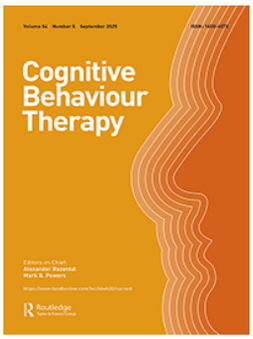

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Videoconferencing-delivered cognitive behavioural therapy for social anxiety disorder: a randomised controlled trial

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ABSTRACT

Videoconferencing-delivered cognitive behaviour therapy (vCBT) has the potential to overcome barriers to accessing treatment for social anxiety disorder (SAD). The present study examines the efficacy and acceptability of vCBT for SAD in a randomised controlled trial. Seventy-eight participants were randomised to a vCBT condition or waitlist control group (61.8% female, 34.2% male, 3.9% non-binary; *M*age = 39.19, *SD* = 12.28). On the Social Interaction Anxiety Scale and Social Phobia Scale—short form (SIAS-6; SPS-6), vCBT within-group analyses indicated large effect sizes from pre-treatment to post-treatment on the SIAS-6 (Cohen's *d* = 0.95; 95% CI: 0.45–1.41) and SPS-6 (*d* = 0.90; 95% CI: 0.41–1.37). The between-group effect size at post-treatment was large on the SPS-6 (*d* = 1.01; 95% CI: 0.51–1.47) and medium on the SIAS-6 (*d* = 0.55; 95% CI: 0.09–1.00). At post-treatment, 57% of participants in the vCBT condition no longer met criteria for SAD and 68% at 3-month follow-up. Benchmarking analyses indicated similar treatment effect sizes to in-person CBT for SAD. Participants rated the program as acceptable and treatment completion rates were high. The results suggest that vCBT may be a viable remote treatment option for individuals with SAD.

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Social anxiety disorder; cognitive behaviour therapy; CBT; remote treatment; videoconferencing; randomised controlled trial

Introduction

Social anxiety disorder (SAD) is characterised by a fear of negative evaluation in social or performance situations (American Psychiatric Association, 2022). This anxiety leads to avoidance of settings in which the person feels they may do something embarrassing or humiliating, or fears their anxiety may be noticeable to others (Andrews et al., 2018). SAD is a common anxiety disorder with an estimated lifetime prevalence of 4% and a 12-month prevalence of 2% (Stein et al., 2017). Despite the high prevalence of SAD, only 23% of lifetime cases report receiving treatment specifically for their SAD symptoms (Bruffaerts et al., 2022).

Cognitive behaviour therapy for social anxiety disorder

Cognitive behaviour therapy (CBT) is a first-line treatment for SAD (National Institute for Health and Care Excellence, 2013). Individual treatment usually consists of up to 14 individual sessions of 60–90 minutes each (National Institute for Health and Care Excellence, 2013). CBT tends to be based on either the Clark and Wells (1995) or Rapee and Heimberg (1997) model of SAD, and includes education about symptoms of SAD, cognitive restructuring to address maladaptive thoughts and beliefs, and in-vivo strategies including graduated exposure to address avoidance behaviours (Pelissolo et al., 2019). Multiple meta-analyses have demonstrated the efficacy of this treatment approach in in-person settings, with medium to large between-group effect sizes (Cohen's *d* ranging from .61 to 1.19) when comparing CBT to a control or waitlist condition (Acarturk et al., 2009; Cuijpers et al., 2016; Hofmann et al., 2012; Mayo-Wilson et al., 2014). In a recent meta-analysis of randomised controlled trials (RCTs), treatment effects appear to be durable (Hedges' *g* = .74) at 12 months and beyond (Kindred et al., 2022).

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While the efficacy of in-person individualised CBT is supported and the provision of CBT as a first-line treatment for SAD is critical, there are a wide range of logistical and psychological barriers to accessing CBT. These include long waitlists, geographical barriers, financial barriers, as well as shame and social stigma (Olfson et al., 2000; Shim et al., 2017). Remotely delivered CBT has the potential to improve access to evidence-based treatment for SAD. Remote delivery uses technology to provide the same CBT techniques used in in-person treatment in either low-intensity or high-intensity formats.

Remote cognitive behaviour therapy for social anxiety disorder

Low-intensity remote CBT is an asynchronous treatment model where patients work through self-help modules either independently (self-guided) or with some support from a clinician (clinician-guided). When clinician guidance is provided, it is typically delivered via email, telephone or secure messaging services (Lattie et al., 2022) and equates to approximately 10 minutes or less per week (Nordgreen et al., 2016). A recent meta-analysis of remote CBT for SAD identified three existing methods of low-intensity remote CBT including; internet-delivered CBT (iCBT), application-based CBT (aCBT) and bibliotherapy-delivered CBT (bCBT) (Winter, Norton, Burley, et al., 2023). Overall, pooled low-intensity delivery is supported with a large effect size from pre-treatment to post-treatment (Hedges' $g = 1.06$). Specifically, iCBT and aCBT also yielded large effect sizes (Hedges' $g = 1.08$ and 1.19, respectively), while bCBT resulted in a medium effect size (Hedges' $g = 0.79$) (Winter, Norton, Burley, et al., 2023). Additionally, internet-delivered cognitive therapy based on the Clark and Wells (1995) model has shown transportability across cultures demonstrating excellent clinical outcomes in recent trials in the United Kingdom (Clark et al., 2023), Hong Kong (Thew et al., 2022) and Japan (Yoshinaga et al., 2023).

High-intensity CBT is synchronous between the therapist and patient, utilising the same amount of clinician contact as in-person CBT (i.e. 60–90 minutes per session). High-intensity remote CBT is typically delivered using internet videoconferencing software (e.g. Zoom or Teams) and has become a popular method of treatment delivery since the COVID-19 pandemic (Lattie et al., 2022). Due to the nature of videoconferencing delivered treatment, therapeutic interactions between therapist and patient can include observations of nonverbal information such as facial expressions, eye-contact, and body language. Furthermore, videoconferencing software is capable of screen sharing and real-time collaboration, similar to an in-person therapy session.

Videoconferencing-delivered CBT (vCBT) has a small but growing evidence-base in the treatment of internalising disorders such as posttraumatic stress disorder (e.g. Frueh et al., 2007; Morland et al., 2015); transdiagnostic mood-anxiety disorder treatment (Stubbings et al., 2013); and generalised anxiety disorder (Trenoska Basile et al., 2024). Existing systematic reviews and literature reviews conclude that vCBT shows great promise as an alternative to in-person therapy; however, the limited number of RCTs examining the efficacy of vCBT for specific psychological disorders is problematic (Berryhill et al., 2018) as treatment and outcomes for one disorder cannot necessarily be generalised to SAD due to differing aetiological and maintaining factors between disorders. To date, the efficacy of vCBT for SAD has not been evaluated in an RCT. A small single-arm trial of vCBT for various anxiety disorders included 10 participants with SAD, each receiving 16 individual sessions (Matsumoto et al., 2018). This trial indicated promise for vCBT for SAD with large within-group effect sizes (Cohen's $d = 1.10$) and high patient satisfaction (Matsumoto et al., 2018). Although this study demonstrates that vCBT may be a promising treatment approach for SAD, the study is limited by the open trial design without a control group and small sample size.

Patient acceptability of the vCBT delivery format is paramount for successful treatment and reduction in barriers to accessing treatment. A recent thematic analysis of patient and therapist perspectives to using vCBT indicated a positive change in attitude towards virtual treatments of anxiety disorders for both patients and therapists following continued use (Song & Foster, 2022). It is likely that the ubiquitous nature of videoconferencing in work, study and social spheres since the COVID-19 pandemic has also fostered a more acceptable perception of remote psychological therapy in general (Lattie et al., 2022). However, despite the growing acceptance and shifts towards remote treatment in the last three years, there is no research on the acceptability of vCBT for patients with SAD.

The present study

The aim of the current study was to address the limitations of the existing literature by examining the acceptability and efficacy of vCBT for SAD using a RCT design. Based on the limited existing literature, it is hypothesised that high-intensity vCBT will (1) result in significant reductions in social anxiety symptoms, yielding large within-group effect sizes from pre-treatment to post-treatment and pre-treatment to 3-month follow-up, and large between-group effect sizes at post-treatment; (2) result in similar reductions to standard in-person CBT using a benchmarking analysis; and (3) be acceptable to individuals with SAD.

Methods

Design

A RCT design adhering to the 2025 CONSORT statement (Hopewell et al., 2025) was used to assess the study hypotheses by comparing a vCBT group to a waitlist control (WLC) group. Given that this is the first examination of vCBT in an RCT design, a WLC was considered an appropriate comparison group. The research was approved by the University of Technology Sydney Health and Medical Research Ethics Committee (REF NO. ETH22–7803). The study was prospectively registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12623000313639) in March 2023 and the study protocol was published (Winter, Norton, & Wootton, 2023). The CONSORT checklist is provided in Supplement A.

Participants

78 participants were deemed eligible and included in the trial, 39 of whom were randomly allocated to the treatment group (vCBT) and 39 to the WLC. Information on the inclusion and exclusion criteria can be seen in the published protocol (Winter, Norton, & Wootton, 2023). Briefly, participants were required to be aged over 18 years with a primary diagnosis of SAD (of at least "moderate severity") as defined by the Diagnostic Interview for Anxiety, Mood, and Obsessive-Compulsive and Related Neuropsychiatric Disorders (DIAMOND; Tolin et al., 2018). Further, participants were required to be medication free or on a stable dose of psychotropic medication for a period of 3 months or longer. Participants were excluded if they had severe depressive symptoms as assessed by a score of 20 or above on the PHQ-9 (Kroenke et al., 2001); were at significant risk of suicide; engaged in daily alcohol use or daily illicit drug use; had a diagnosis of a schizophrenia spectrum disorder; had significant cognitive/intellectual impairment as assessed during the diagnostic interview; had a medical condition that may interfere with treatment; did not have access to a computer with a camera and stable internet on a regular basis; or were not willing to engage in treatment via internet videoconferencing software. Participants were also excluded if they were receiving regular psychological services for their SAD symptoms, defined as sessions at least once a week with a qualified mental health professional. However, ongoing concomitant care was not monitored during the follow-up period.

Procedure

Participants were recruited between April 2023 and April 2024. Recruitment occurred through both paid and unpaid posts on social media and professional networking websites, on the Australian Psychological Society website advertising current clinical trials, and hard copy flyers posted on community noticeboards. From these advertisements participants were directed to an online participant information sheet and consent form and commenced the online screening. Those who met the initial eligibility criteria completed a clinician administered online assessment using the DIAMOND. Participants who met all entry criteria were then randomised on a 1:1 allocation using a random number generation tool (www.random.org). The randomisation sequence was developed by the final author and randomisation was conducted by the first author.

Eligible participants were instructed to complete self-report assessments at various time points using REDCap for data collection and management (Harris et al., 2009, 2019). The treatment group completed self-report assessments prior to the treatment commencing, mid-treatment, post-treatment and

at 3-month follow-up. The treatment group also completed a clinician administered structured clinical interview utilising the DIAMOND (Tolin et al., 2018) at post-treatment and 3-month follow-up. The waitlist control group completed assessments prior to their waitlist period commencing and 8 weeks following. The waitlist participants received treatment following their 8-week waitlist period. Participants were not compensated for participation in the study. Adverse and serious adverse events were monitored throughout the study.

Treatment

Treatment was provided from a university outpatient clinic in Australia utilising videoconferencing software and followed a manualised vCBT treatment program based on Rapee and Heimberg's (1997) model of SAD. The program consisted of 5 modules covering the following domains: (1) psychoeducation; (2) challenging automatic thoughts; (3) challenging core beliefs; (4) exposure; and (5) relapse prevention/consolidation. The treatment was administered in 8 weekly sessions of 50 minutes each. Participants were required to complete homework tasks between sessions. Each participant had an assigned online clinician who administered sessions and reviewed homework. All clinicians were either provisionally registered or fully registered psychologists (5 female; 1 male) under the supervision of an experienced clinical psychologist. To ensure treatment fidelity, treating clinicians received weekly supervision to review client progress and address clinical issues arising from sessions. All sessions were recorded and at least 10% of sessions were randomly selected for review of clinician competence, treatment adherence and integrity checking. Participants in the WLC did not receive treatment for the 8 weeks of the waitlist period, and thereafter received treatment using videoconferencing-delivered imagery rescripting (results described elsewhere; Winter et al., 2025).

Measures

Diagnostic assessment

The DIAMOND (Tolin et al., 2018) is a structured clinical interview that systematically assesses the DSM-5 diagnostic criteria for anxiety disorders, mood disorders, obsessive compulsive and related disorders, trauma and stressor-related disorders, schizophrenia spectrum disorders, eating disorders, somatic symptom and related disorders, substance use disorders and selected neurodevelopmental disorders. The DIAMOND demonstrates very good interrater reliability (kappa = 0.70) and excellent test-retest validity (kappa = 0.86) for the SAD diagnosis (Tolin et al., 2018). The diagnostic interviews were administered by clinicians who were either provisionally registered and in their final year of a Master of Clinical Psychology program or fully registered psychologists under the supervision of an experienced clinical psychologist. All clinicians administering the DIAMOND clinical interview had completed 3 hours of training with very good to excellent interrater-reliability ratings of 0.68–0.89. Post-treatment and 3-month follow-up assessments were not blinded.

Primary outcome measures

Social Interaction Anxiety Scale and Social Phobia Scale – short form (SIAS-6 and SPS-6) (Mattick & Clarke, 1998). The SIAS-6 and SPS-6 are complementary tools designed to evaluate two related but distinct facets of social anxiety, which are central to the disorder (Heidenreich et al., 2011; Peters et al., 2012). The SIAS-6 focuses on broader social interaction anxieties, such as making eye contact, conversing with friends and strangers, and attending social events. In contrast, the SPS-6 targets specific fears of being scrutinized, like drawing attention, or eating, drinking, and writing in public (Peters et al., 2012). Both short forms are self-report measures, each consisting of six items rated on a 5-point Likert scale from 0 (not at all characteristic of me) to 4 (completely characteristic of me). The optimal cut-off scores for identifying individuals with social anxiety disorder (SAD) are 7 or higher on the SIAS-6 and 2 or higher on the SPS-6 (Peters et al., 2012). These short forms have shown reliable psychometric properties, including good internal consistency (α = .75–.85), convergent and discriminant validity, diagnostic accuracy, test-retest reliability and sensitivity to treatment, as demonstrated in previous research (Le Blanc et al., 2014; Peters et al., 2012). The internal consistency in the current sample was α = 0.73 for the SIAS-6 and α = 0.86 for the SPS-6.

Secondary outcome measures

Social Anxiety Disorder Dimensional Scale (SAD-D) (LeBeau et al., 2012). The SAD-D is a 10-item self-report tool designed to measure the severity of social anxiety symptoms. Each item is scored on a five-point Likert scale, from zero ("never" or "none") to four ("all the time" or "extreme"). The SAD-D has shown strong validity and internal consistency in various samples (LeBeau et al., 2016), including an Australian community sample (Binasis et al., 2022; Rice et al., 2021), and has demonstrated good to excellent test-retest reliability (Binasis et al., 2022). It is currently the only validated social anxiety scale based on DSM-5 criteria, capturing the dimensional nature of the disorder assessing the affective, cognitive and behavioural components of social anxiety (Rice et al., 2021; Wong et al., 2016). The measure has a clinical cut-off value of 19 (Rice et al., 2021). The internal consistency in the current sample was $\alpha = 0.86$.

Patient Health Questionnaire – 9 item (PHQ-9) (Kroenke et al., 2001). The PHQ-9 is a commonly used 9-item tool for assessing depressive symptoms. Each item is scored on a 4-point Likert scale ranging from 0 to 3 (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). The total score from these 9 items indicates the severity of depression, with scores of 10 or higher suggesting clinically significant depression (Manea et al., 2012; Zuithoff et al., 2010). The PHQ-9 has been shown to have excellent psychometric properties, including internal consistency, test-retest reliability and discriminative validity (Costantini et al., 2020; Zuithoff et al., 2010). The internal consistency in the current sample was $\alpha = 0.84$.

NIMH Clinician Global Impression (CGI) Scale (self-report version) (Guy, 1976). The CGI is a widely used clinician-administered single-item measure that assesses the severity and improvement of symptoms. In the current study, a self-report version of this scale was utilized. Severity scores range from 1 (normal) to 7 (severely ill), while improvement scores range from 1 (very much improved) to 7 (very much worse). CGI ratings have been shown to positively correlate with both self-report and clinician-administered measures of symptom-specific improvement in individuals with SAD, demonstrating good test-retest reliability (Zaider et al., 2003).

Sheehan Disability Scale (SDS) (Sheehan, 1983). The SDS is a widely used 3-item tool that evaluates the impact of psychiatric symptoms on work, social, and home life functioning. A score of 5 or higher on any item has been used in past studies to identify individuals with clinically significant symptoms (Leon et al., 1992), showing high reliability in primary care settings (Leon et al., 1997). Additionally, it has been recognized as a valid instrument for studying disability in SAD (Aderka et al., 2012; Hambrick et al., 2004).

Process/acceptability measures

Client Satisfaction Questionnaire (CSQ) (Larsen et al., 1979). The CSQ is an 8-item tool designed to gauge participants' overall satisfaction with the treatment they received. It has shown adequate psychometric properties in prior research (Kelly et al., 2018) and is widely used in both primary care and mental health settings (Attkisson & Greenfield, 2004). A score of 22 or higher typically indicates sufficient satisfaction with the treatment (Kelly et al., 2018). The internal consistency for the present study was $\alpha = 0.89$.

Acceptability Questionnaire (AQ). The AQ is a 10-item questionnaire designed to assess the acceptability of remote treatments, particularly how well patients adapt to remote treatments. It has been utilized in various studies involving remote treatment methods (Trenoska Basile et al., 2024; Wootton et al., 2019).

The Working Alliance Inventory-Short Form (Hatcher & Gillaspy, 2006), Core Beliefs Questionnaire (Wong et al., 2017), Clinical Perfectionism Questionnaire (Fairburn et al., 2003), and Experience of Shame Scale (Andrews et al., 2002) were also administered to participants in this study; however, these measures are not reported in this manuscript.

Statistical methods and analysis

Independent t-samples with Bonferroni corrected *p*-values (continuous measures) and chi-square tests (categorical measures) were used to analyse group differences in demographic data, pre-treatment measures, and dropout. For chi-square tests where expected values were less than 5, a Fisher's exact test was used to ascertain significance. Treatment acceptability was examined using descriptive statistics.

The primary analyses of treatment outcomes were conducted using conservative intention-to-treat principles, employing mixed-linear models to manage missing data. Mixed models are a reliable statistical method for analysing longitudinal clinical trial data (Cnaan et al., 1997),

utilising an appropriate covariance structure and maximum likelihood estimation. Additionally, sensitivity analyses were performed to assess the potential impact of missing data on the results using paired samples t-tests for within group analyses and independent samples t-tests for between group comparisons. Effect sizes were calculated according to Cohen's *d* for within-group and between-group differences, based on pooled standard deviations for the entire sample using the estimated marginal means. Within-group effect sizes were calculated from pre-treatment to post-treatment and pre-treatment to 3-month follow-up. Between group effect sizes were calculated at post-treatment comparing the vCBT group to the WLC.

Clinically significant change was evaluated in three ways. First, diagnostic change was measured at post-treatment and at the 3-month follow-up in the treatment group using the DIAMOND (Tolin et al., 2018). Second, treatment response was defined using the Jacobson and Truax (1991) reliable change index (RCI), which indicates a change score that is statistically reliable and not due to measurement error. The RCI thresholds for reliable change were 6.71 for the SIAS-6 and 6.08 for the SPS-6. Reliable deterioration was defined as an increase in symptoms by the RCI magnitude on the SIAS-6 and SPS-6 at post-treatment. Lastly, clinically significant change (CSC) at post-treatment and the 3-month follow-up was defined as meeting the RCI and having a SIAS-6 score below 7 and an SPS-6 score below 2 (Peters et al., 2012).

Benchmarking analyses compared symptom changes in the vCBT group with outcomes from a meta-analysis of in-person CBT (Hall et al., 2024). These analyses followed Minami et al.'s (2008) methodology, considering differences in the rate of change between groups to be clinically trivial if within a margin of ±0.2 of the standardized mean difference.

The present study was designed to detect a large effect size (Cohen's $d = 0.80$) in with an alpha set at 0.05 and power set at .80. This effect size represents the minimum expected reduction in randomised controlled trials based on prior research (Clark et al., 2006). Consequently, the study included a total of 78 participants, with 39 participants in each group.

Results

Participant flow

Participant flow is outlined in Figure 1. In total, 353 participants provided consent and commenced the online screener, of whom 112 were additionally screened using videoconferencing software Zoom to determine their diagnostic status and any comorbid conditions. During the screening process, 12 were lost to follow-up, 8 withdrew and 14 were screened out for not meeting the inclusion criteria. In total, 78 participants (61.8% female, 34.2% male, 3.9% non-binary; *M*age = 39.19, *SD* = 12.28) were deemed eligible and included in the trial, 39 of whom were randomly allocated to the treatment group (vCBT) and 39 to the WLC. A further 2 participants withdrew from the treatment group prior to completing pre-treatment questionnaires. Demographic and clinical characteristics of the sample are presented in Table 1. Outcome measures at baseline for the treatment and control groups as well as the total sample are presented in Table 2.

Adherence and attrition

Post-treatment questionnaires were completed by 30/37 (76.9%) participants in the vCBT group, and 35/39 (89.7%) in the control group. Follow-up questionnaires were completed by 27/37 (72.9%) participants in the vCBT group. DIAMOND interviews were completed by 31/37 (83.8%) participants at post-treatment and 28/37 (75.7%) participants at follow-up. The average number of sessions completed was 6.97 (*SD* = 1.93). A total of 33 participants (33/37; 89.2%) were deemed to be treatment completers (defined as completing at least 6 of the 8 treatment sessions). There were no significant differences between those who completed treatment and those who dropped out based on demographic variables including age, gender, medication, employment status, education, or pre-diagnostic severity (p's > .05).

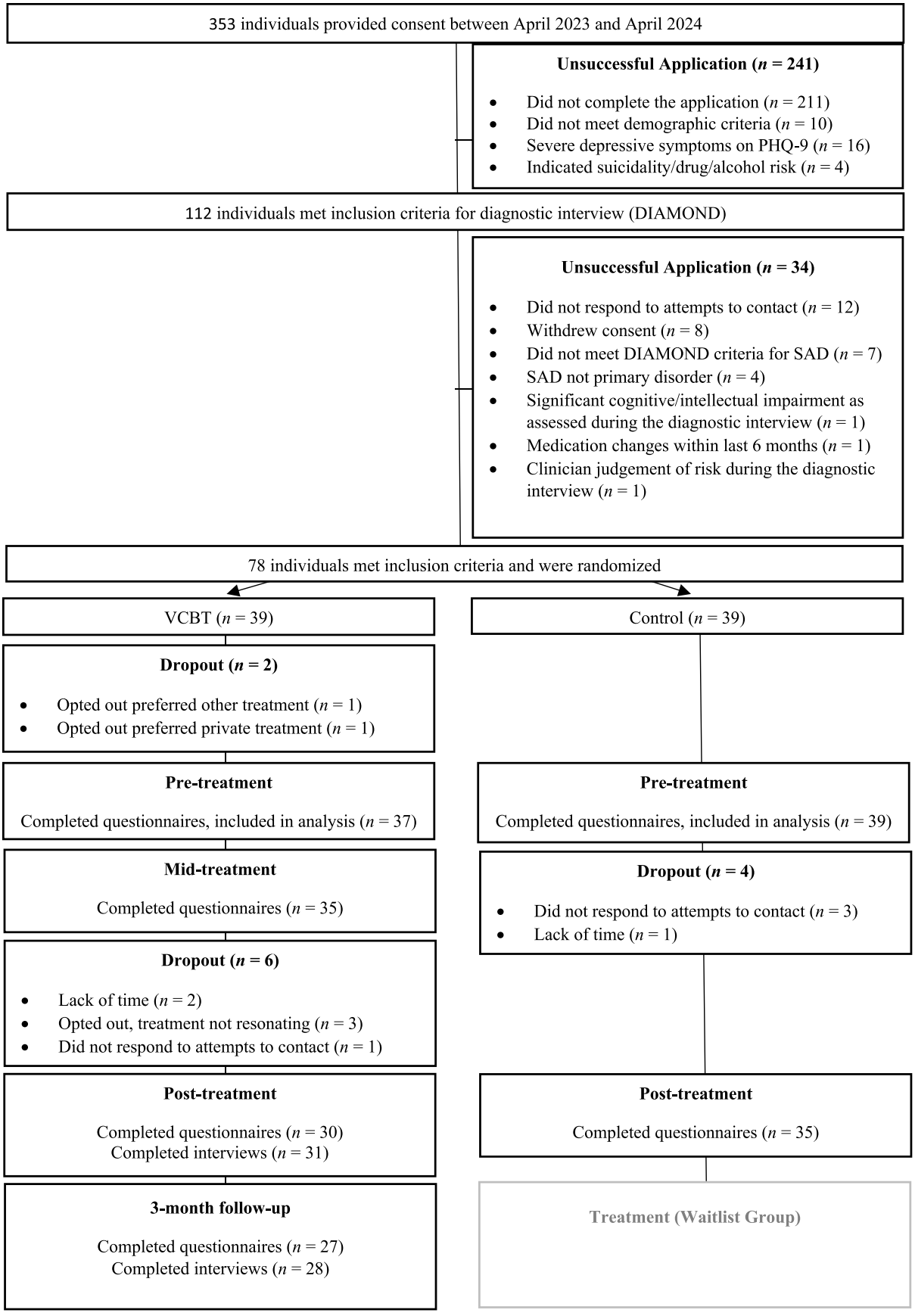

Figure 1. Participant flow chart.

Table 1. Characteristics of the treatment and control groups as well as for the total sample.

	vCBT (n = 37)		Waitlist (n = 39)		Significance Statistics	Total (N = 76)	
Variable	n	%	n	%		n	%
Gender							
Female	26	70.3	21	53.8	$X^2(3, N = 76) = 2.199^a$, p = 0.333	47	61.8
Male	10	27.0	16	41.0		26	34.2
Non-binary/gender diverse	1	2.7	2	5.1		3	3.9
Age							
Mean (SD)	40.59 (12.00)	–	37.79 (12.56)	–	$t(74) = 0.993$, p = 0.324	39.19 (12.28)	–
Range	19–69	–	19–63	–		19–69	–
Marital Status							
Single	8	21.6	20	51.3	$X^2(3, N = 76) = 8.190^a$, p = 0.017	28	36.8
Married/de facto	26	70.3	15	38.5		41	53.9
Divorced/separated/other	3	8.1	4	10.3		7	9.2
Education							
Highschool	5	13.5	8	20.5	$X^2(4, N = 76) = 1.065$, p = 0.786	13	17.1
Trade certificate/diploma	7	18.9	5	12.8		12	15.8
Bachelor's degree	20	54.1	20	51.3		40	52.6
Master's/Doctoral degree	5	13.5	6	15.4		11	14.5
Employment							
Full time	14	37.8	13	33.3	$X^2(7, N = 76) = 7.993^a$, p = 0.243	27	35.5
Part time/casual	9	24.3	5	12.8		14	18.4
Student	5	12.8	10	25.6		15	19.7
At home parent	2	5.4	1	2.6		3	3.9
Unemployed/seeking work	2	5.4	6	15.4		8	10.5
Registered sick/disabled	1	2.7	3	7.7		4	5.3
Retired	4	10.8	1	2.6		5	6.6
Medication	11	29.7	14	35.9	$X^2(2, N = 76) = .327$, p = 0.567	25	32.9
Comorbidities							
Obsessive compulsive disorder	1	2.7	2	5.1	$X^2(2, N = 76) = .295^a$, p = 0.587	3	3.9
Body dysmorphic disorder	2	5.1	2	5.4	$X^2(2, N = 76) = .003^a$, p = 0.957	4	5.3
Hoarding disorder	–	–	2	5.1	$X^2(2, N = 76) = 1.949^a$, p = 0.163	2	2.6
Trichotillomania	1	2.7	–	–	$X^2(2, N = 76) = 1.068^a$, p = 0.301	1	1.3
Excoriation disorder	2	5.4	1	2.6	$X^2(2, N = 76) = .404^a$, p = 0.525	3	3.9
Generalized anxiety disorder	9	24.3	9	23.1	$X^2(2, N = 76) = .016$, p = 0.898	18	23.7
Panic disorder	2	5.4	3	7.7	$X^2(2, N = 76) = .162^a$, p = 0.688	5	6.6
Agoraphobia	10	27.0	10	25.6	$X^2(2, N = 76) = .019$, p = 0.891	20	26.3
Specific phobia	2	5.4	1	2.6	$X^2(2, N = 76) = 0.404^a$, p = 0.525	3	3.9
Major depressive disorder	5	13.5	6	15.4	$X^2(2, N = 76) = .054$, p = 0.817	11	14.5
Persistent depressive disorder	1	2.7	2	5.1	$X^2(2, N = 76) = .295^a$, p = .587	3	3.9
Premenstrual dysphoric disorder	1	2.7	1	2.6	$X^2(2, N = 76) = .001^a$, p = 0.970	2	2.6
Post traumatic stress disorder	2	5.4	–	–	$X^2(2, N = 76) = 2.165^a$, p = 0.141	2	2.6
Adjustment disorder	–	–	1	2.6	$X^2(2, N = 76) = 0.961^a$, p = 0.327	1	1.3
Binge eating disorder	3	8.1	1	2.6	$X^2(2, N = 76) = 1.170^a$, p = 0.279	4	5.3
Bulimia nervosa	–	–	1	2.6	$X^2(2, N = 76) = 0.961^a$, p = 0.327	1	1.3
Somatic symptom disorder	2	5.4	2	5.1	$X^2(2, N = 76) = .003^a$, p = 0.957	4	5.3
Substance use disorder	1	2.7	2	5.1	$X^2(2, N = 76) = .295^a$, p = 0.587	3	3.9
Attention deficit/hyperactivity disorder	3	8.1	2	5.1	$X^2(2, N = 76) = .274^a$, p = 0.600	5	6.6
DIAMOND SAD Severity							
Mean (SD)	4.95 (0.71)		4.92 (0.62)		$t(74) = 0.150$, p = 0.881		
SAD Age of Onset*							
Mean (SD)	17.68 (9.11)		15.39 (11.33)		$t(65) = 0.901$, p = 0.371		

[a]Indicated that cells had expected counts less than 5 and should be interpreted with caution. Fisher's Exact Test used in these instances.
*$N = 66$ (numerical age of onset data for 10 participants was not recorded).

Table 2. Means and standard deviations for outcome measures at baseline for treatment and control groups as well as for the total sample.

Outcome Measure	vCBT (n = 37) Mean (SD)	Waitlist (n = 39) Mean (SD)	Significant Statistics	Total (N = 76) Mean (SD)
SIAS-6	14.05 (4.56)	13.26 (4.37)	$t(74) = .778$, p = 0.439	13.64 (4.45)
SPS-6	12.14 (6.19)	12.46 (5.90)	$t(74) = .235$, p = 0.815	12.30 (6.00)
SAD-D	22.30 (8.06)	20.64 (6.64)	$t(74) = .978$, p = 0.331	21.45 (7.38)
PHQ-9	9.89 (5.37)	8.51 (5.36)	$t(74) = 1.120$, p = 0.266	9.18 (5.37)
CGI-S	3.84 (1.14)	3.95 (1.12)	$t(74) = .427$, p = 0.671	3.89 (1.13)
SDS	15.65 (5.56)	16.46 (5.46)	$t(74) = .643$, p = 0.522	16.07 (5.49)

Note. SIAS-6: Social Interaction Anxiety Scale (6-item), SPS-6: Social Phobia Scale (6-item), SAD-D: Social Anxiety Disorder Dimensional Scale, PHQ-9: Patient Health Questionnaire (9-item), CGI: NIMH Clinician Global Impression, SDS: Sheehan Disability Scale.

Efficacy

Pre-treatment, post-treatment and 3-month follow-up estimated marginal means and standard deviations for the full sample (N = 76) on the primary and secondary outcomes measures, and effect sizes with 95% confidence intervals are outlined in Table 3.

Primary outcome measures

The SIAS-6 assesses fear of social interactions. The analyses revealed a significant effect for Time ($F_{3,\ 43.49}$ = 19.94, $p < 0.001$), and Time by Group interaction ($F_{1,\ 63.39}$ = 15.43, $p < 0.001$), but did not show a difference for Group ($F_{1,\ 79.87}$ = 0.86, p = 0.36) on the SIAS-6. Pairwise comparisons revealed a significant within-group change on the SIAS-6 from pre-treatment to post-treatment for the vCBT group ($p < 0.001$; d = 0.95, 95% *CI*: 0.45–1.41), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p < 0.001$; d = 1.10, 95% CI: 0.59–1.57). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment (p = 0.02) on the SIAS-6 with a medium between-group effect size (d = 0.55; 95% CI: 0.09–1.00).

On the second primary outcome measure, the SPS-6 which assesses social phobia, there was a significant effect for Time ($F_{3,\ 38.91}$ = 11.80, $p < 0.001$), Group ($F_{1,\ 69.03}$ = 6.01, p = 0.01) and Time by Group interaction ($F_{1,\ 69.02}$ = 35.11, $p < 0.001$). Pairwise comparisons revealed a significant within-group change on the SPS-6 from pre-treatment to post-treatment for the vCBT group ($p < 0.001$; d = 0.90, 95% CI: 0.41–1.37), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p < 0.001$; d = 0.82, 95% CI: 0.33–1.28). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment ($p < 0.001$) with a large between-group effect size (d = 1.01; 95% CI: 0.51–1.47).

Secondary outcome measures

On the SAD-D, a dimensional measure of social anxiety symptom severity, there was a significant effect for Time ($F_{3,\ 36.94}$ = 29.90, $p < 0.001$) and Time by Group interaction ($F_{1,\ 70.26}$ = 25.77, $p < 0.001$), however not

Table 3. Estimated marginal means, standard deviations and effect sizes (Cohen's d) for total sample.

	Group	Mean (SD)				Within Group Effect sizes (95% CI)		Between Group Effect sizes (95% CI)
Outcome Measure		Pre-Treatment	Mid-treatment	Post-treatment	Follow-up	Within group pre-treatment to post-treatment	Within group pre-treatment to follow up	vCBT vs Control (Post)
SIAS-6	Treatment	14.05 (4.43)	12.23 (4.39)	9.73 (4.67)	8.93 (4.88)	0.95 (0.45–1.41)	1.10 (0.59–1.57)	0.55 (0.09–1.00)
	Control	13.26 (4.43)	–	12.29 (4.59)	–	0.21 (−0.25–0.67)	–	–
SPS-6	Treatment	12.14 (5.74)	10.11 (6.03)	6.98 (5.68)	6.94 (6.92)	0.90 (0.41–1.37)	0.82 (0.33–1.28)	1.01 (0.51–1.47)
	Control	12.46 (5.75)	–	12.67 (5.61)	–	−0.04 (−0.49–0.42)	–	–
SAD-D	Treatment	22.30 (8.63)	16.67 (8.23)	11.99 (8.05)	10.76 (8.57)	1.23 (0.72–1.71)	1.34 (0.82–1.83)	0.83 (0.35–1.28)
	Control	20.64 (8.62)	–	18.59 (7.89)	–	0.25 (−0.21–0.70)	–	–
PHQ-9	Treatment	9.89 (5.57)	7.82 (5.05)	6.54 (4.95)	7.06 (5.38)	0.64 (0.16–1.09)	0.52 (0.05–0.97)	0.51 (0.05–0.96)
	Control	8.51 (5.57)	–	9.07 (4.88)	–	−0.11 (−0.56–0.35)	–	–
CGI-Severity	Treatment	3.84 (1.17)	3.38 (1.05)	2.56 (1.13)	2.61 (1.20)	1.11 (0.60–1.58)	1.04 (0.54–1.51)	0.99 (0.50–1.45)
	Control	3.95 (1.17)	–	3.67 (1.11)	–	0.24 (−0.22–0.70)	–	–
SDS	Treatment	15.65 (5.60)	11.74 (6.22)	9.11 (5.87)	8.33 (7.02)	1.14 (0.63–1.61)	1.15 (0.64–1.62)	0.95 (0.46–1.41)
	Control	16.46 (5.60)	–	14.59 (5.69)	–	0.33 (−0.13–0.79)	–	–

Note. SIAS-6: Social Interaction Anxiety Scale (6-item), SPS-6: Social Phobia Scale (6-item), SAD-D: Social Anxiety Disorder Dimensional Scale (10-item), PHQ-9: Patient Health Questionnaire (9-item), CGI: NIMH Clinician Global Impression, SDS: Sheehan Disability Scale, effect sizes (Cohen's d) were calculated based on pooled standard deviations, CI: confidence intervals.

for Group ($F_{1, 59.23} = 2.06$, $p = 0.16$). Pairwise comparisons revealed a significant within-group change on the SAD-D from pre-treatment to post-treatment for the vCBT group ($p < 0.001$; $d = 1.23$, 95% *CI*: 0.72–1.71), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p < 0.001$; $d = 1.34$, 95% CI: 0.82–1.82). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment ($p < 0.001$) with a large between-group effect size ($d = 0.83$; 95% CI: 0.35–1.28).

On PHQ-9, a measure of depressive symptoms, there was a significant effect for Time ($F_{3, 41.96} = 3.19$, $p = 0.03$) and Time by Group interaction ($F_{1, 74.12} = 15.33$, $p < 0.001$), however not for Group ($F_{1, 81.80} = 0.27$, $p = 0.60$). Pairwise comparisons revealed a significant within-group change on the PHQ-9 from pre-treatment to post-treatment for the vCBT group ($p = 0.01$; $d = 0.64$, 95% *CI*: 0.16–1.09), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p = 0.03$; $d = 0.52$, 95% CI: 0.05–0.97). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment ($p = 0.03$) with a medium between-group effect size ($d = 0.51$; 95% CI: 0.05–0.96).

The self-reported experience of symptom severity as assessed by the CGI revealed a significant effect for Time ($F_{3, 44.55} = 18.92$, $p < 0.001$), Group ($F_{1, 75.40} = 7.48$, $p = 0.01$) and Time by Group interaction ($F_{1, 63.86} = 14.22$, $p < 0.001$). Pairwise comparisons revealed a significant within-group change on the CGI from pre-treatment to post-treatment for the vCBT group ($p < 0.001$; $d = 1.11$, 95% CI: 0.60–1.58), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p < 0.001$; $d = 1.04$, 95% CI: 0.54–1.51). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment ($p < 0.001$) with a large between-group effect size ($d = 0.99$; 95% CI: 0.50–1.45).

Finally, analyses examining the SDS, a measure of disability, revealed there was a significant effect for Time ($F_{3, 39.21} = 21.05$, $p < 0.001$), Group ($F_{1, 85.36} = 6.78$, $p = 0.01$) and Time by Group interaction ($F_{1, 72.22} = 17.09$, $p < 0.001$). Pairwise comparisons revealed a significant within-group change on the SDS from pre-treatment to post-treatment for the vCBT group ($p < 0.001$; $d = 1.14$, 95% CI: 0.63–1.61), but not the WLC group. There was also a significant within-group change from pre-treatment to 3-month follow-up for the vCBT group ($p < 0.001$; $d = 1.15$, 95% CI: 0.64–1.62). The Time by Group interaction showed that the vCBT group differed significantly from the WLC group at post-treatment ($p < 0.001$) with a large between-group effect size ($d = 0.95$; 95% CI: 0.46–1.41).

Sensitivity analyses

Pre-treatment, post-treatment and 3-month follow-up means and standard deviations for the completer sample on the primary and secondary outcomes measures, and effect sizes with 95% confidence intervals are outlined in the Supplement B and Table Supplement B. The results of the sensitivity analyses were very similar to the ITT analyses with similar significance statistics and effect sizes being found across all measures.

Clinical improvement and deterioration

Diagnostic change

Diagnostic change was measured in the treatment group at post-treatment and 3-month follow-up. When using the last observation carried forward method where diagnostic status was assumed to be consistent with the last assessment 21/37 (56.8%), participants no longer met criteria for SAD at post-treatment and 25/37 (67.6%) no longer met criteria at follow-up. When using the completer data 21/31 (68%) participants no longer met diagnostic criteria for SAD and 22/28 (79%) participants no longer met criteria at 3-month follow-up.

Table 4. Effect sizes (Cohen's d) with 95% CI for total sample.

Sample	Between Group Effect Sizes
	Post-treatment
vCBT (current study)	
SIAS-6	0.55 (0.09–1.00)
SPS-6	1.01 (0.51–1.47)
SAD-D	0.83 (0.35–1.28)
In-person CBT[a] (Hall et al., 2024)	0.95 (0.66–1.23)

Note. [a]Hedge's *g*.

Reliable change and deterioration

Using Jacobson and Truax's (1991) Reliable Change Index (RCI) at post-treatment, 10/30 (33.3%) met the RCI improvement criteria and 0/37 (0%) deteriorated on the SIAS-6. At 3-month follow-up, 11/27 participants (40.7%) met the RCI improvement criteria and 0/27 (0%) deteriorated. On the SPS-6 at post-treatment, 11/30 participants (36.7%) met the RCI improvement criteria and 0/30 (0%) deteriorated. At 3-month follow-up, 13/27 participants (48.1%) met the RCI improvement criteria and 1/27 (3.7%) deteriorated.

Clinically significant change

Clinically significant change (CSC) was defined as meeting the RCI criteria and scoring below the identified cut-score on the SIAS-6 and SPS-6. On the SIAS-6 6/30 participants (20%) met criteria for CSC at post-treatment and 3/27 participants (11.1%) met criteria for CSC at 3-month follow-up. On the SPS-6 1/30 participants (3.3%) met criteria for CSC at post-treatment and 1/27 participants (3.7%) met criteria for CSC at 3-month follow-up.

Benchmarking analysis

Table 4 outlines the effect sizes on the primary outcome measure (SIAS-6) compared with a meta-analysis of in-person individually delivered CBT for SAD (Hall et al., 2024). The results for the benchmarking analyses were mixed. When examining the effect size from the Hall et al. (2024) study (g = 0.95), the effect sizes from the SPS-6 (d = 1.01) and SAD-D (d = 0.83) compare favourably and were clinically trivial. However, when examining the SIAS-6 the effect size in the current study (d = .55) is significantly lower than the between-group effect sizes seen in in-person CBT studies (g = 0.95) (Hall et al., 2024).

Treatment satisfaction and acceptability

The mean score on the CSQ was 28.63 (SD = 3.21). Of those who completed the post-treatment questionnaires, 28/30 (93.3%) participants reported they were "satisfied" or "very satisfied" with the treatment, and 24/30 (80%) stated they would recommend the treatment to a friend.

Discussion

The aim of the present study was to investigate the acceptability and efficacy of vCBT for SAD using a randomized controlled design comparing immediate treatment to a waitlist control group. Overall, the study had three hypotheses: (1) vCBT will result in significant reductions in social anxiety disorder symptoms, resulting in large within-group effect sizes from pre-treatment to post-treatment and pre-treatment to 3-month follow-up, and large between group effect sizes at post-treatment; (2) vCBT will result in similar reductions to standard in-person CBT using a benchmarking analysis; and (3) vCBT for SAD will be acceptable to individuals with SAD. These hypotheses were generally supported in the current study.

The results on the primary measures indicated that vCBT does indeed result in significant reductions in social anxiety disorder symptoms evident in large within-group effect sizes from pre-treatment to post-

treatment and pre-treatment to 3-month follow-up. These within-group effect sizes are consistent with the small existing literature on vCBT for SAD (e.g. Matsumoto et al., 2018). Large effect sizes were also found on secondary measures of symptom severity, the SAD-D and CGI. However, the between-group effect sizes at post-treatment were mixed. On the SPS-6 there was a large between-group effect, however the SIAS-6 resulted in a medium between-group effect.

There may be several reasons for the differences in between group effects on the primary outcome measures. Firstly, these scales measure different constructs; the SIAS-6 items reflect the anxiety associated with the initiation and maintenance of social interactions, while the SPS-6 items reflect the experience of anxiety associated with fear of scrutiny by others (Peters et al., 2012). It is possible that the treatment modality of vCBT is more effective in reducing anxiety related to fears of scrutiny by others than social interaction. This may be due to fewer social interactions needed to be initiated or maintained in the virtual environment compared to in-person psychotherapy (e.g. reception staff, waiting room, travel to and from appointments). These incidental exposures throughout the course of in-person therapy may assist in decreasing symptoms in the domain of social interaction and may result in the need for vCBT treatments to increase the number of exposure exercises that participants are completing during the treatment and future research could examine this by directly comparing outcomes in-person CBT compared with vCBT.

Secondly, this finding may be due to the measure used as it is also noteworthy that the SIAS-6 appears to perform much worse than its longer predecessor (the SIAS; Mattick & Clarke, 1998) when examining clinical change, with effect sizes appearing to be much smaller using the SIAS-6 than the longer measure (Erceg-Hurn & McEvoy, 2018). The SIAS-6 also correlates less well (r = .32) with other measures of anxiety, such as the anxiety subscale of the Depression Anxiety Stress Scale (Lovibond & Lovibond, 1995), than the SPS-6 (r = .50) (Peters et al., 2012). Additionally, the internal consistency of the measure tends to be on the lower end of acceptable (e.g. .71, Erceg-Hurn & McEvoy, 2018, p. 79; Song et al., 2024) and the SIAS-6 does not appear to display measurement equivalence between genders in some samples (Song et al., 2024). For these reasons, results on the SIAS-6 may need to be interpreted with caution.

In order to compare the results of our study to the existing literature examining the efficacy of in-person CBT for SAD benchmarking analyses were completed. This analysis demonstrated that vCBT does result in clinically similar between-group effect sizes on the SPS-6 and SAD-D when compared to in-person CBT delivered in an individual format (Hall et al., 2024). However, lower effect sizes for the SIAS-6 were found when compared to the comparator effect size. While controlled trials directly comparing the relative efficacy of vCBT and in-person CBT are needed, the results of this study indicate that they may be equivalent and thus individuals with SAD now have increased options when accessing evidence-based CBT.

The most salient advantage of vCBT for SAD is the increased access to care for participants. Delivering evidence-based interventions via videoconferencing may reduce many of the barriers that patients with SAD face (Black et al., 2023; Olfson et al., 2000) and importantly, vCBT increases access for individuals living in rural or remote areas, who tend to have less access to services (Boyd et al., 2011). Participants in this study attended sessions from cities as well as rural and remote communities across Australia demonstrating the potential reach of vCBT. In this study we are able to demonstrate the successful adaptation of evidence-based treatment for SAD to a remote environment. For example, social anxiety exposure exercises were able to be successfully adapted for vCBT to ensure that in-session exposures were able to be conducted. This is important given therapist-assisted exposure in session has been demonstrated to be more effective than self-directed exposures in previous research (Öst et al., 1991). Exposures that were less adaptable to the remote environment were used for between session tasks. Similar to in-person CBT, the vCBT treatment was supplemented with worksheets which were shared and developed collaboratively with participants via screensharing. After sessions, homework worksheets were emailed directly to the participant and participants shared their completed worksheet via screensharing or email prior to the following session. This resulted in high rates of homework adherence and completion in this study, which has been demonstrated to impact CBT outcome positively (Rees et al., 2005).

The acceptability of vCBT treatment was high in this sample. For example, the CSQ identified that 93.3% participants in the vCBT group who completed the post-treatment questionnaire were either "satisfied" or "very satisfied" with treatment, and 80% participants stated they would recommend the treatment to a friend. These acceptability findings are similar to those indicated by Matsumoto et al. (2018) in their open trial of vCBT for SAD, obsessive compulsive disorder and panic disorder. Program

adherence was also high, with 89.2% of participants in the vCBT group completing treatment. Overall study dropout was low, with only 8 of 39 (20.5%) of participants dropping out of the study, however two of these participants withdrew prior to commencing the treatment. Of participants who commenced treatment, study dropout was 6 of 37 (16.2%). Participants who withdrew from the study stated reasons such as lack of time (n = 2), vCBT treatment wasn't resonating with them (n = 3), or they did not respond to attempts to contact following 4 sessions (n = 1). The dropout rate in the present study is similar to the wider literature for SAD delivered in-person, with dropout rates generally around 18% for this diagnostic group (Swift & Greenberg, 2014), suggesting remote delivery treatment does not detract from treatment acceptability or adherence.

Research limitations

While the results of the present study are promising and demonstrate that vCBT may be an efficacious treatment for individuals with SAD these results should be interpreted in the context of several limitations. First, the diagnostic interview was not re-administered to control group participants before they commenced treatment. In future research it is advised that the diagnostic interview be re-administered at the end of the control period to ascertain what proportion of patients lose their diagnostic status during the waitlist period. Second, our outcome measures were restricted to those measuring SAD symptoms, depressive symptoms, and disability. Future research may wish to include other clinically relevant measures, such as quality of life (Loerinc et al., 2015). Third, one of the primary outcome measures, the SIAS-6 (Peters et al., 2012) may have some psychometric problems and issues with measuring change in clinical samples (Erceg-Hurn & McEvoy, 2018) and thus we recommend replicating the study using a different primary outcome measure. Fourth, we did not collect outcomes in the control group into the long term, thus we could not benchmark our findings with the existing literature at follow-up. Future research could consider measuring symptoms beyond post-treatment to ascertain the long-term between group effect size. Fifth, there was a high majority of female participants in this study, therefore there may be limitations on generalisability and this study should be replicated with an even distribution of gender. However, the gender distribution in this study is largely consistent with the literature of SAD (Asher et al., 2017). Finally, as this was the first RCT to examine vCBT for SAD, a WLC was used to ascertain whether the treatment was efficacious. However, there is evidence to suggest that use of a waitlist condition can motivate participants to remain socially anxious so that they can receive their originally desired therapy compared to a no-treatment condition (Furukawa et al., 2014). Thus, it is recommended that future research should include an active control group.

Conclusion

The current study sought to examine the acceptability and efficacy of vCBT for SAD in the first known RCT for this remote treatment type. The study demonstrated preliminary evidence to suggest that vCBT for SAD may be an efficacious treatment for SAD. Benchmarking analyses indicated that vCBT may be similar to in-person CBT. Finally, the results indicated that vCBT was generally acceptable for participants. The results of this study have important implications for the dissemination of CBT for SAD and may result in increased treatment options for individuals with SAD. Consideration should be given to how remote treatment studies such as this translate into routine care, specifically in the context of mental health treatment guidelines for referring practitioners, and available insurance options in countries that do not have a national Medicare or insurance scheme. vCBT for SAD appears to be a viable treatment option that increases patient access to evidence-based treatment and reduces strain on mental health access, particularly in communities with limited resources.

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Open scholarship

This article has earned the Center for Open Science badge for Preregistered. The materials are openly accessible at https://github.com/Asghar1982/R-coding

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