institutions that have specific programs for ultra-brief psychological interventions (Norcross et al., 2013; Sperry & Binensztok, 2019). Thus, our research increases the variety of brief psychological interventions which has a particular practical significance as it is specifically designed for cancer patients in treatment whose physical symptoms affects their psychological condition. In fact, providing MBST like brief psycho-oncological intervention may potentially improve breast cancer patients' adherence to their medical treatment in the long term.

On the other hand, our findings showed that performing the MBST intervention in different settings had comparable efficaciousness. There are several possible reasons of why MBST might have been efficacious even after an 8-week time. Katz & Toner (2013) argued that gender difference could be one of these causes among breast cancer patients. Research conducted by Xunlin et al. (2020) in the field of mindfulness demonstrated that women expressed a greater preference for mindfulness techniques compared to men. Nevertheless, Trotman et al. (2019) reported that gender did not have any role when analysing anxiety. It is obvious that mindfulness-based interventions can be efficacious, but they are not for everyone. As mentioned in the systematic review reported by Tate et al. (2018), receiving a life-threatening diagnosis, such as cancer can cause patients a lot of distress and stressful thinking instead of ignoring or forgetting about the diagnosis for a while.

Lam and Cheng (1998) explained the concept of effective disputing as when the patient receives adequate support from the therapist to investigate and analyse their own thinking

process, so that they make better sense of their automatic thoughts. During therapy, patients would potentially increase their awareness about the presented problems, which therefore enables them to understand the inconsistency, as well as the illogic of their automatic thoughts, then come-up with better and healthy alternatives (Akkoyunlu & Türkçapar, 2013; Beck, 2011). It is likely that patients have had enough time during the 8-week to examine the information provided by their therapist in CBT-CD sessions (Carona et al., 2021). Perhaps this could be the reason why a single 20 minutes session of CBT-CD intervention has efficacious results even after 8-weeks.

A systematic review reported the relationship between the side effects of medical treatment of breast cancer and their HR, for example differences of chemotherapy doses, fatigue, and low mood (Arab et al., 2016). This showed that, there was a positive relationship between mindfulness meditation and reduced post-intervention HR, which indicates acceptability of the mindfulness technique (Lorca et al., 2019). Their outcomes are similar with our MBST intervention's results, where HR was lower in comparison to the post-treatment follow-up. Finally, it was suggested by Trotman et al. (2019) to check whether it was the actual HR or perceived HR that changes in regard to the level of psychological distress experienced by patients at the time. Therefore, Trotman et al. (2019)'s suggestion should be considered by therapists and be more vigilant about authenticity of HR in regards to its changes in the event of a psychological distress.

To sum up, the current project offers several theoretical, functional, practical, and clinical contributions to the developing field of psycho-oncology practice. For example, women with breast cancer who are under ongoing medical treatment (e.g., chemotherapy, radiotherapy, etc.) can benefit from MBST as their stress, and anxiety symptoms may be immediately alleviated

in some cases. In fact, the efficacy of the 20mins-long MBST intervention for reducing anxiety and stress continued even after 8 weeks. In order to see visible outcomes from psycho-oncological interventions, usually numerous and lengthy sessions are required, therefore this highlights the importance of our MBST intervention in cancer care. Furthermore, our research supports guided imagery technique which was inspired by *t'ai chi* and *qigong* swinging motions as a valuable method to be utilised in psycho-oncological practice which plays a role in closing the gap in the current psycho-oncology literature. Additionally, the MBST intervention is empirically validated for not only aiding psychological, but also supporting physical health by improving the SpO2 level and taken part in regulating the HR for women with breast cancer.

Even though the current research provides encouraging results for improving anxiety, hopefulness, self-efficacy and stress symptoms for women with breast cancer in treatment, several limitations should be considered and improved in future research.

9.1. Limitations, Strengths, and Future Research Implications

The current research project has some limitations. First, patients were admitted to the study and randomised regardless of their attitude or perception toward mindfulness or CBT-CD interventions which were not tested. Second, the therapist had various multiple roles, such as implemented the intervention, administered the questionnaires, and analysed the data. Third, patients' satisfaction level about the MBST intervention was not measured, and exclusively relied on their results. Fourthly the sample size of this study mainly consisted of middle-aged women, whilst it should be noted that the diagnosed age of breast cancer can vary among women. Additionally, this research was conducted in the Aegean side of Turkiye with Turkish women only where the socio-economic status of the women was higher than other parts of

Turkiye. These patients do not represent all women diagnosed with breast cancer, therefore cautions should be taken when generalising the outcome for other cultures and populations. Further, this study compared the 8-week follow up results, longer periods of follow-up assessments should be examined in future trials for more accurate attenuation of the MBST's efficacy. Lastly, the MBST intervention script was also written in the Turkish language which limits its flexibility for application to non-Turkish speaking populations.

On the other hand, there are some strengths of this research project. The first being, the research's dropout rate in both experimental and control groups were low, but lower in the experimental group. This indicates the strength of the MBST intervention and shows its tolerability among breast cancer patients. In fact, the low attrition rate continued in our second research with a follow-up rate of 95.51%. The main dropout rates were mostly deceased patients due to their medical conditions (n=7).

Our findings demonstrate promising efficacy of MBST among women with breast cancer at the 8-week mark. Therefore, future research should prioritize evaluating the longer-term effectiveness of MBST intervention. Furthermore, it is worth considering the applicability of MBST in group settings, not only for breast cancer patients but also for individuals with other types of cancer. Additionally, given the medical side effects experienced by cancer patients and their reduced mobility in the short and long term, as well as situations such as COVID-19 pandemics where quarantining is necessary, it is important to develop and adapt online delivery methods for MBST. By doing so, we can also enhance the availability of e-health psycho-oncological interventions that can be delivered remotely.

10. CONCLUSIONS

Cancer is considered to be one of the main global public health problems and is listed as the second prominent cause of death. As it is stated in previous studies, almost half of the breast cancer patients reported some level of mental health concerns including but not limited to mood disorder, anxiety disorder, adjustment disorder, depression and mental disorders that were caused by medical conditions (Youlden et al., 2014; Sun et al., 2019). Therefore, it is important to recognise that within this research Mindfulness Based Swinging Technique (MBST) has proven itself to alleviate stress, anxiety and depression symptoms as well as problems such as hopelessness, and lack of self-efficacy among breast cancer patients.

It should be noted that, given the timeframe of this study during the COVID-19 pandemic, any conclusions drawn must take into account and highlight the significant impact of the pandemic on breast cancer patients. For example, the psychological implications of the COVID-19 global pandemic most likely contributed to the difficulties that cancer patients faced. Furthermore, the negative consequences of some of the measures carried out to stop the pandemic, such as reduced access or temporary closure of health care facilities to avoid the spread COVID-19 added to the adverse emotional impacts experienced by individuals who diagnosed with cancer.

Even though evidence-based psycho-oncological interventions for targeting cancer related anxiety, stress, social isolation, or hopelessness significantly improved in quality and variety during the last decade, it is noteworthy that still further advancements are needed for psycho-oncological interventions, including mindfulness, which more than often achieves modest results and has overall positive effects. For this purpose, it is necessary to continue researching new brief evidence-based treatments which target cancer patients in treatment to help prevent the above mentioned adverse emotional effects. For instance, the traditional way of using

guided imagery (GI) and breathing exercises comes with important limitations, such as difficulty in maintaining visualisation during an intervention as visualisation and GI require more focus and attention to sustain. However, this limitation could be addressed by utilising MBST intervention.

The utilisation of the MBST intervention enables patients to redirect their negative thoughts using GI in combination with a swinging exercise, which is then synchronised with their breathing. A repetitive movement of swinging motion has been associated with relaxation and tranquillity. Additionally, often adapting such a swinging motion similarly can be witnessed in medical qigong (MQ) and t'ai chi practices. It is understood that MQ can be practiced with different actions, such as t'ai chi in the field of supportive oncology. Since MBST utilises t'ai chi/qigong among cancer patients it is not unexpected to find great improvement for their anxiety, depression symptoms and overall negative emotions, which also supports the appropriateness of using swinging motion within the MBST intervention.

Furthermore, GI is considered to be a technique which is easy, suitable, and does not restraint cancer patients' activity levels. Research in the current oncology literature has proven that GI techniques enable breast cancer patients to relax, which has been shown to be advantageous considering the unpredictable and complicated adverse side effects of chemotherapy, such as sickness, vomiting, anxiety and stress. Although MBST employed GI techniques within its practice, the efficacy of MBST does not rely on the patient's ability to visualise which means less focus and mental strength is exhausted. This is because the breathing exercises themselves serve as a direct distraction from negative thoughts, while the focus on the swinging exercise stimulates a more conscious thinking pattern.

Regulating the breathing exercises directly influences the patients' heart rate and oxygen saturation level. Indeed, there is an association between interpretation of an event as stressful which could be combined with changes in cardiovascular activity, for example an increase in heart rate may result in an increase in the patients' anxiety level. In fact, one of the possible ways of managing blood oxygen saturation level (SpO2) was found to be through practicing mindfulness, as it has been proven that, mindfulness interventions are more likely to have an impact in the increase of SpO2 level of patients which means improved overall physical, emotional, and mental health. Therefore, it is understood that having a mindfulness based brief intervention, such as MBST would potentially support patients to have better control over their anxiety level, stress and other negative emotions that was caused by the diagnosis of cancer.

The present project introduces a pioneering MBST intervention aimed at enhancing immediate efficacy in addressing anxiety, stress, and hopelessness among women with breast cancer. The MBST project consists of two studies that present results from a randomised clinical trial involving breast cancer patients. Specifically, patients in the experimental group exhibited a significant reduction in anxiety, stress, and hopelessness, as well as increased self-efficacy. While other bio-indicator measures, such as heart rate and oxygen saturation, showed promising non-significant trends. Despite certain limitations, our findings report encouraging results that warrant further investigation with larger sample sizes and longer-term follow-ups, as well as the inclusion of breast cancer patients from diverse cultural and linguistic backgrounds.

Mindfulness-based interventions in the cancer population have been subject to continuous research growth each year. The current project provides another example of how the MBST intervention can enhance and contribute to the existing traditional mindfulness techniques in

addressing health-related anxiety, hopefulness, and stress, particularly within a 20-minute duration. It is expected that the current research project will contribute to new advancements and aid cancer patients in managing their chronic illness and adhering to their medical treatment by increasing hope, alleviating anxiety, and depression, as well as improving self-efficacy.

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