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Yoga-Cognitive Behavioral Therapy (Y-CBT) Benefits Older Adults with Anxiety

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ABSTRACT

Older adults often experience loss of partnership, illness, and declining health which can contribute to anxiety and depression. This can be a significant public health concern. Senior centers play an important role in providing support and community which may reduce these symptoms. Yoga-Cognitive Behavioral Therapy (Y-CBT) is an innovative approach that specifically targets symptoms of anxiety and depression. Within a group model, Y-CBT integrates cognitive behavioral therapy (CBT) with chair yoga. Y-CBT has demonstrated significant reductions in anxiety and co-occurring depression for adults receiving services at an outpatient behavioral health center. The goal of this study was to evaluate the effectiveness of Y-CBT for older adults attending a senior center setting. Thirty-seven older adults (age 62+) from three senior centers enrolled in the study. After the Y-CBT intervention, anxiety improved ($p < .0056$) with a large effect size ($g = 0.88$). Though not significant, depression also improved ($g = 0.418$), with many participants reporting reduced levels of depression into the minimal or clinically non-significant ranges after, as compared with before the Y-CBT experience. These results indicate that Y-CBT may be a promising approach for the symptoms of anxiety and co-occurring depression which older adults experience.

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Older adults; anxiety; depression; CBT; yoga

Introduction

As people age, they often experience difficulties unique to this phase of life such as loss of peers and life partners, financial strain, personal illness or injury, and social isolation. These significant stressors can lead to reactive and frequently debilitating depression and anxiety. The Center for Disease Control (CDC) reported that in the United States, 7 million (18%) of the 39 million people over age 65 were affected by depression prior to the pandemic (Centers for Disease Control and Prevention [CDC], 2013) and 14.2% in 2020 (Lee et al., 2023). In their review of large studies, Canuto et al. (2018) reported that the prevalence of anxiety disorders in people over 65 was 17.2%, with even more suffering subclinical symptoms that have been associated with physical,

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social, and general well-being. Furthermore, 12% of older adults reported that they did not receive adequate social (or emotional) support (Centers for Disease Control and Prevention [CDC], 2008). During the pandemic, the CDC found that 68.7% of older adults in the US had developed symptoms of anxiety and 59.9% of depression (Jemal et al., 2021). In the general population, anxiety and depression often co-occur (Bandelow et al., 2017), and this is true for older adults as well (Gum & Cheavens, 2008).

Social isolation and loneliness have been associated with depression in older adults (Donovan & Blazer, 2020; Worrall et al., 2020) and decreased quality of life (Newman-Norlund et al., 2022). In their review, Klainin-Yobas et al. (2015) report that timely treatment of anxiety and depression is an important element in preventing further decline in an older adult population because both conditions are associated with physical disabilities, increased loneliness, lower quality of life, and increased mortality. Similar to anxiety and depression, studies have found that even after controlling for important behavioral characteristics and biological factors, both loneliness and social isolation are predictors of cardiovascular disease (Golaszewski et al., 2022) as well as poor health and mortality in general (Cacioppo et al., 2010).

Anxiety is a condition which is associated with isolation. Isolated people may feel alone in their experience of fear, apprehension, and the physical symptoms common to the anxious state. Cognitive Behavioral Therapy (CBT) is a widely used psychological approach, which helps people of all ages develop coping skills to address symptoms of anxiety and nonproductive patterns of thought and behavior (Hofmann et al., 2012). It is generally a short term, semi-structured approach that targets the problematic thoughts and behavioral patterns that lead to emotional distress (Wenzel, 2017). Common elements of all CBT approaches include reframing and restructuring negative thoughts, understanding cognitive distortions, collaborating with participants (who learn that they have more control over their distress than they may have thought), and encouraging the practice of new skills to achieve personally important goals to improve their well-being (The Association for Behavioral and Cognitive Therapies [ABCT], n.d.).

Several studies have reported that CBT is an effective approach for reducing symptoms of anxiety, Generalized Anxiety Disorder (GAD) and depression in older adults (Bourgault-Fagnou & Hadjistavropoulos, 2013; Freshour et al., 2016; Hall et al., 2016). For example, in a primary care setting, CBT significantly reduced worry and depression as compared with treatment as usual (TAU) in which both conditions included frequent phone calls (Stanley et al., 2009). Another study, used CBT, for one-hour per week, over six-sessions which significantly improved health anxiety when compared with a wait list control (Bourgault-Fagnou & Hadjistavropoulos, 2013).

In a meta-analysis of CBT outcomes for older adults with GAD, CBT was more effective for those who were still working ($g = 0.94$) than for those who

were not working ($g = 0.55$) (Kishita & Laidlaw, 2017). Reviews found CBT is more beneficial than no therapy but approximately equal to other forms of treatment for anxiety (Hall et al., 2016; Hofmann et al., 2012). Hall et al. (2016) reviewed 14 Random Controlled Trials (RCTs), which studied CBT for older adults with GAD ($n = 444$). The authors found that when compared with TAU, CBT significantly outperformed TAU; one out of every three people received additional benefit with CBT ($g = 0.67$). However, when compared to other active control groups, the CBT results indicated only a small, non-significant advantage. Similarly, in a review of CBT with regard to depression, Hofmann et al. (2012) concluded that, in older adults, CBT appeared to be more effective than no treatment at all. Whether CBT is superior to other active interventions, such as reminiscence or psychodynamic therapies, has remained an open question.

Working in groups with older adults has shown promise in improving anxiety (Bourgault-Fagnou & Hadjistavropoulos, 2013; Hall et al., 2020). Reductions in symptoms of depression have also been reported for older adults enrolled in CBT groups, and the authors suggested that the groups may foster a beneficial sense of social support for the older adults (Welch et al., 2010). Positive outcomes were also observed for older adults enrolled in small groups who were experiencing co-occurring anxiety and depression (Bains et al., 2014).

In recent years, in an attempt to improve CBT outcomes for all participants, CBT has evolved into a family of approaches that add other techniques to CBT protocols. This approach has been considered as part of the “third wave of CBT” and includes contemplative techniques such as mindfulness (Hofmann et al., 2010; Kishita et al., 2016). Mindfulness teaches people to focus their attention, increase their awareness of the present moment (Segal et al., 2002), and suspend judgment in difficult situations (Segal et al., 2002).

Mindfulness-based CBT (MBCT) may be helpful for older adults as it provides new skills which have demonstrated a calming effect on the physical mechanisms of stress (Foulk et al., 2014). Mindfulness appears to serve as a protective function, shielding practitioners from the harmful physical effects of stress (de Frias & Whyne, 2015). In older populations, MBCT has been shown to significantly improve sleep (Chan et al., 2022), reduce anxiety and rumination, and lower symptoms of depression in group MBCT (Foulk et al., 2014). In a review of the empirical results of MBCT for older adult populations, Kishita et al. (2016) reported that for those with GAD, the results Mindfulness Based Stress Reduction (MBSR) which is similar to MBCT, yielded effect sizes in the moderate range for anxiety ($g = 0.58$) and depression ($g = 0.55$). MBSR has also been shown to significantly reduce worry and improve memory in an older population (Lenze et al., 2014).

Yoga is another contemplative technique which has been shown to directly affect the physiology of mood (Basu-Ray et al., 2022; Gard et al., 2014). For

older adults, yoga has shown promise in improving depression (Prathikanti et al., 2017), anxiety, and stress (Baklouti et al., 2023). Like mindfulness (Marino et al., 2021), yoga has shown a beneficial effect on the physiologic processes of stress across several studies (Basu-Ray et al., 2022; Gard et al., 2014).

Yoga has also demonstrated significant improvements in anxiety (Baklouti et al., 2023), quality of life (Hariprasad et al., 2013) and depression in older adult populations (Bonura & Tenenbaum, 2014). In one study 98 older adults were divided into three groups: chair yoga, chair exercise, and control. The yoga participants significantly outperformed both other groups with regard to improvements in anger, anxiety, depression, and quality of life (Bonura & Tenenbaum, 2014). Yoga routines have been shown to be beneficial for older adults (Welford et al., 2022) and Plys and Qualls (2021) reported that of 202 assisted living centers, 29% offered yoga/tai chi and yoga is commonly offered many senior centers across the country (Tobias et al., 2014).

Other studies report that yoga may be beneficial for improving physical functioning (Baklouti et al., 2023; Wang et al., 2016) and may offer neuroprotective effects for women at risk for Alzheimer's (Krause-Sorio et al., 2022). Yoga has shown benefit post-stroke (Walter et al., 2022) and to improve mobility and balance for adults with chronic brain injury (Stephens et al., 2020). In another study, 15 residents of an assisted living (mean age 82.94) participated in an 8-week yoga course; qualitative results showed that participants were able to use yoga to help them engage in daily activities and improve functional fitness (Adams et al., 2020).

Yoga may exert its effects physically by reducing the activity of the sympathetic nervous system, while increasing the activity of the more calming parasympathetic nervous system (Inbaraj et al., 2023). It has also been suggested that as the actions of yoga repeatedly evoke a physiological relaxation response, yoga may reduce the initiation of negative cognitive thoughts before they begin (Khalsa et al., 2015).

One of the many important functions of the parasympathetic nervous system is to exert an adaptive, calming response to stress, balancing the sympathetic nervous system, which can at times, initiate processes harmful to the body, especially when activated over lengthy periods (Gard et al., 2014). In their extensive review, Breit et al. (2018) explained that the vagus nerve serves as a main pathway of the parasympathetic nervous system. Research suggests that the practice of yoga increases vagal tone (Breit et al., 2018), lowers the production of cortisol (Gard et al.; Estevao, 2022) and inflammatory cytokines (Liberale et al., 2022), the lowering of which have all been associated with improved physical (Liberale et al., 2022) and mental health, including decreased depression and anxiety (Breit et al., 2018).

This information is particularly important for older adults, because there is a relationship between the diseases of aging and a person's response to stress,

whether the stress is initiated in the outer environment or from internal biochemical reactions (Lu et al., 2021). An innovative theory called inflamm-aging describes a persistent inflammatory process in older adults which leaves the person more vulnerable to a variety of diseases (Liberale et al., 2022; Xia et al., 2016). As yoga may reduce some inflammatory processes, yoga may serve as a protective mechanism, helping to defend practitioners from the destructive physical effects of stress.

As we can see from the studies cited above, yoga has demonstrated significant mental and physical health benefits. Combining CBT with yoga may offer a broader approach to resolving symptoms of anxiety because CBT primarily targets the way we think (and subsequently behave), and yoga and meditation primarily target our physical states. Yoga Cognitive Behavioral Therapy (Y-CBT) may be particularly helpful in working with anxiety because anxiety has both physical and cognitive (thought) components.

Recently, combining different types of activities has been shown to be beneficial across a variety of fields. For example, physical therapists report that adding yoga to physical therapy improves psychosocial and physical functioning (Thomas et al., 2021). Adding autonomy-supportive work to yoga has shown benefits for adults with intellectual and developmental disabilities (Allison et al., 2021). In a novel 12-week fall-reduction study, the authors looked at the effects of adding yoga to psychoeducation (Adams et al., 2020). The authors reported significant improvements as follows: education improved balance confidence, yoga improved dynamic balance and at the end of the 12 weeks, fear of falling was significantly reduced.

The research cited above employed many forms of yoga. For the current study, the authors chose a style of yoga called Kundalini Yoga (KY) because: 1) KY is a well-known, safe, easily accessible form of yoga which is routinely adapted for therapeutic and research purposes (Simon et al., 2020). 2) KY emphasizes mind – body awareness and describes detailed yoga sets and meditations which are said to improve specific physical and emotional processes (Khalsa et al., 2015). 3) One of the authors is a long time KY teacher which was helpful for the administration of the study. 4) In an older adult population, Kundalini Yoga was found to significantly increase volume in the right hippocampus; this part of the brain is associated with memory loss; atrophy of this part is thought to indicate the potential for Alzheimer's later in life (Ibrahim et al., 2022). Greiner-Ferris and Khalsa (2017) have combined Kundalini yoga with CBT to create Yoga-Cognitive Behavioral Therapy (Y-CBT). A central concept of this model is the observation that the experience of anxiety has both cognitive (thought) and physical symptoms. In an effort to comprehensively address the varied symptoms of anxiety simultaneously, the Y-CBT model blends CBT with kundalini yoga/meditations.

Two studies have begun to establish the efficacy of Y-CBT for adults diagnosed with GAD and other co-occurring conditions in a clinic setting.

Y-CBT significantly reduced anxiety, co-morbid depression, and sleep disturbance in one study (Khalsa et al., 2015) and significantly reduced anxiety, co-occurring depression, and increased self-esteem in a second study (Khalsa, Block, Boisseau, & Greiner-Ferris, n.d.).

The goal of the present study is to evaluate the benefits of Y-CBT for use with older adults who are participants in general senior center activities. Specifically, we hypothesized that Y-CBT would demonstrate significant improvements in anxiety and depression for older adults who self selected to participate in the six Y-CBT sessions at senior centers.

Method

Y-CBT is a manualized, didactic, and experiential group model designed to assist in managing the symptoms of anxiety and co-occurring depression. The model combines simple chair yoga with the concepts and skills of CBT. Each of the three senior centers in the study held a set of six weekly, one and a half hour sessions. Each session included: (1) didactic instruction and experiential practice in CBT techniques, including cognitive restructuring (2) kundalini yoga and meditation and (3) group process and discussion.

Social isolation often leaves people feeling alone in their experience of anxiety. For this reason, the group leaders actively guided discussions to encourage camaraderie among members and draw out the experience of universality (Yalom & Leszcz, 2005) in their struggles with anxiety. Leaders encouraged members to share their successes as well as their challenges, knowing that both states were experiences that all members would share at some point. The value of shared experience was regularly noted as less vocal members became more engaged in dialog and subsequently took an additional step in attempting to use the skills their cohorts had found helpful.

Each session was organized around a particular topic and consisted of an approximately equal focus on each of the three components. For example, in the first session, about 1/3rd of the time was spent teaching the central concept of Y-CBT which is that the anxious state is comprised of both physical and cognitive experiences and therefore relief requires change in both. The didactic material further illustrated this concept with examples and experiential exercises. Participants were encouraged to offer their experiences with anxiety and how they felt about the idea of the mind-body interaction. For the yoga/meditation/breathing component of the group, the emphasis was on patterned breathing meditations which were combined with specific poses to help the group become accustomed to the idea of using breath in coordination with posture, hand, and arm positions to change mood. To maximize the benefit of each session, specific yoga sets and meditations were interwoven with appropriate CBT skills and educational materials. Focused discussions were interspersed throughout the group to allow members to share questions, struggles,

and improvements as they move toward mastery of the new cognitive and physical skills.

A typical session began with controlled patterned breathing followed by a variety of kundalini yoga (KY) postures and meditations. Generous adaptations were made to the yoga sets in order to increase accessibility for the older adult population. All yoga was performed in a chair and participants wore comfortable street clothing. KY is similar to hatha yoga in that both include many of the same physical poses. KY also includes other exercises, postures, and breathing techniques in conjunction with mindfulness meditations, postures and physical exercises not traditionally found in hatha.

An example of a yoga set is called “Yoga for Heart, Mind and Voice.” One of the postures asks the participant to hold their arms out to the sides, with the right palm facing up and the left palm facing down. This posture lifts and opens their chest, helping to encourage the participant to breath more deeply, which often accompanies feelings of well-being and compassion. All yoga sets and meditations are available in the book “The Yoga-CBT Workbook for Anxiety (Greiner-Ferris & Khalsa, 2017), where photos of each pose are accompanied by detailed instruction.

New strategies for participants to practice thinking differently are offered in each session. A unique power point is used in each group as a teaching aid to assist in reinforcing the new concepts. Each group provides strategies for shifting problematic, ruminative, or negative thought patterns to a more neutral or hopeful outlook.

To give the reader of this article a fuller understanding of the sessions, here is a more detailed description of three of the groups. In the first group participants are offered factual and research-based information about the symptoms of anxiety and how these symptoms can have a dramatic impact on the quality of a person’s life. We have found that offering this factual/didactic information has several benefits. First, it reassures the participants that the leaders understand the experience of anxiety and will be offering strategies to manage their symptoms. Second, it provides an atmosphere of community among participants as the discussions during this group allow for sharing of common experiences. Third, this educational material quantifies that the physical and cognitive experiences of anxiety are very real and valid and need not be hidden or a source of shame.

In the second group, an exercise called “*Wisdom Cards*” is offered. In this exercise, from a large selection of quotes, participants are asked to intentionally choose an inspirational quote that has particular meaning to them and share their thoughts about the quote. Next, participants are asked to randomly select a quote from the same selection and discuss how the second quote relates to the first. When people are struggling with long-term stress and anxiety, they often seek what is familiar or safe. People may find themselves closed off from new concepts or input that could be helpful or inspiring. This

exercise offers an opportunity to find unexpected inspiration thus fostering cognitive restructuring and reframing while offering people a soothing and supportive process to incorporate the new inspirational concepts and solutions.

In a later group, members are offered the opportunity to complete a unique worksheet designed to review and reinforce the changes that they have made and the concepts they have learned over the course of the class. Beck's work using cognitive distortions is incorporated throughout this exercise to assist members to identify faulty (negative) self-assumptions and then replace them with more positive and productive thoughts (Beck, 1995). Within small groups members diagram and share how their ability to manage the impact of anxiety and their self-concept has changed during the process of the group experience.

The groups were co-facilitated by two clinicians trained in the Y-CBT model. One of the leaders was a psychologist with 25+ years of experience who had been offering the Y-CBT model for 7 years. The other leader was a Licensed Mental Health Clinician, with 3 years of experience with Y-CBT. Three senior centers hosted the 6 group sessions. Each group lasted approximately one and one-half hours. A minimum of 10 participants were recruited for each group. Although homework was not required, participants were encouraged to practice at home.

Study design

This study utilized a pretest/posttest design. To enroll participants, we collaborated with three senior centers located in the Metro-West region of Massachusetts. The senior centers, using their usual marketing activities, enrolled 37 people aged 62 and older, in the Y-CBT groups. The average age of the participant was 73.31 (range = 62–99, standard deviation = 8.24), and most of them were women ($n = 31$, 84%).

Baseline statistics for each of the questionnaires were gathered prior to the start of the 6-sessions. Group means and standard deviations for each variable were accessed. Participant engagement was calculated, based on attendance at each of the sessions. At the end of Y-CBT, the variables were reassessed based on the same scales as were administered before the sessions began. For the PHQ-9, the STAI-S, and the SCS-SF pre-posttest differences were examined using paired t-tests; effect sizes were also calculated using hedges' g and power was analyzed using G*Power calculations.

Participants

Participants were recruited by senior centers in the area. Ethical approval for this project was obtained from the Riverside Community Care Human Rights Committee. Riverside Community Care is one of the largest behavioral health

care human service providers in Massachusetts, serving over 40,000 people a year. Participants were recruited directly by the senior centers involved in the study and informed consent forms were filled out at the senior centers where the intervention was administered.

Measurements

Attendance was taken to evaluate participant participation. Self-report questionnaires were administered before and after the six sessions ended. The goal was to determine whether anxiety and depression would be decreased after Y-CBT. Two reliable, well-established self-report tests were chosen to measure anxiety and depression, respectively: *The State Trait Anxiety Inventory State subscale (STAI-S)* and *The Patient Health Questionnaire (PHQ-9)*. Both the STAI-S and the PHQ-9 have gained widespread use in research and practice and have been used with older adults to successfully measure anxiety (Bonura & Tenenbaum, 2014) and depression (Smagula et al., 2022), respectively. Participants completed these scales individually, and neither group leaders nor other group members could see their responses.

The STAI-S measures the participants' current level of anxiety (Spielberger, 1983). It is a Likert-type scale ranging from 1 (*almost never*) to 4 (*almost always*); higher scores indicate higher levels of anxiety. The participant is asked to fill out the items considering how they currently feel. Examples of the STAI-S include "I feel calm" and "I feel secure." Spielberger originally developed the inventory and reported high levels of reliability and internal consistency with strong alpha coefficients (0.90).

Derived from the longer Primary Care Evaluation of Mental Disorders (PRIME-MD), the PHQ-9 is a brief assessment scale used to measure depression (Kroenke et al., 2001). Over the past decades, it has gained increasing use in both research and practice. The PHQ-9 is a self-administered measurement of depression symptoms, which scores each of the 9 DSM-IV criteria on a 4-point Likert scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). Higher scores indicate higher levels of depression. The participant is asked: "Over the last 2 weeks, how often have you been bothered by any of the following problems." Examples of the questions include: "Little interest or pleasure in doing things" and "Feeling down, depressed, or hopeless. The PHQ-9 has a Cronbach's alpha of 0.86–0.89, with excellent test-retest reliability as well as high construct and criterion validity (Kroenke et al., 2001).

As self-compassion is considered to be related to contemplative techniques such as mindfulness (Neff, 2003), we also administered the *Self-Compassion Scale – Short form (SCS-SF)* (Raes et al., 2011). The SCS-SF has 12 Likert-type questions, ranging from 1 (*almost never*) to 5 (*almost always*); it has demonstrated internal consistency (Cronbach's alpha \geq 0.86) as well as a strong correlation with the long form of the Self-

Compassion Scale ($r \geq 0.97$). Self-compassion is considered a way of being kind to yourself, to understand your experience as part of being human (Neff, 2003). Example items include “When I’m going through a very hard time, I give myself the caring and tenderness I need” and “I’m disapproving and judgmental about my own flaws and inadequacies.”

Smith (2015) examined 102 older adults living in an independent living retirement community. The author reported that higher levels of self-compassion were associated with greater psychological well-being even in the face of poor health or other stressful situations. Conversely, older adults with lower levels of self-compassion who were facing these difficult stressors demonstrated higher levels of depression.

Results

Sample description

In our study, of the 37 enrollees, 13 dropped out (35%) with 24 (65%) finishing an average of 5.2 of the six available sessions. Because this was a community population (not a clinical trial) participation and attrition rates were of concern. A review of CBT for older adults, Hall et al. (2016), found three studies that involved groups, and their attrition rates ranged from 22% to 35%. Foulk et al. (2014) reported a 26% dropout rate for group MBCT, and Hariprasad et al. (2013) reported a dropout rate of 28% for older adults during taking yoga classes.

All participants were capable of participating in the yoga. The three senior centers were from towns of approximately equal ethnicity and socio-economic status; one center enrolled 10 participants, another 12, and the third 15. The groups were offered at times recommended by the directors of the centers, all during the workday, between approximately 10am and 3pm. At pretest, there were no significant differences between completers and non-completers for age or initial levels of anxiety, depression, or self-compassion. There was a significant correlation between level of anxiety and age ($r = -.636, p \leq .0005$); we did not assess employment status, so it was not clear whether this reflects lack of work or simply that increased aging was associated with increases in anxiety. Because these sessions were offered during working hours, it was likely that most of the participants were not working or, at most, working part-time.

Group sizes averaged 8.22 per session with a range of 4–12 depending on the senior center and the weather. Of the 24 who finished the six-sessions, 20 participants who completed 4 sessions or more and at least one of the questionnaires at the end of the last group meeting and were called “completers.” Of these completers, 17 were women (86%). Completers attended an average of 5.25 of the six sessions. This compared favorably with results for Y-CBT in a clinic setting (Khalsa et al., 2015), and with reports from the literature.

Participant reported test results

In this study, people who scored higher on the anxiety questionnaire were also likely to score higher on the depression scale both at the pre and posttests; anxiety and depression correlated strongly in this sample both before ($r = 0.55$, $p \leq .005$) and after ($r = 0.80$, $p \leq .0005$) Y-CBT.

Each week, participants discussed their experiences using the techniques at home and no difficulties or adverse effects were reported. Although no measurement was recorded, the participants appeared enthusiastic to share their personal experiences with different techniques and reported that the skills seemed to be helpful in alleviating their anxieties.

Statistical evaluation of mean changes from pre to posttest was analyzed using paired sample *t*-tests. Effect size was measured using Hedges' *g*, which is a variation of Cohen's *d* that adjusts for biases due to small sample sizes (Hedges & Olkin, 1985). The extent of the Hedges' *g* effect size may be understood using Cohen's convention as small (0.2), medium (0.5), and large (0.8). Mean substitution was used to replace the missing data points.

Table 1 shows changes from pre to post test for Y-CBT for older adults, including the means, standard deviation, significance levels, and effect sizes before and after Y-CBT (Table 1). Improvements were reported for all three measures (anxiety, depression, and self-compassion) with the STAI-S and SCS-SF demonstrating significant improvements. After Y-CBT, participants reported that their anxiety improved ($p \leq .0056$) with a large effect size ($g = 0.88$) [CI: -2.533 – 4.295]. Self-compassion improved ($p \leq .0438$) with a moderate effect size ($g = .384$) [CI: -3.074 – 2.305] and though not significant, depression, as measured by the PHQ-9, was reduced with a moderate effect size ($g = .418$) [CI: -0.981 – 1.817].

Table 2 and Table 3 show results at initiation and completion of Y-CBT sorted by clinical significance levels, using the benchmarks of the authors for the PHQ-9 (Kroenke et al., 2001) and STAI (Julian, 2011; Spielberger, 1983), respectively (Tables 2 & 3). These results show that many subjects decreased their levels of depression into the minimal or clinically non-significant ranges after Y-CBT, though the sample size precluded analysis of the significance of these changes.

Table 1. Pre-Post Test Comparison for the Y-CBT Intervention.

Test	<i>n</i>	Pre		Post		<i>p</i>	Hedge's <i>g</i>	95% Confidence Interval	
		Mean	SD	Mean	SD			Lower	Upper
STAI-S	20	44.51	10.93	34.61	11.10	0.0056	0.881	–2.533	4.295
SCS-SF	19	37.26	8.18	40.58	8.73	0.0438	0.384	–3.074	2.305
PHQ-9	19	7.76	4.47	5.88	4.33	0.1384	0.418	–0.981	1.817

STAI-S = The State Trait Anxiety Inventory – State Scale; SCS-SF = Self-Compassion Scale – Short form; PHQ-9 = Patient Health Questionnaire.

Table 2. PHQ-9 Scores for Pre and Posttests Sorted by Depression Level.

Severity	PHQ-9 Score	Pretest <i>n</i>	Post-test <i>n</i>
Minimal	0–4	5	10
Mild	5–9	8	5
Moderate	10–14	5	3
Mod Severe	15–19	1	1
Severe	20–27	0	0
Total		19	19

PHQ-9= Patient Health Care Questionnaire.

Table 3. STAI-S Scores for Pre and Post-Tests Sorted by Anxiety Level.

Anxiety Level	score	Pretest <i>n</i>	Posttest <i>n</i>
Not clinically significant	≤38	7	15
Clinically significant	>39	13	5
Total		20	20

STAI-S= The State Trait Anxiety Inventory – State Scale.

Discussion

CBT is a well-researched, highly regarded set of techniques. It offers an empowering therapeutic intervention, which invites people to engage in a process to improve mental habits. Although effective for older adults, there is room for improvement (Kishita & Laidlaw, 2017). Historically CBT has been combined with other activities such as mindfulness to bring about change. Practitioners may also consider using CBT with other supports as well. In this article, we explored combining CBT with yoga (Y-CBT) because of the independent evidence for usefulness of yoga (Baklouti et al., 2023; Bonura & Tenenbaum, 2014; Prathikanti et al., 2017) and its complementary mechanisms of change to those in CBT (Gard et al., 2014).

In two previous studies, Y-CBT has shown promise in reducing anxiety and co-occurring depression for adults diagnosed with GAD (Khalsa et al., 2015; Khalsa, Boisseau & Greiner-Ferris, unpublished manuscript). The purpose of the current research was to explore the potential use of Y-CBT with older adults in senior center settings. The results indicate that Y-CBT significantly improved anxiety and self-compassion, and for those with symptoms of depression, depression was also reduced. However, because we did not use dismantling techniques or measure hypothesized mediators of the separate effects of yoga, CBT, and their components, this study does not demonstrate what elements of Y-CBT affected participants' benefits or how.

CBT has been extensively studied across the age spectrum. According to recent research reports, CBT demonstrates reductions in symptoms of anxiety for older adults in the range of $g = 0.94$ for those who still work, to 0.55 for non-working older adults (Kishita & Laidlaw, 2017). In the current study, anxiety was reduced with a large effect size ($g = 0.88$). Although we did not assess work, as the groups were held mid-day, it is likely that the majority of

participants were not working. These results indicate that Y-CBT may be a promising approach for older adults who experience anxiety, though we did not directly compare Y-CBT to CBT alone, which needs to be done in future research.

In the current study, overall, depression was also reduced with a moderate effect size ($g = .418$), but the difference was not significant. However, this compares favorably with a review of both CBT and mindfulness for this age group, as reported by Kishita et al. (2016). The authors found that the results for both CBT and mindfulness-based classes yielded effect sizes in the moderate range for depression ($g = .055$). Similarly, Bonura and Tenenbaum (2014) found effect sizes in the moderate range after yoga for symptoms of depression in older adults ($d = .41$ to 0.53). As the current study was carried out in a non-clinical environment and as Y-CBT was designed for a clinical population, it is possible that a sample, which was screened for depressive diagnoses, would yield significant differences. Tables 2 and 3 give an indication in this direction as many subjects decreased their levels of depression into the minimal or clinically non-significant ranges after as compared with before the Y-CBT sessions.

Self-compassion involves being kind to ourselves and is related to mindfulness (Neff, 2003). Y-CBT includes mindfulness techniques and works to help the participant to see themselves and others through more compassionate eyes. In this study, Y-CBT completers demonstrated significant improvement in self-compassion ($p \leq .0438$), though the effect size ($g = .384$) was small.

Limitations & future directions

This study has several limitations. Homework was not tracked, and this element should be included as part of future studies as practice has been shown to have significant benefits (Peretz et al., 2023). Data on participant's previous yoga experience, ethnicity, marital, economic, and employment status were not collected, and future studies should include this information. Additionally, the study results should be limited to a self-selecting group who live in the community, attend senior centers, and participate in activities such as yoga.

The attrition rate in this study (35%) is consistent with the other Y-CBT studies, as well with the rates found for those with anxiety in the general population, where the range is 10.3% to 57% (Santana & Fontenelle, 2011). This dropout rate is also consistent with results in a review for older adults where dropout rates were reported in the 0% to 44% range for CBT (Hall et al., 2016). However, in line with these other studies, the dropout rate is still too high. Factors such as weather, which cancels more sessions for older adults, may need to be considered in future research. A follow-up questionnaire,

which would include information about reasons for dropout, would also be very beneficial in evaluating the long-term effects of the intervention.

Other limitations include the sample size being small (but see below regarding power to detect effects of the sizes found in this study); there was no intent-to-treat analysis and no control or comparison group. This limits the confidence with which we can conclude that significant changes in outcomes were due to Y-CBT as a whole or should be attributed to a particular aspect of Y-CBT, and whether Y-CBT outperforms CBT. We hoped that these findings would begin to establish Y-CBT's effectiveness and justify further research with a control group to test changes in outcome compared to other conditions such as CBT alone, without yoga. Similarly, information about marital, work, and economic status would also have provided valuable information. A follow-up questionnaire about the long-term effects is also needed.

Future studies could also examine specific elements of each of the components to evaluate how much change can be attributed to specific techniques. For example, studies of the brain have shown that calming mechanisms in the brain become more active during a type of meditation called mindfulness and the people report feeling calmer as well (Zhang et al., 2021). Future studies could also screen for depression and anxiety, which Tables 2 and 3 indicate might yield more significant improvement, as compared to those who are not clinically depressed or anxious at the start of the sessions.

Based on the data provided by this study, we can estimate the necessary parameters to design a larger, randomized clinical trial. We can base this on G*Power results (Faul et al., 2007), with a 95% CI (two-tailed alpha set to $p < .05$), with power (likelihood of finding an effect that exists) set to the standard level of 80% or to 95% to match the Type I error level. Our current data indicate that to measure the effect of Y-CBT for: 1) anxiety (STAI-S): a sample size of 13 and 19 participants would be required, respectively; 2) Self-Compassion (SCS-SF): a sample size of 56 and 91 participants, respectively, would be required; 3) Depression (PHQ-9) a sample size of 47 and 77 participants at intake would be required.

Y-CBT, which combines Cognitive Behavioral Therapy with yoga within the context of group process, may be beneficial in improving self-compassion and in reducing symptoms of anxiety and depression. Combining the elements of Y-CBT may be helpful as follows: Like other small group processes, the group therapy setting provides a forum for social interaction, mutual support, and reciprocal validation (Husaini et al., 2004) thereby reducing feelings of perceived social isolation. Whereas, it may be said that CBT works primarily by correcting dysfunctional *cognitive and behavioral processes* while also affecting physical systems, yoga, and meditation work primarily by correcting maladaptive *physical processes* while also affecting the emotional and cognitive aspects involved in the experience of anxiety and comorbid depression. As with CBT (Wenzel, 2017),

after Y-CBT, people may be more effective at countering challenging maladaptive thoughts. Like mindfulness (de Frias & Whyne, 2015) and yoga (Basu-Ray et al., 2022), Y-CBT may serve a protective function in shielding older practitioners from the harmful physical effects of stress. Like yoga (Greiner-Ferris & Khalsa, 2017), Y-CBT may reduce the initiation of negative cognitive thoughts before they begin, and Y-CBT may accomplish all of these goals simultaneously.

Conclusions

The current study indicates that Y-CBT may be useful for the reduction of symptoms of anxiety and depression for older adults. Continued practice of these physical and cognitive skills may give older adults useful tools as they manage the issues of aging. The clinical implications of this approach when working with older adults indicate that attention to the relationship between the cognitive and physical expressions of anxiety will yield significant benefit.

Despite the limitations of this research, this study indicates that Y-CBT may have potential benefit for adults who are experiencing anxiety and depression in senior center settings.

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Disclosure statement

There are no competing interests for the MetroWest Health Foundation or for Riverside Community Care, a non-profit behavioral health organization both of which supported this work. Neither corporation had a role in the analysis of data or in the drafting of the manuscript. Greiner-Ferris and Khalsa are involved in Y-CBT research, courses, and practice. Julie Greiner-Ferris works for Riverside. Manjit Khalsa worked for Riverside at the time of the study. They published: *The Yoga-CBT Workbook for Anxiety* (New Harbinger Publications) in 2017. Paul Block has no conflicts of interest with respect to this publication.

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Data

The data that support the findings of this study are available from the corresponding author, [JGF], upon reasonable request.

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