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A pragmatic preference trial of therapeutic yoga as an adjunct to group cognitive behaviour therapy versus group CBT alone for depression and anxiety

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ABSTRACT

Background: Yoga has several mechanisms that make it a promising treatment for depression and anxiety, including physical activity, behavioural activation, and mindfulness. Following positive outcomes from adapted CBT interventions incorporating mindfulness-based practices, this study explored the effects of a therapeutic yoga program as an adjunct to group-based CBT for depression or anxiety.

Methods: This was a pragmatic preference trial involving adults diagnosed with depression or anxiety in a regional primary mental healthcare service ($n = 59$), comparing transdiagnostic group CBT ($n = 27$) with transdiagnostic group CBT combined with an adjunct therapeutic yoga program ($n = 32$). A preference recruitment design allowed eligible participants ($n = 35$) to self-select into the adjunct program. The Depression Anxiety Stress Scale-21 (DASS) was assessed at baseline, post-intervention, and three-months follow up.

Results: CBT + Yoga was an acceptable alternative to CBT alone. Significant reductions were observed in total DASS scores and the 3 subscales of the DASS for both groups, however CBT + Yoga showed significantly lower depressive and anxiety symptoms post-intervention, compared to CBT alone. CBT + Yoga also showed sustained reductions in depressive symptoms over three-months, and more rapid reductions in depressive symptoms, compared to CBT alone.

Limitations: These findings should be considered preliminary due to the moderate sample size, with a rigorous randomised control trial necessary to definitively support the integration of yoga within mental health care to augment the benefits and uptake of transdiagnostic CBT for depression and anxiety.

Conclusions: Complementing other mindfulness-based practices, therapeutic yoga shows promise as an adjunct to transdiagnostic CBT.

1. Introduction

Cognitive Behavioural Therapy (CBT) is widely regarded as a gold-standard treatment for anxiety and depression, with level one evidence across multiple presentations and formats, including individual and manualised group protocols (Carpenter et al., 2018; Cuijpers et al., 2019; Santoft et al., 2019). The treatment proposes that mental disorders are maintained by cognitive and behavioural factors that are amenable to change by applying tools and strategies that identify and challenge unhelpful thinking and behavioural patterns (Beck, 2011). Given the high rates of comorbidity across anxiety and depression, as well as shared underlying aetiological and maintenance processes, CBT is used as a transdiagnostic treatment for anxiety and depression (Nathan et al., 2004; Norton et al., 2021), with similar rates of efficacy

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Table 1
Yoga postures and pranayama used during group classes.

Postures	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Savasana (Corpse Pose)	X	X	X	X	X	X	X	X
Ardho Mukha Svanasana (Downward Facing Dog)				X		X	X	X
Cakravakasana (Sunbird)	X	X	X	X	X	X	X	X
Tadasana (Standing Balance)				X		X		X
Urdhva Prasrta Padasana (Lying Leg Raise)		X	X				X	X
Uttanasana (Standing Forward Bend)	X	X	X	X	X	X	X	X
Ardha Uttanasana (Standing Half Forward Bend)	X	X		X		X		
Virabhdrasana 1 (Warrior)	X		X	X		X	X	
Virabhdrasana 2 (Warrior Twist)	X			X		X		
Apanasana (Lying Knees to Chest)	X	X	X	X	X	X	X	
Dvipadapitham (Bridge)	X	X			X	X		X
Trikonasana Parsva (Standing Triangle)		X		X	X			X
Parsva Uttanasana (Lateral Forward Bend)			X				X	
Jathara Paravrtti (Modified Lying Twist)		X		X	X	X	X	
Supta Baddha Konasana (Lying Butterfly)		X						
Janursirsasana (Assymetrical Seated Forward Bend)			X					
Jathara Paravrtti Parsva (Lying Assymetrical Twist)	X							
Sukhasana (Crossed Legs Seated)	X	X	X	X	X	X	X	X
Sukhasana (plus twist) (Crossed Legs Seated Twist)		X		X			X	
Vajrasana (Lightning Bolt/Diamond)								X
Bhujanghasana (Cobra)						X	X	
Utkatasana (Squat)						X		
Dandasana (Stick Pose)							X	
Prasrita Pada Uttanasana (Wide Leg Forward Bend)								X
Ardha Matsyendrasana (D) (Lateral Seated Twist)							X	
Viparita Karani (Lying Supported Inversion)					X		X	X
Utthita Parsva Konasana (Standing Lateral Angle)					X			
Pranayama techniques								
Palming (Hands to eyes)		X						
Recaka Pranayama (Long exhalation focus)	X				X	X		X
Ujjayi (Ocean Breath)			X	X	X	X	X	X
Karanyasam (Finger movement linked to breath)				X	X	X		X
Anuloma Ujjayi (Inhale -ujjayi, Exhale -alternate nostril)							X	X

Based on Krishnamacharaya tradition (Kraftsow, 1999).

reported when compared to disorder-specific protocols (Andersen et al., 2016; Newby et al., 2015).

Despite the robust evidence for CBT as a treatment for anxiety and depressive disorders, at least half of all adults who complete CBT remain symptomatic, with a sizeable group for whom CBT is not efficacious (Santoft et al., 2019) or tolerable (Berk and Parker, 2009). Viewed alongside moderate dropout rates for adults engaged with CBT for anxiety and depression (Carpenter et al., 2018; Dunlop et al., 2017), as well as overall modest rates of access to current mental health treatments (Whiteford et al., 2014), examination of new or adapted approaches is warranted.

The inclusion of mindfulness-based practices into CBT protocols shows promising results. Third wave CBT adaptations, such as mindfulness-based cognitive therapy (MBCT) (Segal et al., 2013), are aimed explicitly at treatment-resistant forms of depression (Segal et al., 2010). Mindfulness practices cultivate deliberate and nonjudgmental attention to the present-moment experience (Kabat-Zinn, 1994), and are proposed to enhance CBT by developing mindful attention to cognitive and emotional experiences and behaviours (Lang, 2013). An attentive state supports the adoption of reflective over reflexive responses through strategies characteristic of CBT, such as thought disputation and behavioural activation (Hayes et al., 2006).

Yoga is a movement practice that fosters mindful awareness and may offer additional benefits to specific mindfulness practices when integrated with CBT. It arises from a traditional Eastern School of philosophical thought aimed at promoting self-realisation and transcendence (Desikachar, 1995). More recently in western cultures, yoga is a holistic practice for health and wellbeing, typically combining physical movement (asana) with breath practices (pranayama) and relaxation, in a form known as *hatha yoga* (Kraftsow, 1999). Body-oriented or movement-based mindful approaches, such as yoga, often focus on developing somatic awareness before moving towards awareness of thoughts and feelings, on the assumption that cognitions can be more difficult to access (Emerson and Hopper, 2011). Yoga, therefore, may represent a more accessible form of mindfulness practice than seated and concentration practices of meditation (Carmody and Baer, 2008; Dick et al., 2014). In parallel, yoga has demonstrated emerging evidence as a treatment for anxiety (Cramer et al., 2018) and depression (Cramer et al., 2017; Cramer et al., 2013), but the pilot nature of this evidence has hampered establishing definitive conclusions about the efficacy of yoga for these conditions as a standalone treatment.

Accordingly, interest has grown in the potential role of yoga as a complementary or adjunct treatment, particularly with psychotherapy approaches, including CBT (Caplan et al., 2013; Valente and Marotta, 2011; Ware, 2007). Nevertheless, it remains unclear how it might augment treatment effects with current therapies for common mental disorders, including depression (Nauphal et al., 2019). To our knowledge, only two studies have examined yoga as an ancillary treatment to CBT for anxiety or depression (Khalsa et al., 2015; Vorkapic and Rangé, 2014), only one of which was controlled (Vorkapic and Rangé, 2014). First, the pilot study of Khalsa et al. (2015) examined the efficacy of a six-week combined yoga and group CBT protocol (Y-CBT) for 32 adults diagnosed with treatment-resistant generalised anxiety disorder (GAD), alongside various other comorbid conditions. Positive effects were observed for the inclusion of yoga, suggesting that yoga-enhanced CBT is a promising treatment approach for reducing anxiety and depressive symptoms in a population with multiple comorbidities and more persistent forms of anxiety. The authors theorised that a combination of yoga and CBT might enhance the benefits of both treatments used as standalone therapies. However, the study was too small to test this hypothesis. The second relevant study is a small, randomised trial ($n = 20$) that examined the effects of a group-based yoga intervention compared

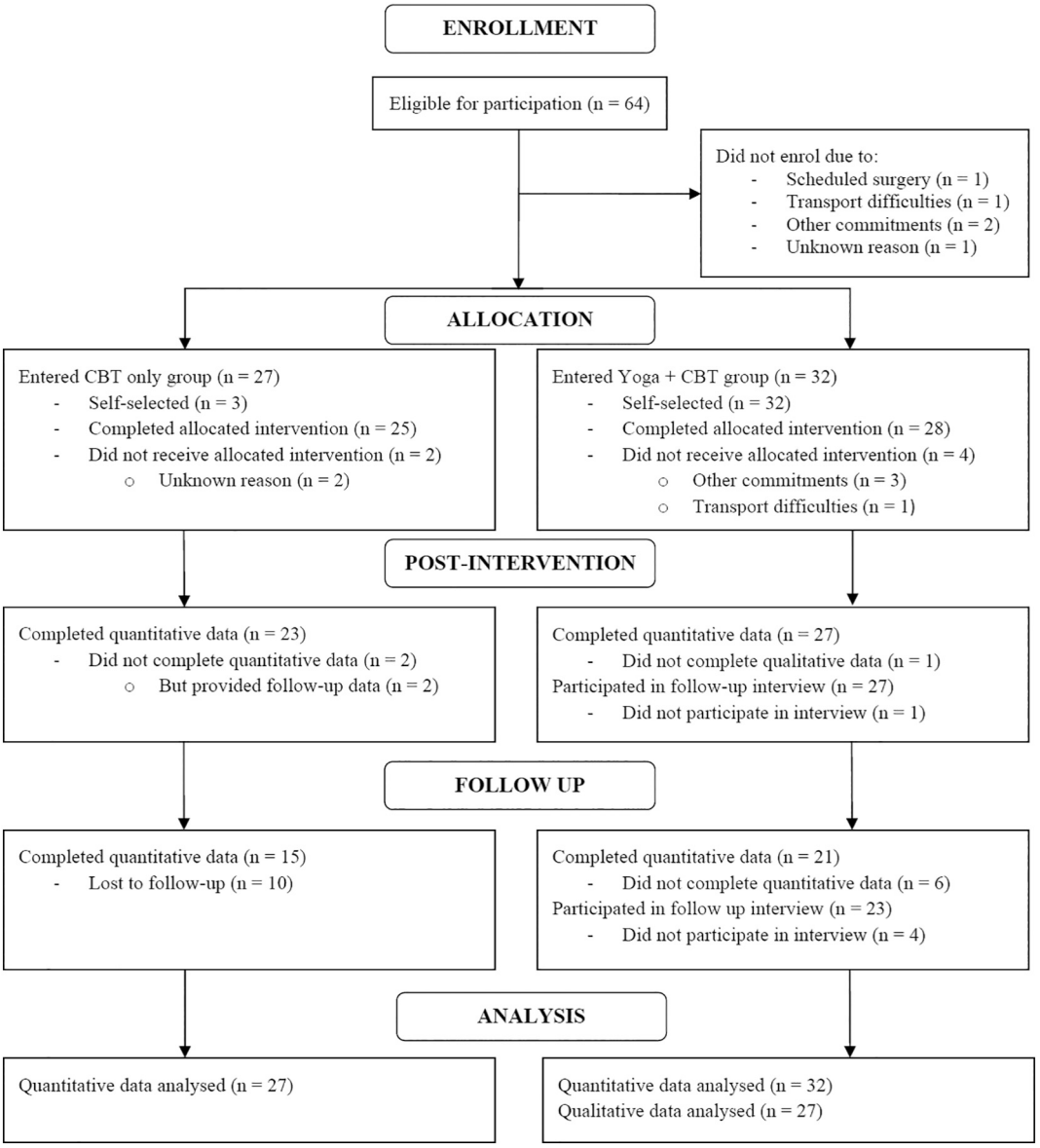

Fig. 1. CONSORT Flow diagram.

to a combined group yoga and CBT treatment model aimed at reducing symptoms of panic disorder (Vorkapic and Rangé, 2014). Significant reductions in anxiety and panic symptoms were observed for both the standalone yoga intervention and combined treatment group. With moderately greater reductions in panic symptoms associated with the integrated treatment, the authors proposed that the combination of yoga and CBT might synergistically enhance benefits associated with improved emotional regulation and cognitive flexibility. However, as the study did not include a standalone CBT condition, any specific additive benefit of yoga-based interventions combined with CBT could not be identified.

Without stronger evidence for yoga-based interventions alongside CBT for the treatment of anxiety and depression, enthusiasm for such integrative approaches should be tempered against the evidence base. To our knowledge, no research has examined the relative effects of CBT, representing the current first-line recommended treatment for anxiety and depression, with and without yoga. As such, we conducted a pragmatic, preference, mixed-methods pilot study to examine the acceptability, feasibility, and preliminary outcomes of group CBT with therapeutic yoga as an adjunct treatment. The primary aim of the present study was to assess the preliminary efficacy of group CBT with therapeutic yoga by comparing post-treatment and three-month follow-up outcomes for depression and anxiety from group-based CBT with therapeutic yoga (CBT + Yoga), compared to group CBT alone (Treatment as usual; TAU). The qualitative findings have been reported elsewhere (Capon et al., 2021). A secondary aim was to examine the acceptability of yoga as an adjunct therapy through the incorporation of a nested preference arm to recruitment, allowing a group of eligible participants to self-select into either TAU or TAU with the adjunct therapeutic yoga program.

2. Methods

The trial was registered through the Australian and New Zealand Clinical Trials Registry (ANZCTR) (trial ID: ACTRN12620000601932) and is described following the Consolidated Standards of Reporting Trials (CONSORT) statement (Schulz et al., 2010).

Table 2
Participant characteristics.

	Yoga + CBT (n = 32)		CBT only (n = 27)	
	Mean	SD	Mean	SD
Age (years)	41.42	13.45	38.64	16.49
	n	%	n	%
Gender				
Male	8	25	8	29.63
Female	24	75	18	66.67
Other	0	0	1	3.70
Country of birth				
Australia	32	100	22	81.48
Highest qualification completed				
University degree	11	34.38	6	22.22
Diploma/apprenticeship	10	31.25	7	25.93
High school, VCE equivalent	7	21.88	9	33.33
No formal qualifications	4	12.5	5	18.52
Employment				
Employed - full time (38 h week)	6	18.75	1	3.70
Employed - part time (<38 h)	9	28.13	4	14.81
Employed – hours not specified	0	0	5	18.52
Not employed	17	53.13	17	62.96
Other mental health conditions impacting daily functioning				
Other mood disorder	1	3.13	2	7.4
Post-traumatic stress disorder	1	3.13	0	0
Eating disorder	1	3.13	0	0
Physical conditions impacting daily functioning				
Pain	8	25	2	7.4
Asthma	1	3.13	2	7.4
Musculoskeletal conditions	5	15.63	2	7.4
Prior experience with yoga	17	53.13	10	37.04

Table 3
Differences between groups at baseline.

	Yoga + CBT			CBT			
	Mean	*SD*	*N (%)*	*Mean*	*SD*	*N (%)*	*Significance*
Age	40.4	13.3		38.8	16.8		$t(57) = 0.41$, $p = .53$
DASS-21 Total score	28.1	11.7		32.4	12.5		$t(57) = 1.31$, $p = .19$
Depression subscale	8.94	6.09		11.8	5.6		$t(57) = 1.7$, $p = .08$
Anxiety subscale	8.52	4.68		9.33	4.22		$t(57) = 0.77$, $p = .44$
Stress subscale	10.7	4.02		11.3	4.99		$t(57) = 0.46$, $p = .64$
Female			24 (75)			18 (69)	$X^2 = 1.59$, $p = .45$
Compliance	78.1%	23.8		81%	18.8		$X^2 = 0.24$, $p = .64$

Note: CBT: Cognitive behavioural therapy; DASS-21: Depression Anxiety Stress Scale; SD: Standard deviation.

2.1. Participants

Participants were recruited from a regional primary mental health clinic in Geelong, Australia that provides evidence-based psychological treatment for adults ($n = 59$). New and existing service clients were eligible if diagnosed with an anxiety or depressive disorder, established via the Structured Clinical Interview for DSM-5 (First et al., 2016) and deemed suitable for transdiagnostic group CBT treatment based on the service criteria. Exclusion criteria followed those adopted by the service for group-based treatment and the treatment manual (Centre for Clinical Interventions, 2021). All participants provided written informed consent after receiving a complete description of the study and confirming that participation would not impact their TAU.

2.2. Outcome measures

The primary outcome measure was the Depression Anxiety Stress Scale - 21 (DASS-21) (Lovibond and Lovibond, 1996). The DASS-21 is a self-report measure that consists of a total distress score and three subscales designed to assess the emotional states of depression, anxiety, and stress. Each subscale contains seven items scored from zero (*did not apply to me at all*) to three (*applied to me very much or most of the time*). Total scores are calculated for each subscale by summing each item, with scores ranging from zero to 21, higher scores indicate more symptoms. Total distress scores are calculated by summing the subscales together, with scores ranging from zero to 60. The overall scale is a valid measure in clinical care (Ng et al., 2007) and has high internal consistency (Cronbach's alpha = 0.92) and re-test reliability ($r = 0.91$) (Lovibond and Lovibond, 1996).

2.3. Interventions

2.3.1. CBT

The control group was a transdiagnostic CBT group program, representing TAU, adapted from the manualised Mood Management Course, developed by the CCI (Nathan et al., 2004). This program is designed to provide effective group-based treatment for anxiety and depression and has comparable efficacy to individual CBT (Craigie and Nathan, 2009). Delivered across eight weekly two-hour sessions, the group aimed to support clients to understand their symptoms, learn practical management strategies, and encourage practice within and outside the group to maintain skills and prevent relapse. The program was facilitated by a clinical psychologist and two provisional psychologists, with up to ten participants per group. Content included psychoeducation, goal setting, behavioural activation, graded exposure, relaxation, thought disputation, and mindfulness.

2.3.2. Therapeutic yoga program

The therapeutic yoga program was delivered under instruction from a Senior Yoga teacher and Yoga Therapist. It involved weekly group sessions and a personalised home practice. The program was informed by the yoga therapy framework (Kraftsow, 1999) and consensus-based recommendations for yoga interventions targeting anxiety and depression (de Manincor et al., 2015). Group sessions were 60 min each and occurred weekly over eight weeks, with up to ten participants in each group. They combined relaxation, breathing, gentle physical postures and movements from standing, lying, or sitting positions, suitable for all levels of experience and utilising modifications where necessary (See Table 1 for elaboration of postures and breathing techniques).

The personalised home practice was developed for each participant by the yoga teacher. Routines were typically 15 to 30 min in duration and involved simple movement and breathing techniques, considering the current health of each participant and any physical injury. Participants were advised to complete their home practice at least three days per week and detail their adherence in weekly practice logs.

2.4. Procedure

Recruitment was conducted in two waves. Wave I was the preference arm of the study and provided participants with the option to self-select or not into the adjunct therapeutic yoga program. We conducted yoga groups until sufficient participants were recruited as defined by our power analysis. Afterwards, in Wave II we recruited participants for the control group only (TAU). All participants in both arms received a $40 gift card upon completion of the post-intervention assessments, and we provided yoga mats to participants in the CBT + Yoga group. We collected demographic information at baseline, and DASS outcome measures at baseline (T1), post-intervention (8 weeks; T2), and three-months follow-up (T3). Before starting recruitment, the Barwon Health Human Research Ethics Committee granted ethics approval

Table 4
Fixed omnibus and parameter estimates for DASS Total symptoms.

Fixed effect omnibus tests					Random components		
R2 = 0.247; ICC = 0.684							
	F	Num df	Den df	*p*	Groups	SD	Variance
Group	7.41	1	59.2	0.009	ID	1.056	1.116
Time	36.66	2	80.2	<0.001	Residual	0.719	0.516
Time * Group	3.30	2	80.2	0.042			

Fixed effects parameter estimates							
			95% CI				
Effect	Estimate	SE	Lower	Upper	df	t	*p*
(Intercept)	4.6101	0.157	4.303	4.9174	59.2	29.404	<0.001
Time (linear)	−0.838	0.128	−1.09	−0.5868	81.9	−6.531	<0.001
Time (quadratic)	0.403	0.111	0.185	0.6221	78.7	3.622	<0.001
Group	−0.426	0.157	−0.734	−0.1195	59.2	−2.722	0.009
Time * Group (Linear)	−0.303	0.128	−0.555	−0.0523	81.9	−2.367	0.02
Time * Group (Quadratic)	0.038	0.111	−0.18	0.2565	78.7	0.341	0.734

Table 5
Fixed omnibus and parameter estimates for depressive symptoms.

Fixed effect omnibus tests					Random components		
R2 = 0.19; ICC = 0.591							
	F	Num df	Den df	*p*	Groups	SD	Variance
Time	15.19	2	85.7	<0.001	ID	0.807	0.652
Group	10.13	1	57.6	0.002	Residual	0.672	0.451
Time * Group	1.8	2	85.7	0.171			

Fixed effects parameter estimates							
			95% CI				
Effect	Estimate	SE	Lower	Upper	df	t	*p*
(Intercept)	2.608	0.122	2.369	2.848	57.6	21.318	<0.001
Time (linear)	−0.472	0.109	−0.684	−0.259	87.5	−4.35	<0.001
Time (quadratic)	0.254	0.1	0.057	0.451	84	2.532	0.013
Group	−0.778	0.245	−1.258	−0.299	57.6	−3.183	0.002
Time * Group (Linear)	−0.41	0.217	−0.836	0.014	87.5	−1.894	0.062
Time * Group (Quadratic)	−0.097	0.201	−0.491	0.295	84	−0.487	0.627

Table 6
Fixed omnibus and parameter estimates for anxious symptoms.

Fixed effect omnibus tests					Random components		
R2 = 0.23; ICC = 0.653							
	F	Num df	Den df	*p*	Groups	SD	Variance
Time	42.58	2	86.8	<0.001	ID	0.721	0.52
Group	3.94	1	59.7	0.052	Residual	0.525	0.276
Time * Group	2.15	2	86.8	0.123			

Fixed effects parameter estimates							
			95% CI				
Effect	Estimate	SE	Lower	Upper	df	t	*p*
(Intercept)	2.294	0.106	2.086	2.502	59.7	21.634	<0.001
Time (linear)	−0.743	0.085	−0.909	−0.576	88.3	−8.729	<0.001
Time (quadratic)	0.106	0.078	−0.048	0.259	85.4	1.346	0.182
Group	−0.421	0.212	−0.836	−0.005	59.7	−1.985	0.052
Time * Group (Linear)	−0.141	0.17	−0.474	0.192	88.3	−0.829	0.41
Time * Group (Quadratic)	0.27	0.157	−0.038	0.578	85.4	1.717	0.09

Table 7
Fixed omnibus and parameter estimates for stress symptoms.

Fixed effect omnibus tests					Random components		
R2 = 0.17; ICC = 0.639							
	F	Num df	Den df	*p*	Groups	SD	Variance
Time	23.29	2	80.1	<0.001	ID	0.807	0.652
Group	3.28	1	58.8	0.075	Residual	0.672	0.451
Time * Group	2.76	2	80.1	0.069			

Fixed effects parameter estimates							
			95% CI				
Effect	Estimate	SE	Lower	Upper	df	t	*p*
(Intercept)	2.8243	0.1001	2.628	3.0204	58.8	28.224	<0.001
Time (linear)	−0.4084	0.0883	−0.581	−0.2353	82.2	−4.625	<0.001
Time (quadratic)	0.2785	0.0768	0.128	0.4291	78.5	3.627	<0.001
Group	−0.1814	0.1001	−0.377	0.0148	58.8	−1.812	0.075
Time * Group (Linear)	−0.185	0.0883	−0.358	−0.0119	82.2	−2.094	0.039
Time * Group (Quadratic)	0.0365	0.0768	−0.114	0.187	78.5	0.475	0.636

Table 8
Post Hoc comparisons between groups.

Time[a]	Group	Time	Group	MD	SE	t	df	*p*
DASS Total								
1	CBT	1	Yoga+CBT	0.399	0.331	1.208	84.5	0.23
2	CBT	2	Yoga+CBT	0.955	0.347	2.75	94.8	0.007
3	CBT	3	Yoga+CBT	1.087	0.392	2.772	119.7	0.006
Depression								
1	CBT	1	Yoga+CBT	0.528	0.276	1.917	91.1	0.058
2	CBT	2	Yoga+CBT	0.698	0.291	2.402	102.5	0.018
3	CBT	3	Yoga+CBT	1.090	0.329	3.315	129.3	0.001
Anxiety								
1	CBT	1	Yoga+CBT	0.211	0.233	0.905	86.3	0.368
2	CBT	2	Yoga+CBT	0.641	0.245	2.616	97.2	0.010
3	CBT	3	Yoga+CBT	0.419	0.275	1.525	123.7	0.130
Stress								
1	CBT	1	Yoga+CBT	0.071	0.218	0.327	82.7	0.744
2	CBT	2	Yoga+CBT	0.422	0.228	1.853	91.5	0.067
3	CBT	3	Yoga+CBT	0.594	0.276	2.158	124.9	0.033

[a] Time 1, 2, and 3 refer to baseline, follow-up, and 3 months respectively.

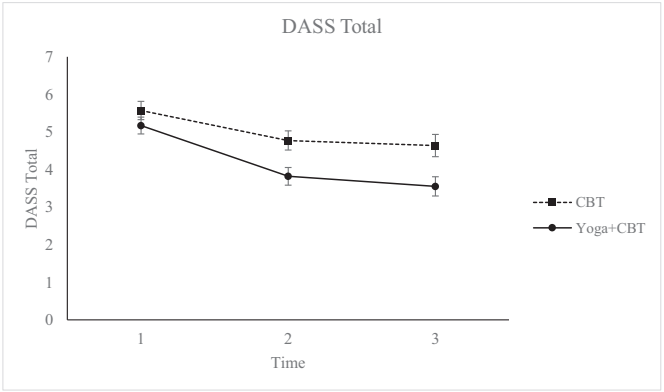

Fig. 2. Total DASS symptoms over time.
0: CBT only group; 1: CBT + Yoga group.

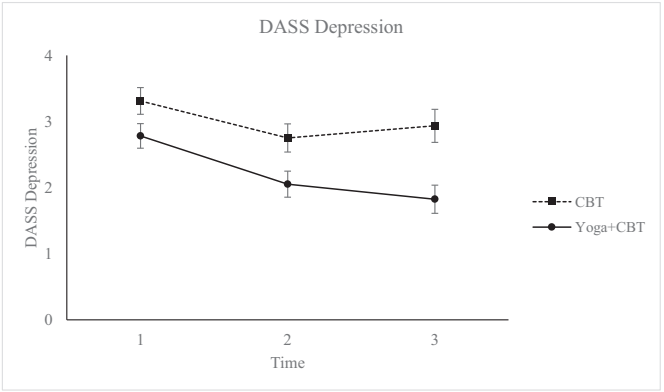

Fig. 3. Depressive symptoms over time.
0: CBT only group; 1: CBT + Yoga group.

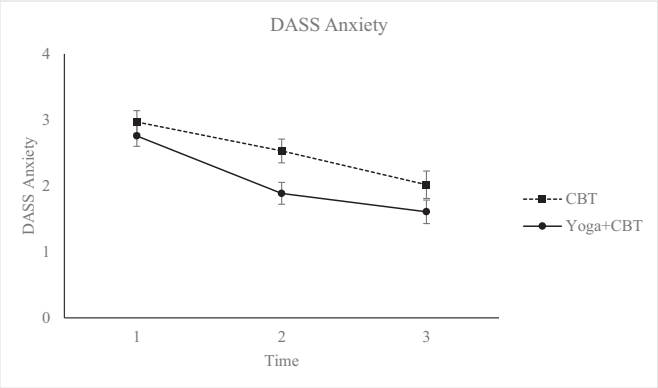

Fig. 4. Anxiety symptoms over time.
0: CBT only group; 1: CBT + Yoga group.

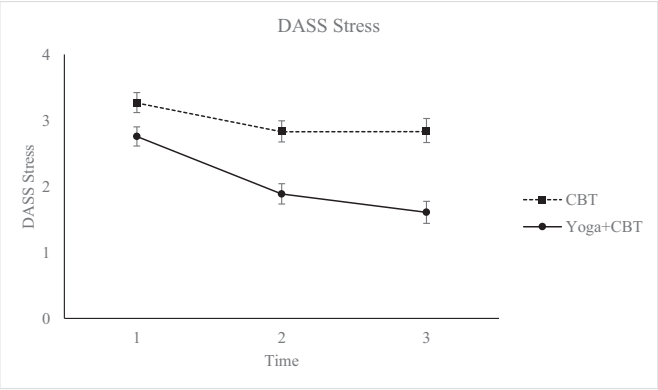

Fig. 5. Stress symptoms over time.
0: CBT only group; 1: CBT + Yoga group.

(Protocol number 18/102).

2.5. Data analyses

For this study, we used the WebPower package for R (Zhang and Yuan, 2018) to perform an a priori power estimation for a repeated-measures linear mixed model. Setting the alpha level of 0.05, power of 80%, and a correlation parameter of 0.8, following previous research (Cramer et al., 2013), a total sample size of 56 participants was needed to detect a minimum absolute effect size of f = 0.4.

We planned a fixed-effects linear mixed model with between-within interactions for each outcome to examine whether CBT augmented by yoga would be superior to CBT alone to reduce DASS total and subscale scores. We used Jamovi software (The Jamovi Project, 2020; R Core Team, 2020) and the GAMlj package (Galluci, 2019) to interrogate the data and the Bonferroni correction for multiple comparisons. Given the exploratory nature of the data, we persisted with our interrogation of the data despite the absence of statistically significant omnibus main effects or interactions. Mild skew was present in each dependent variable at baseline and was corrected using the square root transformation.

3. Results

A total of 59 participants were enrolled in the study, with $n = 27$ engaged in CBT only and $n = 32$ in CBT + Yoga. Of the 35 participants recruited during the Wave I preference arm of recruitment, only three selected TAU (CBT alone). At T2, there were 50 participants overall ($n =$ 27 in CBT + Yoga), and 34 at T3 ($n = 21$ in CBT + Yoga). See Fig. 1 for CONSORT flow diagram.

Most participants were female (71.1%), born in Australia (100%) and not currently engaged in employment (57.6%) (see Tables 2 and 3). A trend was observed for participants in the CBT + Yoga group to have higher levels of employment, higher reported pain and other physical conditions impacting their daily functioning, and more prior exposure to yoga. The inclusion of these demographics as covariates in subsequent modelling did not change the analysis and were omitted from these models. At T1, participants scored between the high end of moderate to severe range DASS-21 subscales, with no significant differences in scores observed between treatment groups.

3.1. Descriptive statistics

We examined linear and non-linear interactions between time and treatment groups for the DASS total score and subscales over T1, T2 and T3. Tables 4 to 7 contain the omnibus tests of model fit and parameter estimates for each outcome. As both groups improved, significant interactions were observed between group and time for the DASS total score and stress, and linear effects for time for anxiety and depression. A main effect showed higher average depressive symptoms for the CBT only condition across all time points.

3.2. Post-hoc simple effects

While both groups showed significantly reduced scores on all measures over time, some between-groups differences were observed at individual time points (displayed in Table 8). The CBT + Yoga group demonstrated significantly lower DASS total scores and depressive symptoms at T2 (SMDs = 0.59 [0.02, 1.17] and 0.68 [0.11, 1.25] respectively), compared to the CBT only group, and an even greater difference was observed at T3 (SMDs = 1.04 [0.31, 1.77] and 1.14 [0.41, 1.87] respectively). The CBT + Yoga group also showed significantly fewer anxiety symptoms at T2 than the CBT only group (SMD = 0.75 [0.17, 1.32]), and fewer stress symptoms at T3 (SMD = 0.75 [0.04, 1.46]). We did not observe any significant differences for anxiety symptoms at T3, nor stress at T2.

3.3. Change in anxiety and depression severity over time

Examination of time as a simple moderator for distress symptoms within each experimental group revealed that the linear decrease in DASS total and subscale scores was stronger for the CBT + Yoga group on all outcomes. These findings suggest that while both conditions displayed significant reductions in overall distress and depressive symptom severity from T1 to T2 (supported by within-groups post-hoc examination of simple effects in Table 8), further reductions in overall distress and depression severity are observed from T2 to T3 for the CBT + Yoga group. In contrast, overall distress and depression severity began to increase again for the CBT alone group. The rate of change for the CBT + Yoga group was twice that of the CBT only group for the first two time points, as is the overall longitudinal reduction. For anxiety symptoms, the moderator effects were less distinct. Both treatment conditions were associated with significant, negative linear effects of time, yet the effect was slightly stronger for the CBT + Yoga group. Stress symptoms were broadly comparable to total distress and depression subscale scores, with a plateau effect observed after T2 for both groups, but greater change prior. See Figs. 2 to 5 for illustrations of these effects and Table 9 for the simple moderator effects of time.

4. Discussion

This study is the first to explore and demonstrate the effects of yoga on engagement and clinical outcomes for CBT by directly comparing standalone CBT to CBT combined with a therapeutic yoga program for anxiety and depression. Our findings suggest that a CBT + Yoga

Table 9
Simple moderator effects for time.

DASS total								
Moderator levels				95% Confidence interval				
	Contrast	Estimate	SE	Lower	Upper	df	t	*p*
CBT	Linear	−0.659	0.188	−1.032	−0.286	86.8	−3.51	<0.001
	Quadratic	0.27	0.17	−0.068	0.608	84.1	1.59	0.116
Yoga and CBT	Linear	−1.145	0.161	−1.464	−0.826	86.2	−7.13	<0.001
	Quadratic	0.443	0.151	0.1435	0.743	82.7	2.94	0.004

Depression								
Moderator levels				95% Confidence interval				
	Contrast	Estimate	SE	Lower	Upper	df	t	*p*
CBT	Linear	−0.267	0.166	−0.596	0.063	88	−1.6	0.112
	Quadratic	0.303	0.151	0.003	0.602	84.8	2.01	0.047
Yoga and CBT	Linear	−0.677	0.139	−0.954	−0.4	86.8	−4.86	<0.001
	Quadratic	0.205	0.133	−0.058	0.469	82.9	1.55	0.126

Anxiety								
Moderator levels				95% Confidence interval				
	Contrast	Estimate	SE	Lower	Upper	df	t	*p*
CBT	Linear	−0.672	0.13	−0.931	−0.413	88.7	−5.156	<0.001
	Quadratic	−0.029	0.118	−0.263	0.205	86	−0.247	0.806
Yoga and CBT	Linear	−0.813	0.109	−1.03	−0.596	87.8	−7.437	<0.001
	Quadratic	0.24	0.104	0.034	0.447	84.5	2.318	0.023

Stress								
Moderator levels				95% Confidence interval				
	Contrast	Estimate	SE	Lower	Upper	df	t	*p*
CBT	Linear	−0.223	0.13	0.1419	0.1419	82.9	−1.57	0.119
	Quadratic	0.242	0.118	0.1176	0.1176	79.1	2.06	0.043
Yoga and CBT	Linear	−0.593	0.109	0.1052	0.1052	81.0	−5.64	<0.001
	Quadratic	0.315	0.104	0.0988	0.0988	77.6	3.19	0.002

intervention is more effective than CBT alone for reducing symptoms of anxiety and depression post-treatment. They also indicate that a combined protocol may be more effective than CBT alone for sustaining improvements in depression over a three-month period. Exploratory examination of outcome trends also suggests that CBT + Yoga might result in quicker improvements in depression, offering promise for enhancing treatment engagement and compliance.

These findings inform CBT intervention research, which although establishing CBT as the gold standard among other psychological treatments for anxiety and depression (Andersen et al., 2016; Norton et al., 2021), also reveals gaps in efficacy and acceptability for these conditions (Carpenter et al., 2018; Santoft et al., 2019), and comparatively weaker evidence for the sustainability of associated benefits (Bandelow et al., 2018). Mindfulness may improve short and long-term efficacy of CBT (Segal et al., 2013) by helping people to identify unhelpful behavioural and thought patterns, which can then be modified by CBT tools, and by supporting them to change their relationship with distressing internal experiences (Lang, 2013). As a '*mindfulness in motion*' (Salmon et al., 2009), our findings indicate that yoga offers an alternative approach to cultivating mindful attention, that, like other mindfulness-based practices, has the effect of augmenting the benefits of CBT and sustaining improvements overtime. Notably, many depressed or anxious people find more contemplative and seated mindfulness practices difficult to engage with (Carmody and Baer, 2008). Accordingly, yoga may also be a more suitable adjunct to CBT for this clinical population and a practice found easier to sustain longer term.

Triangulating these findings with qualitative data reported prior (Capon et al., 2021), suggests that a key mechanism for the enhanced clinical outcomes found for CBT + Yoga was the capacity for yoga to cultivate mindful attention. Participants revealed that moving the body with the breath enhanced their awareness of internal states and symptoms of anxiety and depression. This provided opportunities to apply CBT strategies to reduce these symptoms and afforded feelings of calm and positive affect to arise naturally.

Participants also remarked that yoga represented a form of behavioural activation that supported them to engage in CBT and their daily life. By engaging in a regular yoga practice they reported ultimately feeling more connected, empowered, and self-compassionate, whilst also noticing physical benefits, such as improved sleep and renewed energy (Capon et al., 2021). These aggregate effects reflect several proposed models for the therapeutic mechanisms of yoga, which recognise that by uniquely incorporating movement, breath regulation, and relaxation, yoga impacts across the biopsychosocial system of health (Butterfield et al., 2017; Evans et al., 2009; Gard et al., 2014). Considered alongside the established benefits of exercise for ameliorating depressive and anxious symptoms (Nyström et al., 2015; Stonerock et al., 2015), and the complementary underlying theoretical frameworks between yoga and western psychological treatments, particularly CBT (Caplan et al., 2013; Ware, 2007), a compelling rationale is emerging for yoga as an adjunct treatment for the management for depression and anxiety.

A secondary aim of this study was to examine the acceptability of yoga as an adjunct to CBT through the adoption of a preference recruitment wave. Mental health approaches that combine mind and

body practices may be less stigmatising than other mental health treatments, including CBT as a standalone approach (Uebelacker et al., 2010). As such, the high uptake of this novel intervention also highlights the potential for yoga to promote engagement in CBT and overcome a well-established barrier to access to mental health treatment for some adults (Corrigan, 2004).

As is the case with exploratory studies, several limitations are noteworthy. Specifically, the moderate sample size and non-randomised and non-blinded design was underpowered to examine all effects of interest, including differences between those that self-selected yoga compared to those that did not. We note moderate sample attrition from post-treatment to three-month follow-up, and we also acknowledge that it is atypical to persist with the investigation of simple effects in the absence of statistically significant interaction effects. However, the absence of a statistically significant omnibus interaction effect did not preclude the potential for substantial effects that would otherwise go unobserved (for example, see Dawson and Richter (2006)). To avoid possible overinterpretation of the data, we used multiple comparison correction techniques and cautious examination to analyse these findings. Trials involving preference may engage more motivated individuals into the preference arm which may induce bias. As such, it is possible that preference effects explain the observed differences. It is also possible that the improvements observed for the CBT + Yoga group were related to their higher dose of non-specific rather than therapeutic effects of the adjunct treatment, such as attention, compassionate care, and positive expectations for improvement (Kaptuchuk, 2002).

Nevertheless, assuming the judicious interpretation of any potential treatment effects, exploratory studies, which may also assess the preliminary efficacy, are regarded as an essential first step for demonstrating early signs of acceptability, feasibility, and clinical potential of novel interventions. Following promising findings for such interventions, the next step is to move more robust but inevitably more costly research designs, such as randomised control trials (RCT) (Thabane et al., 2010). Accordingly, the findings reported here support the need for a larger RCT to examine further how yoga might interact with CBT to enhance recovery from anxiety and depression. The inclusion of more men in such trials is also encouraged, noting their underrepresentation in the present study and mental health treatment in general (Affleck et al., 2018), and the need for a more nuanced understanding of which approaches are more acceptable to them (Seidler et al., 2016).

5. Conclusion

This study suggests yoga is a viable adjunct to transdiagnostic CBT, that like other mindfulness-based practices, is associated with moderately better and sustained improvements for depression and anxiety. This finding suggests that implementing yoga alongside CBT within mental health settings can enhance treatment uptake and outcomes for people with depression and anxiety. Future research adopting more robust study designs, including RCTs, is needed to definitively establish the evidence for this novel intervention.

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Conflict of interest

Author MOS designed the study and along with author HC, wrote the protocol. Authors MOS and HC managed the literature searches and manuscript development. Author DS undertook the statistical analysis. All authors contributed to and have approved the final manuscript.

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