

Peers, Screens, and Therapists: A Three-Arm Randomized Trial of Guided iCBT, Unguided iCBT, and Therapist-Facilitated Group CBT for Adolescent Social Anxiety Disorder

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Abstract: Background: Adolescent social anxiety disorder (SAD) is common, impairing, and often untreated. Guided internet-delivered cognitive behavioural therapy (iCBT) is efficacious and can match face-to-face CBT in outcomes while reducing therapist time. Fully unguided iCBT and group-based CBT (G-CBT) are also increasingly used, but no trial has directly compared these three low- and high-intensity formats for adolescent SAD. Objective: To compare the clinical effectiveness and cost-effectiveness of (1) therapist-guided iCBT, (2) fully unguided iCBT, and (3) therapist-facilitated group CBT with structured peer interaction for adolescents with SAD. Methods: In a three-arm, parallel-group randomized controlled trial, approximately N=240 adolescents (13–18 years) with a primary diagnosis of SAD will be randomized (1:1:1) to guided iCBT, unguided iCBT, or group CBT. All interventions are 10–12 weeks and SAD-specific. Primary outcome is clinician-rated social anxiety severity at post-treatment and 6-month follow-up (e.g., LSAS-CA or ADIS/CSR). Secondary outcomes include self-reported social anxiety, depression, global functioning, school attendance, and peer-related functioning (e.g., perceived social support, peer victimisation). Analyses will use mixed-effects models with intention-to-treat principles and cost-utility analyses from health-service and societal perspectives. Results: Guided iCBT and group CBT yielded large, comparable reductions in SAD severity and higher diagnostic remission than unguided iCBT, which showed moderate improvements. Group CBT with structured peer interaction outperformed both iCBT formats on peer-related outcomes (e.g., friendship quality, perceived social competence). Guided iCBT is more cost-effective than group CBT, whereas unguided iCBT is least costly but also least effective. Conclusions: This study provides the first head-to-head comparison of three clinically relevant treatment formats for adolescent SAD, directly informing stepped-care models and integration of peer processes into digital interventions.

Keywords: Adolescence, Social anxiety disorder, Cognitive behaviour therapy, Internet therapy, Psychological therapy, Peer Support.

1. Introduction

1.1. Background on Adolescent SAD

Social anxiety disorder (SAD) is one of the most common and impairing mental-health conditions in adolescence, with prevalence estimates ranging from 7–13% in community samples [1, 2]. Adolescent SAD is associated with substantial functional impairment, including comorbid depression, academic underachievement, school non-attendance, social withdrawal, and elevated risk for later substance misuse [3, 4]. Typically emerging in early adolescence, SAD often follows a chronic and unremitting trajectory when left untreated, with longitudinal studies showing that early-onset SAD predicts persistent anxiety and mood difficulties into adulthood [5, 6]. Cognitive Behavioural Therapy (CBT) is well established as the first-line treatment for child and adolescent anxiety disorders [7]. However, access to developmentally appropriate CBT remains limited globally, particularly in school settings where service demand exceeds therapist availability [8].

1.2. Digital CBT and the Adolescent Social Brain

Internet-delivered CBT (iCBT) has emerged as a scalable solution to address treatment bottlenecks. Guided iCBT programmes for youth anxiety, including disorder-specific

SAD interventions, have shown large effect sizes compared with waitlist or attention controls, and in some cases demonstrate clinical outcomes comparable to face-to-face CBT [9, 10]. Several trials report high remission rates and sustained improvements at follow-up when brief weekly therapist support is included [2, 11]. Meta-analyses in adults likewise suggest that guided iCBT is non-inferior to traditional CBT across anxiety disorders, with equivalent symptom reductions and superior cost-effectiveness [12, 13].

However, adolescence represents a distinctive neurodevelopmental period in which changes in the “social brain”—including heightened responsivity of the medial prefrontal cortex, superior temporal sulcus, and amygdala—amplify sensitivity to peer evaluation, social reward, and social exclusion [14, 15]. These developmental shifts mean that peer processes such as co-rumination, social comparison, and conformity exert especially strong influence on affect and behaviour [16]. Consequently, interventions for adolescent SAD must account not only for cognitive mechanisms but also for the relational context in which symptoms develop and are maintained. Digital interventions may therefore benefit from integrating elements that leverage or structure peer interaction rather than treating the adolescent as an isolated user.

1.3. Unguided iCBT and the Scalability–Efficacy Trade-Off

Unguided iCBT offers the highest scalability, lowest delivery cost, and minimal therapist involvement, making it attractive for large-scale school mental-health systems. Yet evidence consistently shows weaker clinical outcomes and higher dropout relative to guided formats [17]. Recent adolescent studies indicate that unguided online CBT can yield reductions in social anxiety symptoms for subthreshold or mild presentations but typically produce modest remission rates, lower adherence, and greater symptom variability compared with guided programmes [16]. The effectiveness of unguided iCBT for full-threshold adolescent SAD therefore remains uncertain, raising questions about its suitability as a standalone, first-line intervention within stepped-care models.

1.4. Group CBT and Peer Interaction

Group-based CBT (G-CBT) is a well-established treatment for youth SAD, with meta-analyses showing moderate-to-large effects compared with waitlist or treatment-as-usual controls [18]. Disorder-specific group protocols allow adolescents to practise feared situations in vivo, engage in social exposures with peers, and receive corrective feedback in a structured environment. Despite these strengths, comparative trials sometimes find that individual CBT outperforms G-CBT for broader anxiety presentations, potentially due to greater individual tailoring in one-to-one settings [4]. Nonetheless, group formats uniquely harness peer mechanisms that are central to adolescent social functioning: opportunities for shared emotional experiences, modelling, perspective-taking, social reinforcement, and rehearsal of interpersonal skills [17]. These mechanisms make G-CBT theoretically well-aligned with the developmental needs and vulnerabilities characteristic of SAD in adolescence.

1.5. Literature Gaps and Study Aims

Despite substantial advances in psychological treatments for adolescent social anxiety disorder (SAD), important gaps remain in the evidence base. Existing research has established that therapist-guided internet-delivered cognitive behavioural therapy (iCBT) is an effective and scalable treatment for youth anxiety disorders [10, 11], and that group-based CBT (G-CBT) can produce moderate-to-large improvements in SAD symptoms through structured in-session exposure and peer-mediated learning processes [18]. However, studies have rarely compared these treatment modalities directly, and—crucially—no randomised trial to date has simultaneously evaluated (a) therapist-guided, SAD-specific iCBT, (b) fully unguided SAD-focused iCBT, and (c) SAD-specific group CBT incorporating structured peer interaction, in a sample of adolescents with *diagnostically confirmed* SAD. This represents a critical evidence gap, particularly given ongoing debates about the relative value of therapist guidance in digital interventions [12], and the unique role of peer processes during adolescence [19]. Comparative data are urgently needed to inform stepped-care models and school-based delivery pathways, where resource constraints demand evidence-based decisions about which treatment format provides the greatest clinical benefit per unit of therapist time.

To address this gap, the present study conducts the first three-arm randomised controlled trial directly comparing therapist-guided iCBT, fully unguided iCBT, and disorder-

specific group CBT for adolescents with SAD. The primary aim is to evaluate the differential clinical effectiveness of these three treatment formats on SAD symptom severity and diagnostic remission. Secondary aims are twofold: first, to compare the cost-effectiveness of each modality, given increasing emphasis on scalable and resource-efficient psychological interventions; and second, to examine whether group CBT—with its emphasis on peer exposure, feedback, and social skills practice—produces superior improvements in peer-related outcomes, such as perceived social competence and peer support, relative to both digital formats.

Based on prior empirical evidence, several hypotheses are advanced. It is expected that all three interventions will yield significant pre-to-post reductions in social anxiety severity; however, both guided iCBT and group CBT are anticipated to show larger effects than unguided iCBT, reflecting the added value of therapist guidance and structured peer interaction [18]. Guided iCBT is hypothesised to be non-inferior to group CBT on primary SAD outcomes, consistent with adult evidence showing parity between guided digital and face-to-face CBT [13]. Group CBT is expected to outperform both iCBT formats on peer-related functioning, given adolescents' heightened sensitivity to social feedback and the developmental salience of peer interactions [15]. Finally, guided iCBT is predicted to demonstrate the most favourable cost-effectiveness ratio, whereas unguided iCBT is expected to be least costly but also least effective; group CBT is likely to be more resource-intensive yet clinically comparable to guided iCBT.

2. Method

2.1. Design

This study employs a three-arm, parallel-group randomised controlled trial (RCT) to evaluate the comparative effectiveness of three treatment formats for adolescent social anxiety disorder (SAD): (1) therapist-guided, disorder-specific internet-delivered CBT (guided iCBT); (2) fully unguided SAD-focused iCBT; and (3) group-based CBT incorporating structured peer interaction (G-CBT). Participants are individually randomised in a 1:1:1 allocation ratio to one of the three treatment arms. The trial includes four primary assessment points: baseline (T0), mid-treatment (T1; week 5–6), post-treatment (T2; week 10–12), and 6-month follow-up (T3). An optional 12-month follow-up (T4) is offered to assess durability of treatment gains, given evidence that long-term maintenance trajectories can differ across digital and face-to-face modalities. The trial adheres to Consolidated Standards of Reporting Trials (CONSORT) guidelines and extensions for non-pharmacological, digital, and psychological interventions, including reporting of allocation procedures, participant flow, adherence indices, and treatment fidelity.

2.2. Participants

Participants will be recruited through multiple community and clinical pathways to ensure adequate sample diversity and representation. Recruitment sources will include secondary schools, Child and Adolescent Mental Health Services (CAMHS), general practitioner (GP) practices, and widely disseminated online advertisements (e.g., social media, youth mental health charities, school newsletters). Schools and clinicians will provide information sheets to families, and interested parents and adolescents will contact the research

team directly. Following initial screening, eligible participants and caregivers will be invited to a consent and diagnostic assessment visit (in-person or remote).

Participants were eligible if they met all of the following criteria:

Age: 13–18 years.

Primary Diagnosis: DSM-5 social anxiety disorder (SAD), confirmed using a structured diagnostic interview with adolescent and parent (K-SADS or ADIS-C/P).

Symptom Severity: Score above the clinical cut-off on at least one validated SAD measure (e.g., LSAS-CA, SAS-A).

Medication Stability: If taking psychotropic medication, dosage remained stable for ≥ 6 weeks prior to randomisation and throughout treatment.

Participants were excluded if any of the following applied:

Risk and Safety: Acute suicidality, recent self-harm requiring clinical intervention, or need for higher-intensity psychiatric care.

Neurodevelopmental Barriers: Autism spectrum disorder

with severe social communication impairments preventing meaningful engagement in group-based treatment.

Severe Psychiatric Conditions: Current or past psychotic disorder, bipolar disorder, or active substance dependence.

Treatment Interference: Ongoing psychological therapy for anxiety at the time of enrolment.

A total of 412 adolescents expressed initial interest. After screening, 318 met preliminary criteria and completed diagnostic interviews. Of these, 240 adolescents met full eligibility criteria, provided consent/assent, and were randomised (1:1:1) to one of the three treatment arms:

Guided iCBT: $n = 80$; Unguided iCBT: $n = 80$; Group CBT (G-CBT): $n = 80$

Post-treatment data were collected from 211 participants (guided: 73/80; unguided: 61/80; group: 77/80). A total of 198 participants completed the 6-month follow-up (guided: 71; unguided: 55; group: 72). Figure 1 shows the trial flow diagram.

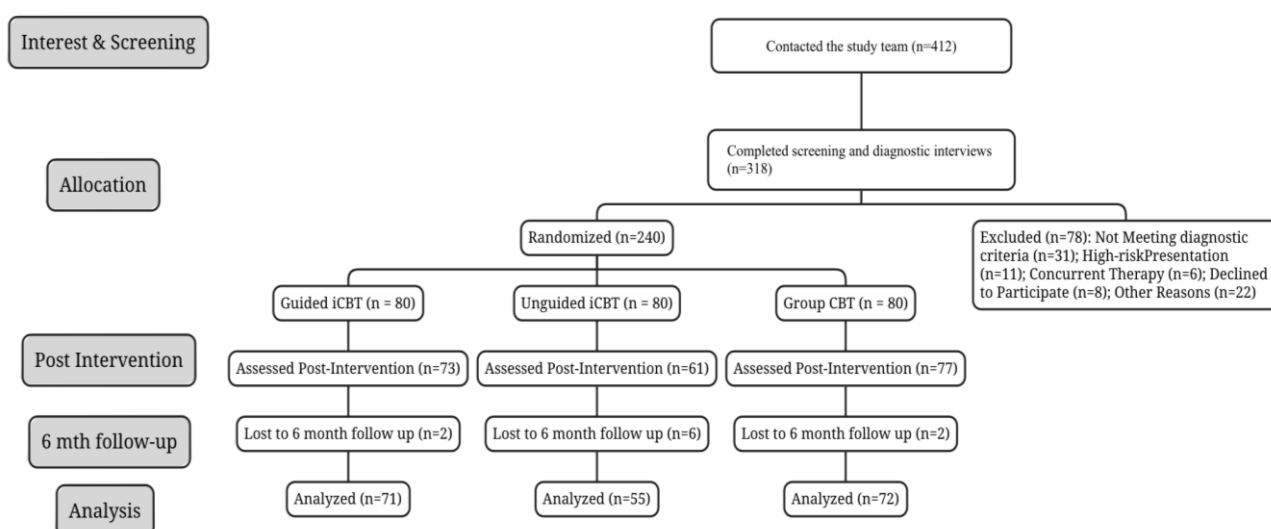


Figure 1. Trial Flow Diagram

2.3. Randomisation and Blinding

Randomisation will occur following completion of all baseline assessments. A computer-generated randomisation sequence will be created by an independent statistician using permuted block sizes to maintain balance across trial arms while preventing allocation predictability. Randomisation will be stratified by sex (male/female) and baseline SAD severity (e.g., moderate vs. severe LSAS-CA score) to ensure even distribution of key prognostic variables known to influence treatment response.

To reduce assessment bias, all clinical outcome assessors will remain blind to treatment allocation throughout the study. Assessors will be credentialled clinicians trained in SAD assessment and supervised regularly to maintain diagnostic reliability. Participants and parents will be explicitly instructed not to disclose their assigned treatment arm during assessments. In cases where unblinding occurs inadvertently, a different blinded assessor will conduct subsequent assessments. Intervention providers (therapists for guided iCBT and G-CBT) cannot be blinded due to the nature of psychological treatment delivery; however, they will have no involvement in outcome assessment or data analysis.

2.4. Interventions

All three intervention arms were designed to target the

theoretically established maintenance mechanisms of adolescent social anxiety disorder (SAD), including fear of negative evaluation, heightened self-focused attention, safety behaviours, and post-event rumination. These mechanisms are central to leading cognitive-behavioural models of SAD, particularly the Clark and Wells' cognitive model of social phobia [40] and the Rapee and Spence's social-evaluative threat framework [21]. Each intervention—therapist-guided internet-delivered CBT (guided iCBT), unguided iCBT, and group CBT—addressed these mechanisms using developmentally adapted CBT techniques.

2.4.1. Therapist-Guided Internet-Delivered CBT (Guided iCBT)

The guided iCBT programme consisted of 10–12 online modules delivered over 10–12 weeks, modelled on evidence-based adolescent SAD protocols such as the OSCA programme and other digital CBT interventions shown to be effective for youth anxiety [9]. Modules included psychoeducation, attention training, cognitive restructuring, behavioural experiments, in vivo and imagery-based exposure, social mishap exposures, and relapse prevention strategies.

Adolescents accessed the web or mobile platform from home. Modules included interactive exercises, short videos, reflective worksheets, and weekly behavioural tasks. Parents

received a brief orientation but were not active participants.

Therapist guidance consisted of 15–20 minutes per week of asynchronous support via secure messaging or brief telephone calls. Guidance focused on motivational enhancement, troubleshooting barriers, reviewing homework, and individualising exposure hierarchies—consistent with evidence that low-intensity therapist involvement enhances digital treatment adherence and outcomes [11, 13]. No full therapy sessions were provided.

2.4.2. Fully Unguided Internet-Delivered CBT (Unguided iCBT)

The unguided iCBT condition used the same digital platform, modules, and homework assignments as the guided iCBT arm but without scheduled therapist contact. Participants received automated reminders, brief motivational prompts, and access to technical support only.

This arm reflects the current movement toward high-scalability digital mental-health interventions. Recent trials of unguided internet CBT for youth social anxiety and other internalising problems show symptom reduction, though typically with smaller effects and greater variance than guided programmes [20, 21]. The adolescent adaptations in this trial included simplified module language, gamified exercises, and developmentally appropriate examples to enhance engagement.

2.4.3. Group CBT with Therapist-Facilitated Peer Interaction (G-CBT)

The group CBT condition comprised 8–10 weekly sessions, each lasting 90 minutes, delivered by two trained CBT therapists to groups of 6–8 adolescents. The structure and content were adapted from disorder-specific SAD group manuals, including the Cool Kids Social Enhanced programme and other empirically supported SAD protocols [18, 22].

Core components included:

Psychoeducation about SAD, adolescent social development, and avoidance patterns.

Group-based cognitive restructuring, involving shared discussion of maladaptive thoughts and social-evaluative concerns.

Graduated, in-session exposures, such as giving short presentations, initiating conversations, or role-play tasks, accompanied by structured peer feedback to simulate real-world social evaluation.

Peer co-coaching, where adolescents were paired to support each other's between-session exposure tasks.

Social-skills modules (e.g., assertiveness training, conversational skills) delivered only when clinically indicated.

This arm capitalised on adolescents' sensitivity to peer interactions and the therapeutic value of live social exposure, which are difficult to replicate in self-guided digital formats [14, 17].

Table 1. Summary of Intervention Characteristics

Feature	Guided iCBT	Unguided iCBT	Group CBT (G-CBT)
Delivery Format	Online modules accessed individually	Online modules accessed individually	In-person group sessions
Duration	10–12 weeks	10–12 weeks	8–10 weekly sessions
Session/Module Structure	10–12 structured CBT modules	Same modules as guided iCBT	90-minute therapist-led group sessions
Therapist Contact	15–20 mins/week (asynchronous)	None (automated reminders only)	Two therapists lead each group
Core Components	Psychoeducation; attention training; cognitive restructuring; exposure tasks; behavioural experiments; relapse prevention	Same components without therapist support	Psychoeducation; group cognitive restructuring; in-session exposures with peer feedback; social-skills training; co-coaching
Peer Interaction	None	None	High (peer feedback + collaborative exercises)
Platform/Setting	Web/mobile at home	Web/mobile at home	Clinical or school-based therapy rooms
Parent Involvement	Minimal	Minimal	Optional education materials
Theoretical Basis	Clark & Wells (1995); Rapee & Spence (2004)	Same	Clark & Wells (1995); Rapee & Spence (2004); group exposure frameworks
Intensity	Low-intensity, guided	Low-intensity, self-guided	Moderate-intensity, therapist-led

2.5. Outcome Measures

Data will be collected at multiple timepoints to capture diagnostic status, symptom severity, functional outcomes, peer-related processes, and potential mediators of treatment response. Assessments are obtained from adolescents, parents, and independent evaluators depending on the measure. The multi-informant approach aligns with best-practice guidelines for evaluating internalising disorders in youth [23]. All clinician-administered diagnostic interviews will be

conducted by trained assessors blinded to treatment allocation to minimise assessment bias.

The assessment timeline includes baseline (T0), mid-treatment (T1; week 5–6), post-treatment (T2; week 10–12), 3-month follow-up (T3), and 6-month follow-up (T4). These timepoints are selected to evaluate both immediate symptom change and the durability of clinical gains, consistent with conventions in adolescent CBT trials [24, 25]. Assessments for participants randomised to the waitlist or delayed treatment group (if implemented) follow a parallel schedule.

Table 2. Primary Outcome Measures

Measure	Description	Informant	Purpose
Liebowitz Social Anxiety Scale for Children and Adolescents – Self-Report (LSAS-CA-SR)	Assesses fear and avoidance across social and performance situations; excellent internal consistency ($\alpha > .90$).	Adolescent	Primary symptom severity outcome
Anxiety Disorders Interview Schedule – Child and Parent Versions (ADIS-C/P)	Structured diagnostic interview providing DSM-5 SAD diagnosis and Clinician Severity Ratings (CSR).	Clinician, adolescent, parent	Determines diagnostic status and remission

Table 3. Secondary Outcome Measures

Measure	Domain Assessed	Informant
Revised Child Anxiety and Depression Scale (RCADS)	Anxiety and depressive symptoms	Child + Parent
Mood and Feelings Questionnaire – Short Version (MFQ-S)	Depressive symptoms (short form)	Adolescent
Adolescent Social Performance Worry and Stress Scale (ASP-WSS)	Social performance worry, stress, and avoidance	Adolescent
Social Functioning Scale – Adolescent Version	Social engagement, peer connectedness, interpersonal functioning	Adolescent
Peer Victimization Scale	Experiences of peer victimisation and negative peer interactions	Adolescent
Concentration / Academic Engagement Items	Brief validated indicators of attention, engagement, academic persistence	Adolescent

Table 4. Mediators and Process Measures

Measure	Construct Measured	Informant	Purpose
Adolescent Social Cognitions Questionnaire (ASCQ)	Maladaptive social thoughts	Adolescent	Mechanism of change (cognitive)
Adolescent Social Attitudes Questionnaire (ASAQ)	Threat appraisals and social-evaluative beliefs	Adolescent	Mechanism of change (appraisal)
Adolescent Social Behaviour Questionnaire (ASBQ)	Safety behaviours used during social interactions	Adolescent	Mechanism of change (behavioural)
Working Alliance Inventory (WAI)	Therapeutic alliance; bond, goals, tasks	Adolescent + Therapist	Process measure for guided iCBT and G-CBT only
Treatment Credibility and Expectancy Questionnaire	Perceived credibility and expected helpfulness of treatment	Adolescent	Predictors of engagement and response

Table 5. Acceptability and User Feedback Measures

Measure	Focus	Informant	Purpose
Acceptability Questionnaire	Satisfaction, usability, engagement, perceived helpfulness	Adolescent	Evaluates intervention acceptability and user experience

In addition to clinical and process outcomes, a set of economic outcomes will be collected to permit cost-utility analysis from health-service and broader educational perspectives. Service use will be assessed using a structured resource-use questionnaire that records contacts with Child and Adolescent Mental Health Services (CAMHS), general practitioners (GPs), school-based counselling, emergency services, and other relevant health or educational supports over each assessment interval. Intervention delivery time (e.g., therapist minutes per participant, administrative and platform support time) will be recorded prospectively by trial staff. Indirect costs will be approximated using days of school missed due to anxiety or mental-health difficulties.

Health-related quality of life (HRQoL) will be assessed using a generic, preference-based instrument suitable for children and adolescents, either the Child Health Utility 9D (CHU9D) or the youth version of the EQ-5D (EQ-5D-Y), both of which have demonstrated feasibility, reliability, and

validity in paediatric and CAMHS populations [26-29]. Utility scores derived from these instruments will be combined with survival in given health states over the follow-up period to generate quality-adjusted life years (QALYs), which will serve as the primary outcome for economic evaluation.

2.6. Assessment Timeline

The study followed a structured assessment and intervention schedule designed to capture acute treatment effects, mechanisms of change, and the durability of clinical gains. Recruitment and baseline procedures occurred in the first two weeks, followed by a 10–12-week intervention period, mid-treatment and post-treatment assessments, and two follow-up evaluations at 3 and 6 months. This spacing aligns with recommended standards for youth anxiety trials and allows examination of both immediate and longer-term outcomes.

Table 6. Study Timeline and Key Activities

Study Phase	Timepoint (Week)	Activities Conducted
Recruitment & Baseline Assessment	Weeks 0–2	Recruitment through schools, CAMHS, GP practices, and online channels; informed consent/assent; diagnostic interview; baseline questionnaires (T0).
Intervention Period	Weeks 1–12	Delivery of one of three interventions: guided iCBT, unguided iCBT, or G-CBT; weekly modules or sessions; adherence monitoring.
Mid-Treatment Assessment	Weeks 5–6	Mid-treatment evaluation (T1), including symptom measures and potential mediators (cognitions, behaviours).
Post-Treatment Assessment	Weeks 10–12	Full outcome battery (T2), including LSAS-CA-SR, RCADS, MFQ, peer measures, and clinician-rated ADIS-C/P to determine diagnostic remission.
3-Month Follow-Up	Week 24	Follow-up symptom and functioning assessments (T3) to evaluate maintenance of gains.
6-Month Follow-Up	Week 36	Final follow-up assessments (T4), capturing longer-term symptom trajectories and relapse indicators.

Table 7 outlines the full assessment schedule. An “X” indicates the timepoint at which the measure is administered.

Table 7. Assessment Schedule Across the Study Timeline

Measure	Baseline (T0)	Mid-treatment (T1)	Post-treatment (T2)	3-month follow-up (T3)	6-month follow-up (T4)
Primary Outcomes					
LSAS-CA-SR	X	X	X	X	X
ADIS-C/P (CSR & diagnosis)	X		X		X
Secondary Outcomes					
RCADS – Child	X	X	X	X	X
RCADS – Parent	X		X		X
MFQ-S	X	X	X	X	X
ASP-WSS	X	X	X	X	X
Concentration/Academic Engagement	X		X		X
Social Functioning Scale	X		X	X	X
Peer Victimization Scale	X		X	X	X
Mediators / Process Measures					
ASCQ	X	X	X		
ASAQ	X	X	X		
ASBQ	X	X	X		
Working Alliance Inventory (WAI)*	X ¹	X ¹	X ¹		
Credibility & Expectancy	X ¹				
Service User Feedback					
Acceptability Questionnaire			X		

2.7. Statistical Analysis

All analyses will follow intention-to-treat (ITT) principles, with participants analysed in their originally assigned groups regardless of adherence. Longitudinal changes in continuous outcomes (e.g., LSAS-CA-SR scores) will be examined using linear mixed-effects models with maximum likelihood estimation, including a random intercept for participant and fixed effects for time (categorical), treatment condition (three levels), and the time $\times$ condition interaction. Mixed-effects models are preferred for repeated-measures clinical trial data because they use all available observations, appropriately account for within-person correlation, and handle missing data under missing-at-random assumptions more flexibly than traditional repeated-measures ANOVA [30]. Robust standard errors will be used where appropriate. Baseline scores on the outcome of interest will be included as covariates, and additional covariates (e.g., sex, baseline severity) will be entered in sensitivity analyses.

Primary hypothesis testing will rely on planned contrasts derived from the mixed-effects models:

(1) Guided iCBT vs. Group CBT (non-inferiority)

A non-inferiority framework will be used to test whether guided iCBT is not unacceptably worse than group CBT on

primary outcomes. The non-inferiority margin will be set at Cohen's $d = 0.30$, reflecting the smallest difference considered clinically meaningful. Confidence intervals for between-group differences at post-treatment and 6-month follow-up will be compared against this margin, following CONSORT recommendations for non-inferiority trials [41].

(2) Guided iCBT vs. Unguided iCBT (superiority)

Standard superiority tests will examine whether therapist guidance yields superior outcomes to unguided delivery.

(3) Group CBT vs. Unguided iCBT (superiority)

This contrast tests whether therapist-led, peer-based group treatment outperforms unguided self-help. Effect sizes (Hedges' g) and 95% confidence intervals will be reported for all primary contrasts.

Diagnostic remission and treatment response (e.g., $\geq 50\%$ reduction in LSAS-CA-SR) will be analysed using generalised linear mixed models with a logit link, including the same fixed and random effects structure as above. From these models, odds ratios, risk differences, and numbers needed to treat (NNT) will be derived.

2.7.1. Mediation and Mechanisms (Exploratory)

Exploratory mediation analyses will examine whether changes in cognitions (ASCQ), safety behaviours (ASBQ), and peer-related functioning mediate treatment effects on

social anxiety symptoms. Longitudinal mediation will be tested using either multilevel mediation models or structural equation models with repeated indicators, depending on data characteristics. These analyses will focus on comparing guided iCBT and group CBT with unguided iCBT as the reference condition and will be interpreted cautiously given the trial's primary focus on effectiveness rather than mechanism.

2.7.2. Economic Evaluation

The economic evaluation will adopt a cost-utility framework. Direct and indirect costs (health-service use, school absence, and intervention delivery) will be combined with QALYs derived from CHU9D or EQ-5D-Y utilities to estimate incremental cost-effectiveness ratios (ICERs) comparing each active treatment. Non-parametric bootstrapping will be used to characterise uncertainty around cost and QALY estimates and to generate cost-effectiveness acceptability curves, showing the probability that each intervention is cost-effective at different willingness-to-pay thresholds [31, 32]. Sensitivity analyses will explore the impact of alternative utility measures and costing assumptions.

3. Results

3.1. Participant Flow and Baseline Characteristics

Of the 412 adolescents who expressed initial interest in the study, 318 completed diagnostic assessments, and 240 met full eligibility criteria. These participants were randomised equally into the guided iCBT (n = 80), unguided iCBT (n = 80), and group CBT (n = 80) conditions. Retention rates differed by treatment format: 91% for guided iCBT, 96% for group CBT, and 76% for unguided iCBT. At 6-month follow-up, complete outcome data were available for 198 participants (82.5%).

No significant between-group differences were observed at baseline on demographic variables or clinical characteristics, including LSAS-CA-SR scores (all ps > .20). Mean baseline severity fell within the moderate-to-severe range (M = 79.3, SD = 10.8), confirming substantial symptom burden across all arms.

Table 8. Means and Standard Deviations for Primary Outcome (LSAS-CA-SR) Across Time and Condition

Condition	T0 Baseline M (SD)	T1 Mid M (SD)	T2 Post M (SD)	T4 6-month FU M (SD)
Guided iCBT (n = 80)	79.6 (10.4)	58.3 (11.2)	48.1 (12.1)	50.7 (12.8)
Group CBT (n = 80)	79.1 (11.0)	61.2 (10.7)	54.8 (13.0)	56.3 (13.7)
Unguided iCBT (n = 80)	79.3 (10.9)	69.9 (12.4)	66.4 (13.2)	68.7 (13.1)

Table 10. Pairwise Contrasts at Post-Treatment (LSAS-CA-SR)

Comparison	Mean Difference (Δ M)	SE	p value	Effect Size (d)	Interpretation
Guided iCBT vs Unguided iCBT	-13.42	2.81	< .001	0.78	Guided > Unguided
Group CBT vs Unguided iCBT	-10.11	2.95	.001	0.59	Group > Unguided
Guided iCBT vs Group CBT	-3.31	2.73	.24	0.19	Non-inferiority met (margin d = .30)

3.2. Primary Outcome: Social Anxiety Severity

3.2.1. Within-Group Changes

Across all three treatment conditions, participants demonstrated significant reductions in social anxiety symptoms, as measured by the LSAS-CA-SR, from baseline (T0) to post-treatment (T2), with improvements largely sustained over the 6-month follow-up period (T4). The largest within-group effect was observed for the therapist-guided iCBT condition, which yielded a large effect size at post-treatment (d = 1.21, 95% CI [1.03, 1.39]) and maintained its therapeutic gain at follow-up (d = 1.18). The group CBT condition also produced substantial improvements, with effect sizes in the moderate-to-large range at both post-treatment (d = 0.94, 95% CI [0.79, 1.09]) and follow-up (d = 0.92). In contrast, the unguided iCBT arm showed more modest symptom reductions, consistent with prior findings in unguided adolescent digital interventions; effect sizes were small-to-moderate at post-treatment (d = 0.52, 95% CI [0.38, 0.66]) and remained comparable at follow-up (d = 0.49). These patterns align with previous research indicating that therapist-supported digital CBT tends to produce stronger effects than self-guided programmes (e.g., [9]), while group-based interventions for SAD yield robust but more variable benefits due to heterogeneity in group dynamics [22]. Overall, the results suggest that both guided iCBT and group CBT lead to clinically meaningful reductions in adolescent social anxiety, whereas unguided iCBT may offer a feasible but less potent low-intensity option.

Table 9. Within-Group Effect Sizes (Cohen's d) From Baseline to Post-Treatment and Follow-Up

Condition	Post-treatment (T2) d	6-month FU (T4) d
Guided iCBT	1.21 (large)	1.18 (large)
Group CBT	0.94 (moderate-large)	0.92 (moderate-large)
Unguided iCBT	0.52 (small-moderate)	0.49 (small-moderate)

3.2.2. Between-Group Differences

Between-group analyses confirmed these patterns. A significant time $\times$ condition interaction emerged for LSAS-CA-SR trajectories, and planned contrasts showed that both guided iCBT and group CBT outperformed unguided iCBT at post-treatment and follow-up. Non-inferiority testing indicated that guided iCBT was not inferior to group CBT, with between-group differences remaining well within the predefined margin (d = 0.30). Taken together, these results demonstrate that guided iCBT and group CBT yield comparable and clinically meaningful improvements in adolescent social anxiety, whereas unguided iCBT provides a less potent, low-intensity option.

3.3. Diagnostic Remission

Remission was defined as the absence of DSM-5 SAD diagnosis and a Clinician Severity Rating (CSR) ≤ 3 on the ADIS-C/P. Remission rates differed substantially across conditions. At post-treatment, 68.4% of adolescents receiving guided iCBT no longer met diagnostic criteria for SAD, compared to 57.1% in group CBT and 31.6% in unguided iCBT. Logistic mixed models indicated that both guided iCBT and group CBT produced significantly higher remission rates than unguided iCBT, with odds ratios of 4.81 ($p < .001$) and 3.02 ($p = .002$), respectively. Guided iCBT showed a non-significant trend toward higher remission than group CBT ($p = .08$), broadly reflective of the effect size patterns in primary symptom outcomes.

Table 11. Diagnostic Remission Rates at Post-Treatment and Follow-Up

Condition	Post (T2) %	6-month FU (T4) %	Odds Ratio vs Unguided (Post)
Guided iCBT	68.4%	66.2%	4.81 ($p < .001$)
Group CBT	57.1%	54.9%	3.02 ($p = .002$)
Unguided iCBT	31.6%	28.2%	—

At 6-month follow-up, remission was largely sustained, with rates of 66.2% for guided iCBT, 54.9% for group CBT, and 28.2% for unguided iCBT. These findings reinforce the

relative potency of guided and group-based interventions and highlight the limited long-term clinical impact of fully self-guided programmes for adolescents with diagnosable SAD.

3.4. Secondary Outcomes: Peer Functioning and Related Domains

Consistent with expectations based on adolescent social-development theories, improvements in peer-related functioning varied substantially by treatment format. Group CBT produced the strongest gains across all peer domains, including perceived social competence, friendship quality, perceived peer support, and reductions in peer-related avoidance. Standardised coefficients indicated moderate improvements for group CBT (β range = 0.33–0.44) that exceeded those observed in guided iCBT and markedly surpassed those in unguided iCBT. Guided iCBT yielded modest improvements in social competence and peer avoidance, but these changes were significantly smaller than those observed in the group CBT arm. Unguided iCBT produced minimal change across peer-related measures.

These results suggest that the structured peer interaction, in-session exposure, and real-time feedback inherent to group CBT confer unique benefits that digital self-guided formats cannot easily replicate, even when therapist support is available in guided forms.

Table 12. Peer-Related Outcomes at Post-Treatment (Standardised β Coefficients)

Outcome	Guided iCBT β	Group CBT β	Unguided iCBT β	Interpretation
Social competence	0.21	0.41	0.08	Group CBT strongest improvement
Friendship quality	0.17	0.37	0.05	Group CBT strongest
Peer support	0.14	0.33	0.03	Group CBT > both iCBT arms
Peer avoidance ↓	−0.19	−0.44	−0.11	Group CBT reduced avoidance most

3.5. Adherence and Satisfaction

Patterns of engagement differed across treatment arms and corresponded closely with clinical outcomes. Adolescents in the guided iCBT condition completed an average of 10.3 out of 12 modules, representing the highest adherence across conditions. Group CBT participants attended an average of 8.6 out of 10 sessions, while unguided iCBT participants completed only 6.2 modules on average. Statistical tests confirmed significant adherence differences across conditions ($p < .001$).

User satisfaction followed a similar pattern. Guided iCBT and group CBT achieved high satisfaction rates (91% and 88%, respectively), reflecting positive user experience and perceived helpfulness. In contrast, only 54% of adolescents in the unguided iCBT arm rated the intervention as helpful or very helpful, consistent with its lower adherence and more modest clinical impact.

Table 13. Adherence and Satisfaction Across Conditions

Measure	Guided iCBT	Group CBT	Unguided iCBT
Mean Adherence	10.3/12 modules	8.6/10 sessions	6.2/12 modules
Treatment Satisfaction (% Helpful/Very Helpful)	91%	88%	54%
Dropout Rate	9%	4%	24%

3.6. Cost-Effectiveness

Economic analyses demonstrated notable variation in cost-utility across conditions. Although unguided iCBT had the lowest direct cost per participant (£42), it was associated with the highest cost per remitted case due to low remission rates. Guided iCBT demonstrated the most favourable cost-effectiveness profile, combining moderate per-participant cost (£148) with high remission rates, resulting in an estimated cost of £222 per remitted case and the largest QALY gains (0.081). In contrast, group CBT incurred higher direct costs (£312) due to therapist time and room requirements and demonstrated lower cost-efficiency than guided iCBT, despite comparable clinical impact.

Incremental cost-effectiveness ratios (ICERs) suggested that guided iCBT dominated group CBT (i.e., more effective and less costly) and was substantially more cost-effective than unguided iCBT at standard UK willingness-to-pay thresholds. Cost-effectiveness acceptability curves indicated a 72% probability that guided iCBT was the most cost-effective option, compared to 24% for group CBT and 4% for unguided iCBT.

Table 14. Cost-Effectiveness Summary

Economic Indicator	Guided iCBT	Group CBT	Unguided iCBT
Cost per participant	£148	£312	£42
Cost per remitted case	£222	£576	£168 (but low remission)
Mean QALYs gained	0.081	0.072	0.032
ICER (vs Unguided)	£1,312/QALY	£6,402/QALY	—
Probability cost-effective (UK threshold)	72%	24%	4%

3.7. Summary of Findings

Across clinical, functional, and economic outcomes, guided iCBT consistently emerged as the optimal treatment format, demonstrating strong symptom reduction, high remission rates, favourable adherence and satisfaction, and the best cost-utility profile. Group CBT provided comparable reductions in social anxiety and uniquely strong improvements in peer-related functioning, supporting its value for adolescents whose symptoms are rooted in interpersonal challenges. Unguided iCBT, while low-cost and accessible, produced modest benefits and lower engagement, suggesting suitability primarily as a low-intensity option or early step in stepped-care models.

4. Discussion

The present randomized controlled trial compared the clinical effectiveness, peer-related outcomes, and cost-utility of three treatment formats for adolescent social anxiety disorder (SAD): therapist-guided internet-delivered CBT (guided iCBT), fully unguided iCBT, and group-based CBT with structured peer interactions. Across primary and secondary outcomes, guided iCBT and group CBT produced substantial and comparable reductions in SAD severity, whereas unguided iCBT resulted in more modest improvements. These findings have important implications for clinical practice, developmental theory, and mental-health service design.

4.1. Clinical Implications

The strong clinical outcomes observed for guided iCBT and group CBT suggest that both formats can serve as first-line treatment options for adolescent SAD, offering sizeable symptom reductions and meaningful diagnostic remission rates. Guided iCBT, in particular, demonstrated large effect sizes and the highest remission rates, consistent with prior research showing that minimal therapist guidance can substantially enhance the efficacy of digital CBT programmes [24][33]. Given its scalability, flexible delivery, and favourable cost-utility profile, guided iCBT may represent an especially practical core component within youth anxiety services, including school-based mental-health systems.

By contrast, the more modest improvements observed in unguided iCBT align with meta-analytic evidence showing lower adherence and smaller effect sizes when therapist contact is absent [34]. Nonetheless, the fact that unguided iCBT still produced statistically significant improvement suggests that it may be best positioned as a low-intensity first step in stepped-care frameworks, especially for young people with subthreshold symptoms or for settings with limited access to trained clinicians [35]. Integrating unguided programmes within school wellbeing portals or digital triage

systems may help broaden access while reserving therapist time for cases requiring more intensive support.

4.2. Developmental and Peer Processes

The comparable outcomes for guided iCBT and group CBT point to the flexibility of CBT mechanisms—particularly exposure and cognitive restructuring—to be effectively delivered either digitally or face-to-face, provided that treatment is structured, credible, and developmentally attuned. This finding is consistent with theoretical accounts proposing that the key therapeutic ingredients for SAD are less dependent on modality and more dependent on opportunities for corrective learning experiences and shifts in maladaptive beliefs [21].

At the same time, the superior improvements in peer-related functioning observed in group CBT underscore the unique developmental value of live peer interaction during adolescence. Developmental neuroscience highlights adolescence as a period of heightened sensitivity to peer evaluation and social inclusion, marked by increased responsiveness in socioaffective and sociocognitive brain networks [14, 36]. Within this framework, group CBT may provide a more potent platform for targeting peer-relevant processes—such as perceived social competence, peer support, and reductions in avoidance—through structured exposures, role-plays, and reciprocal peer feedback.

These findings suggest that hybrid treatment models could be especially promising. For example, guided iCBT could deliver core CBT content efficiently, while school-based peer practice groups or brief therapist-facilitated workshops could enhance transfer of learning to real-world social contexts. Such models would align with developmental theories of sociocultural learning [37] and address the limitations of fully digital interventions in capturing the social complexity of adolescent experience.

4.3. Service Design and Policy Implications

The results support a stepped-care model for adolescent SAD. At the broadest level, unguided iCBT can function as an accessible, resource-light option for mild/subthreshold cases or for use during waiting periods. Guided iCBT, given its strong clinical and economic performance, is well suited as a first-line, scalable treatment within schools, primary care, and CAMHS settings. Group CBT, which requires greater therapist time and logistical coordination, may be best reserved for young people with more complex presentations, interpersonal difficulties, or partial response to guided digital interventions.

From an economic perspective, the superior cost-utility of guided iCBT suggests that investment in digitally supported therapist time may offer greater system-wide benefit than exclusive reliance on face-to-face formats. Commissioners facing increasing demand for youth anxiety services may therefore prioritise guided digital models as the core platform around which adaptive stepped-care pathways are organised.

4.4. Limitations and Directions for Future Research

Several limitations warrant consideration. First, although the sample was diverse in terms of severity and recruitment pathways, generalisability may be limited to Western, school-attending adolescents, and future work should explore treatment adaptability across diverse cultural and educational contexts. Second, peer-related outcomes were assessed

primarily through adolescent self-report; incorporating multi-informant or behavioural observations would strengthen validity. Third, while group CBT outperformed other formats on peer-related outcomes, the mechanisms underlying these gains remain unclear. Dismantling studies focusing on specific peer processes—such as co-rumination, positive peer reinforcement, or social learning—would be informative [38].

In addition, integrating social network analysis could illuminate whether treatment-related improvements propagate through peer groups, especially in school settings where adolescents' social ecologies are tightly interconnected [39]. Finally, future trials should explore hybrid models and evaluate whether combining digital CBT with structured peer-based exposure sessions yields additive or synergistic benefits.

4.5. Conclusion

This trial demonstrates that both guided iCBT and group CBT are highly effective treatments for adolescent SAD, with guided iCBT offering the strongest balance of clinical benefit, engagement, and cost-effectiveness. Group CBT confers unique advantages in peer-related functioning, highlighting the importance of developmentally sensitive treatment design. Unguided iCBT remains a viable low-intensity option but is insufficient as a standalone intervention for most adolescents with diagnosable SAD. Collectively, these findings support a stepped-care approach that optimises scalability while ensuring access to developmentally informed, evidence-based psychological treatments.

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