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ARTICLE

An intervention to build social identities improves mental health and wellbeing in people with elevated social anxiety: Evidence from a single-arm clinical trial

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Abstract

Objectives: Current best-practice treatments for social anxiety disorder do not directly address loneliness, despite its role in the maintenance of the condition. The current study targets this issue directly, using mixed methods to provide an initial test of the efficacy of an established loneliness intervention, Groups 4 Health (G4H), among 33 people with clinically elevated social anxiety symptoms.

Design: A single-arm design was used and outcomes were assessed at baseline, programme completion and 5-month follow-up (3 months after programme completion).

Methods: Loneliness, social anxiety symptoms, depression symptoms and well-being were assessed at each time point. Semi-structured follow-up interviews were also conducted to explore the feasibility and acceptability of G4H in this population.

Results: Results from intention-to-treat analyses provide initial evidence of the programme's efficacy: participants' loneliness ($d = -1.08$), social anxiety symptoms ($d = -.45$), and depression symptoms ($d = -.60$) reduced significantly from baseline to 5-month follow-up while their well-being ($d = 1.00$) increased. Four themes emerged from reflexive thematic analysis: (1) the importance of challenging initial anxiety about attending group therapy, (2) the value of being vulnerable with fellow group members, (3) the role of G4H in increasing participants' social confidence, and

(4) processes which both helped and hindered participants' ability to engage with their group.
Conclusions: Together, results suggest that G4H is a promising and innovative treatment option for people with social anxiety, and further controlled evaluation is warranted.

KEYWORDS
group memberships, group psychotherapy, loneliness, mental health, social anxiety, social identity, social isolation

Practitioner points

- GROUPS 4 HEALTH is a five-session group therapy programme which directly targets loneliness and has been validated in Phase I, II, and III clinical trials. This study presents the first test of GROUPS 4 HEALTH's efficacy, acceptability and feasibility in a population with clinically elevated social anxiety symptoms at baseline.
- There were large reductions in loneliness and moderate reductions in both social anxiety and depression symptoms from baseline to 5-month follow-up. Across this timeframe, there were also large increases in participants' well-being.
- Interviews revealed that GROUPS 4 HEALTH provided an informal behavioural experiment by creating opportunities for participants to challenge their initial anxiety about attending group therapy and practice being vulnerable with their fellow group members. In addition, participants reflected that GROUPS 4 HEALTH increased their social confidence through its emphasis on skill development and behaviour change.

INTRODUCTION

Social anxiety disorder (SAD) substantially impacts a person's social life, educational attainment and employment (e.g., Aderka et al., 2012; Moitra et al., 2011; Ruscio et al., 2008; Vilaplana-Pérez et al., 2021), but is often undiagnosed and thus untreated (e.g., Katzelnick et al., 2001; Keller, 2003). A fear of negative evaluation is a core component of the condition's diagnostic criteria (American Psychiatric Association, 2022). However, this fear does not operate in a vacuum—it is experienced in the course of relating socially with others (as described in maintenance models of SAD; e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997). Crucially, fear of negative evaluation causes distress not only in the short term, but also through another mechanism which results from long-term avoidance of social situations: feelings of loneliness. Loneliness—the perceived lack of close, meaningful relationships—has a bi-directional association with social anxiety, such that their effects are mutually reinforcing (e.g., Lim et al., 2016; Maes et al., 2019). This issue raises an important question: can an evidence-based loneliness intervention reduce symptoms of social anxiety in this population? To this end, we present an initial test of an established group therapy programme that directly targets loneliness, GROUPS 4 HEALTH (G4H; Haslam et al., 2025), among people with clinically elevated social anxiety symptoms.

Current treatments for social anxiety

Data from Mayo-Wilson et al.'s (2014) network meta-analysis of 101 randomized controlled trials (RCTs) support the use of both psychological and pharmacological treatments for SAD. However,

Mayo-Wilson et al. recommend the use of individual cognitive behavioural therapy (CBT) rather than pharmacological alternatives as CBT produces large reductions in SAD symptoms, teaches skills which can be used ongoingly to maintain treatment gains, and is associated with fewer side-effects. As such, best-practice guidelines recommend individual CBT based on Clark and Wells' (1995) or Rapee and Heimberg (1997) models as the frontline treatment for SAD (National Institute for Health and Care Excellence [NICE], 2013), consistent with Mayo-Wilson et al.'s findings and cost-effectiveness data specific to the British healthcare context (Mavranezouli et al., 2015). Central to both of these CBT treatment models is an emphasis on *exposure* to feared social situations, which can both alter a person's dysfunctional beliefs through corrective experience (i.e., via formal or informal behavioural experiments) and increase their sense of self-efficacy. Although it was not emphasized in their recommendations, Mayo-Wilson et al.'s results also suggest that *group* CBT is an efficacious treatment for SAD, producing comparably large reductions in SAD symptoms to individual approaches (see also Barkowski et al., 2016).

Indeed, there are reasons to suspect that group therapy may offer additional benefits over individual approaches. Attending group therapy is, in and of itself, a type of exposure, allowing group members to challenge their beliefs about their ability to engage in feared social situations and tolerate associated distress. Group members can also provide each other with corrective feedback following more formal exposure tasks (see Hofmann & Otto, 2018, for a discussion) and may generally offer each other supportive, non-judgemental responses that counter the fear of negative evaluation inherent to SAD. Yet, it is possible that fear may also prevent clients from engaging in group therapy—clients may express a direct preference for individual therapy on this basis or, alternatively, therapists may believe that clients will find group therapy too distressing and thus hesitate to recommend it. Given these unique features of group therapy, further exploration of its utility in treating SAD appears warranted.

Crucially though, while CBT is an efficacious treatment for SAD in the short term, current meta-analytic data indicate that remission rates for SAD are low compared to other anxiety disorders. On average, only 45.4% of people with SAD who complete CBT remit at follow-up (approximately 6 months post-treatment) whereas the overall remission rate for anxiety disorders is 56.1% (Springer et al., 2018). These data may suggest that people with SAD can find it challenging to apply some core CBT skills once formal treatment is complete, and/or that these skills do not target all of the condition's core maintaining factors effectively. For example, it may be that people with SAD more frequently avoid feared social situations when they no longer have the support of a therapist. In this case, a core CBT skill—exposure—is not fully engaged post-treatment and may undermine treatment outcomes; this is because continued engagement with feared social situations is needed to reinforce new beliefs about the self (e.g., of being able to tolerate anxiety) and others (e.g., as being accepting rather than judgemental). Additionally, failure to support clients to develop meaningful social relationships leaves them vulnerable to another process which maintains SAD: loneliness.

The role of loneliness in maintaining social anxiety

Evidence from a wide range of samples (e.g., adults, Lim et al., 2016; children and adolescents, Maes et al., 2019) and methods (e.g., experience sampling, Oren-Yagoda et al., 2022; treatment evaluation; O'Day et al., 2021) indicates that social anxiety and loneliness are bi-directionally related. Several explanations for this relationship have been proposed. For instance, Oren-Yagoda et al. (2022) argue that a person with SAD may attempt to reduce the risk of negative evaluation by sharing minimal information about themselves during conversation (i.e., a safety behaviour); however, such safety behaviour usage leads to feelings of inauthenticity in interactions (Plasencia et al., 2016), hampering efforts to connect with others and increasing feelings of loneliness. Alternatively, the process of reviewing one's performance in-depth after a feared social situation (i.e., post-event processing) may trigger further situational avoidance in the future, increasing both loneliness and the occurrence of other maintaining factors (e.g., anticipatory processing; Oren-Yagoda et al., 2022).

However, current treatments for SAD do not appear to address loneliness effectively. For example, in O'Day et al.'s (2021) RCT comparing the efficacy of group CBT versus group mindfulness-based stress reduction in people with SAD, the treatments produced equivalent small-moderate reductions in loneliness, with no continued symptom improvement over the 1-year follow-up (O'Day et al., 2021). Consistent with previous meta-analytic data (Masi et al., 2011), O'Day et al. argued that CBT should effectively address loneliness by targeting participants' maladaptive cognitions. Yet, their findings suggest that cognitive restructuring alone may not counter loneliness, perhaps because it does not target loneliness explicitly.

The Groups 4 Health intervention

One treatment approach that explicitly targets loneliness is G4H (Haslam et al., 2025). G4H is a manualized group therapy programme that draws on social identity theorizing (social identity theory, Tajfel & Turner, 1979; self-categorization theory, Turner et al., 1987), and particularly the social identity model of identity change (SIMIC; Haslam et al., 2021). Social identity theorizing asserts that when people's group memberships (e.g., as a family member, runner, student, etc.) are internalized, they form part of the self-concept and become *social identities*. These social identities provide psychological resources such as social support, agency and self-esteem which have flow-on effects such as improved mental health (e.g., Greenaway et al., 2015; Häusser et al., 2023; Jetten et al., 2015). For example, social identification has been found to predict lower stress and depression symptoms via increased perceptions of group-based social support which, in turn, led to a greater sense of collective self-efficacy (Junker et al., 2019). SIMIC extends this further, arguing that, because of the resources they provide, social identities are crucial in supporting our ability to cope with stress, adversity, and other life changes. However, life transitions often threaten these identities which, in turn, attenuate the associated psychological resources they provide and undermine health and well-being (Haslam et al., 2021).

G4H targets loneliness by scaffolding the development and maintenance of social identities across five modules (Haslam et al., 2025). In Module 1, participants receive psychoeducation on the importance of group-based belonging for health. Participants are then guided to map their own social worlds in Module 2 (Cruwys et al., 2016), and learn skills to both make the most of their existing groups and more effectively manage challenging groups in Module 3. Module 4 provides an opportunity to develop new group memberships, using the G4H group as a scaffold to reconnect with an existing group and/or join a new group prior to Module 5. Modules 1 through 4 are completed weekly, while Module 5 is completed 1 month later to review progress, troubleshoot challenges and celebrate participants' success. Figure 1 provides a visual overview of each module's content.

G4H has been evaluated in three phases of clinical trials that recruited student, community and clinical samples presenting with loneliness in association with depression symptoms (Cruwys, Haslam, Rathbone, et al., 2022; Haslam et al., 2016, 2019). These trials found that G4H is not only effective in reducing loneliness in these populations, with moderate to large effect sizes, but is also feasible and acceptable (Cruwys, Haslam, Haslam, et al., 2022). Some evidence also suggests that G4H may be beneficial for social anxiety. In particular, Haslam et al.'s (2016) study found significant reductions in social anxiety symptoms from baseline to programme completion, with improvements observed in a majority of participants (59.3%). Similar reductions in social anxiety symptoms were reported in a subsequent RCT involving a community sample with diagnosed mental illness and/or clinically significant depression symptoms at baseline (Haslam et al., 2019). A recent secondary analysis of the above trials showed that people with more severe social anxiety symptoms at baseline benefit the most from the G4H programme (Cruwys et al., 2023). However, no previous trial has recruited on the basis of social anxiety or included this as a primary outcome.

We reason that the G4H programme may hold particular benefit for people with social anxiety. In supporting the development and maintenance of social identities, G4H not only works to improve

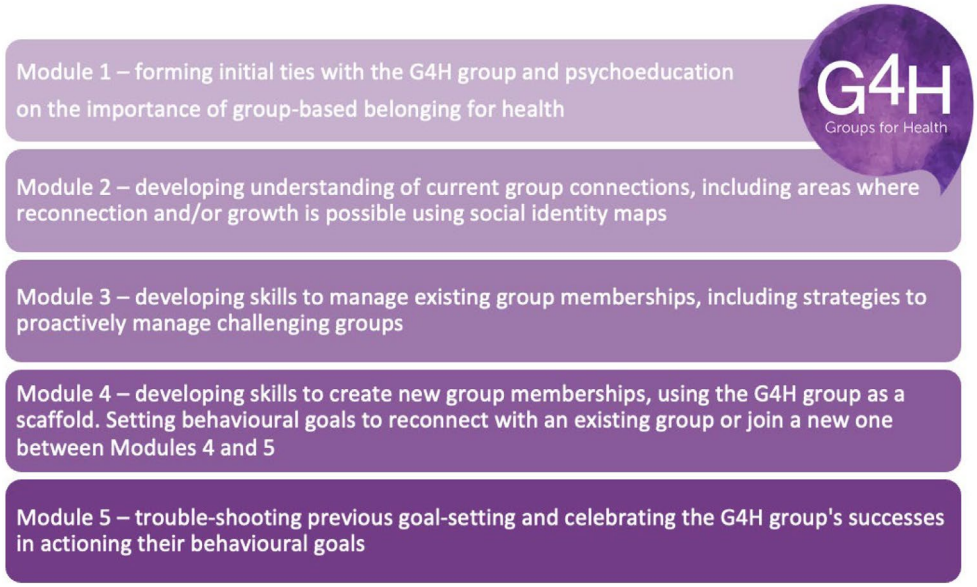

FIGURE 1 *GROUPS 4 HEALTH* program overview.

health and well-being but it also directly targets loneliness—a mechanism through which social anxiety symptoms are maintained (e.g., Lim et al., 2016; Maes et al., 2019). Further, attending a group therapy programme like G4H provides in vivo exposure, forming an informal behavioural experiment in and of itself (e.g., regarding clients' ability to tolerate distress, the nature of other people's reactions, etc.). Through its focus on skill development and behaviour change, G4H also works to build clients' sense of self-efficacy and facilitate ongoing exposure to feared social situations. Therefore, G4H may target both novel processes in SAD's maintenance like loneliness alongside established maintaining factors (i.e., avoidance; Clark & Wells, 1995; Rapee & Heimberg, 1997). In this way, the G4H programme appears well-positioned to improve remission rates in people with SAD.

The current study

Despite preliminary evidence supporting the use of G4H for treating social anxiety, previous trials have not considered social anxiety as a primary outcome or tested the efficacy of G4H in a population recruited on the basis of clinically elevated symptoms. Likewise, the feasibility and acceptability of G4H has not been assessed in this population. Therefore, this study had two aims: (1) to provide a pilot test of G4H's efficacy, and (2) to explore its feasibility and acceptability, in a population with clinical social anxiety symptoms. This approach is in line with best-practice guidance for complex intervention development, which emphasizes a non-linear, reflexive, and pragmatic approach to intervention development and evaluation (see Skivington et al., 2021). In particular, Skivington et al.'s guidelines note the importance of determining the feasibilty and early efficacy of an intervention, before more resource-intensive designs such as RCTs are conducted. To achieve this, we recruited participants who scored above a clinical cut-off for SAD (Menatti et al., 2015) and assessed their symptom change from baseline to 5-month follow-up (3 months after programme completion), using a single-arm design in which all eligible participants were offered the G4H programme and data were analysed using intention-to-treat principles. Semi-structured follow-up interviews were also conducted and were analysed using reflexive thematic analysis. The primary hypotheses were that participants' social anxiety symptoms (H1) and loneliness (H2) would significantly reduce from pre- to post-treatment, with these improvements being maintained at 5-month follow-up. As secondary outcomes, it was also anticipated that depression

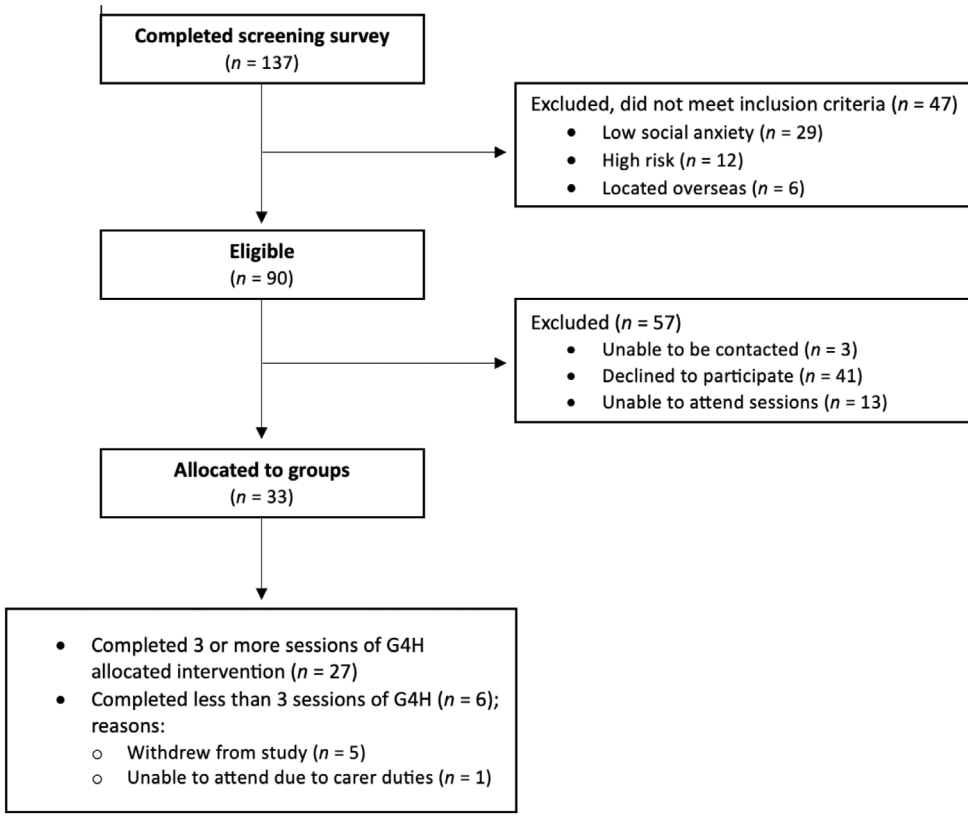

FIGURE 2 *Groups 4 Health* trial CONSORT diagram.

symptoms would significantly reduce (H3) while well-being would significantly increase (H4) from pre- to post-treatment, with these improvements being maintained at 5-month follow-up.

MATERIALS AND METHODS

Design

The current study used mixed methods to provide an initial test of the efficacy, feasibility, and acceptability of G4H in a population with clinically elevated social anxiety symptoms. A single-arm design was used and outcomes were assessed at baseline, programme completion and 5-month follow-up (3 months after programme completion). Semi-structured follow-up interviews were also conducted. Figure 2 outlines the trial profile. An a priori power analysis conducted in G*Power found that to detect a medium effect size ($d = .42$) with a repeated measures t-test (our initial planned analysis), power of .80 and an alpha of .05, a minimum sample of 47 participants was needed (Faul et al., 2007). To achieve this, assuming approximately 60% retention rates at 5-month follow-up (as per Haslam et al., 2016), we aimed to recruit a total sample of 80 participants for the G4H groups. A total of six G4H groups were run between September 2022 and June 2023. Informed consent was obtained from all participants and confirmed at each stage of the study. Ethical approval was granted by the Human Research Ethics Committee at the Australian National University (Protocol: 2021/794). This study was prospectively registered with the Australian New Zealand Clinical Trials Registry (ANZCTR), and the published protocol is available (https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?ACTRN=12622000077763p).

Participants and procedure

One hundred and thirty-seven people completed the screening survey for the G4H programme, of which 33 were allocated to a G4H therapy group and constituted our final sample. Average age was 25.66 years ($SD = 10.90$, range: 18–67) and the majority of the sample identified as women (66.67%), White (63.64%), and had secondary school education or greater (84.84%). Table 1 provides an overview of demographic characteristics.

The G4H programme was advertised via a number of sources, including community-based supports (e.g., local GP clinics), university-based supports (e.g., university psychology clinic, university social media pages), an undergraduate research participation platform, fliers and word-of-mouth. All advertisements directed interested individuals to complete a screening survey, which also served as baseline data for those respondents who went on to complete the programme.

Inclusion criteria required that participants were: (a) aged 18 years or older, (b) had clinically elevated social anxiety symptoms indicative of SAD, as assessed by scores of 12 or greater on the Social Interaction Phobia Scale (SIPS; Reilly et al., 2012), and (c) demonstrated sufficient English language skills to enable group participation. In Menatti et al.'s (2015) study, a cut-off of 12 on the SIPS best-distinguished between participants with SAD diagnoses and healthy controls. Exclusion criteria were (a) severe suicidal ideation,[1] (b) acute psychological symptoms that would interfere with capacity to complete the groups (e.g., active psychosis), (c) substance dependence or intoxication, and (d) severe neurological conditions or intellectual impairment.

To improve retention, participants received incentives for completing the post-programme assessment (AUD$10), 5-month follow-up assessment (AUD$20), and for completing qualitative interviews (AUD$20). Participants who were current students were also offered course credit for completing the screening survey and, if eligible, for participation in the G4H programme (maximum of 6.5 hours of course credit).

GROUPS 4 HEALTH

The G4H programme was co-facilitated by two trainee psychologists per therapy group. They were enrolled in a professional psychology graduate programme and had previously attained competency in risk assessment and supportive counselling. In addition, all facilitators were provided with a full day of training in G4H and weekly supervision with the third author, a clinical psychologist with expertise in G4H. Consistent with other trials, a short catch-up session was offered if participants missed a session, and completion of at least three modules was considered programme completion (Cruwys, Haslam, Haslam, et al., 2022).

Qualitative interviews

Following programme completion, all participants were invited to complete one-on-one semi-structured interviews with either the first or second author. Six participants chose to participate. Each interview lasted approximately 30 minutes. The interviews focused on participants' experience in their G4H group, particularly of their anxiety in the group setting (including its effect on their cognition, emotion, and behaviour) and factors that they believed supported their engagement in the programme.

[1]In the ANZCTR registration, endorsement of Item 9 on Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), which assesses for self-harm and/or suicidality, was considered grounds for exclusion. However, following best practice and in line with our ethics approval, a non-zero endorsement of Item 9 was treated as an indication that a phone call with a trainee psychologist was required to conduct a full risk assessment and determine eligibility. There were two potential outcomes of this call: (1) eligible for G4H (e.g., if assessed as low risk and had additional external supports available) or (2) ineligible for G4H (e.g., if assessed as high risk, risk without external supports, etc.). Appropriate referrals were provided to all participants who indicated risk. Supervision was provided by the third author, an experienced clinical psychologist.

TABLE 1 Participant demographic characteristics and baseline data ($N = 33$).

Age, *M* (*SD*; range)	25.66 (10.90; 18–67)
Gender, *n* (%)	
Woman	22 (66.67%)
Man	9 (27.27%)
Non-binary	2 (6.06%)
Ethnicity, *n* (%)	
White	21 (63.64%)
Asian	10 (30.30%)
Middle Eastern	1 (3.03%)
Mixed	1 (3.03%)
Education, *n* (%)	
Year 12 certificate	11 (33.33%)
Trade certificate/Diploma	4 (12.12%)
Some university	9 (27.27%)
Bachelor's degree	6 (18.18%)
Post-graduate degree	2 (6.06%)
Other	1 (3.03%)
Recruitment source, *n* (%)	
Research recruitment platform	14 (42.42%)
Flyer	4 (12.12%)
Word-of-mouth/Social media	15 (45.46%)
Mental health diagnosis, *n* (%)	
Yes	14 (42.42%)
Unsure	2 (6.06%)
No	16 (48.48%)
Nil response	1 (3.03%)
Concurrent mental health treatment, *n* (%)[a]	
Yes	14 (87.50%)
No	2 (12.50%)
Outcome measures, *M* (*SD*; range)	
Social Interaction Phobia Scale	32.79 (13.83; 12.00–56.00)
UCLA Loneliness Scale 20-items	55.46 (11.28; 31.00–74.00)
Patient Health Questionnaire 9-items	11.42 (5.41; 3.00–27.00)
Short Warwick-Edinburgh Mental Well-Being Scale	18.75 (2.90; 12.40–26.02)

[a]Participants were only asked about concurrent mental health treatment if they indicated that they had received a mental health diagnosis, so data is specific to this subsample of participants. Thus around *half* (42.42%) of our total sample were receiving concurrent treatment.

In addition, participants were asked to share any changes in their lives that they had noticed since completing the programme (particularly in terms of their anxiety symptoms and social connectedness; see Data S1 for details).

Measures

Primary and secondary outcomes were assessed at baseline, programme completion, and 5-month follow-up. As part of the study, several additional measures were administered (see Data S1 for details).

Primary outcomes

Social anxiety was measured using Reilly et al.'s (2012) 14-item SIPS (e.g., "When mixing socially I am uncomfortable"), on a 5-point scale (0 = Not at all true or characteristic of me, 4 = Extremely true or characteristic of me), $\alpha = .94–.97$.[2]

Loneliness was measured using the 20-item UCLA Loneliness Scale (ULS-20; e.g., "I lack companionship"; Russell et al., 1980), on a 4-point scale (1 = Never, 4 = Often), $\alpha = .91–.95$.

Secondary outcomes

Depression was measured using the 9-item PHQ-9 (e.g., "Little interest or pleasure in doing things"; Kroenke et al., 2001), on a 5-point scale (0 = Not at all, 3 = Nearly every day), $\alpha = .85–.90$.

Well-being was measured using the 7-item Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS; e.g., "I've been feeling optimistic about the future"), on a 5-point scale (1 = None of the time, 5 = All of the time), $\alpha = .65–.82$. SWEMWBS scores were transformed in accordance with author recommendations (NHS Health Scotland, University of Warwick, & University of Edinburgh, 2008; see also Ng Fat et al., 2017).

Analysis plan

Mixed-model repeated measures (MMRM) models were used to test each hypothesis. These models were nested, with a fixed effect of time point (level 1) and random intercepts for participant (level 2) and, for social anxiety only, therapy group (level 3).[3] As the intervals between different time points varied, time point was treated categorically, and both linear and non-linear patterns of association were examined. Estimated marginal means were used to perform planned follow-up contrasts as appropriate, correcting for multiple comparisons with a multivariate *t*-distribution. Full information likelihood maximization (FIML) was used to manage missing data within each MMRM model. FIML retains all available data for participants and thus honours intention-to-treat principles and maximizes power (Mallinckrodt et al., 2008; Mazza et al., 2015). MMRMs were run in R (v4.3.2; R Core Team, 2023) on macOS, using the lme4 (v1.1.35.3; Bates et al., 2015) and emmeans (1.10.1; Lenth, 2024) packages.

To analyse the semi-structured interviews, reflexive thematic analysis was used (Braun & Clarke, 2006, 2019). Reflexive thematic analysis is a process that flexibly moves between six stages: (1) data familiarization; (2) initial data coding; (3) initial theme generation; (4) initial theme review, which compares these themes against both coded data and the full data and can involve further theme development; (5) refinement, definition and naming of themes; and (6) write up. In the current paper, a deductive approach was used that drew upon maintenance models of social anxiety, broad cognitive behavioural principles, and insights from the social identity approach to health. Themes were initially developed by the first author and revised through subsequent feedback from co-authors.

[2]In the ANZCTR registration, it was planned to measure social anxiety symptoms using the Social Interaction Anxiety Scale (SIAS) and Social Phobia Scale (SPS) (Mattick & Clarke, 1998); however, the SIPS, which combines the SIAS and SPS, was used instead to reduce participant burden.
[3]Random intercepts for both participant *and* therapy group were initially included for all variables. However, therapy group accounted for near-zero variance in loneliness, depression, and well-being and thus created issues with singularity. Thus, therapy group was dropped for these models (i.e., only a random intercept for participant was included).

RESULTS

At baseline, the sample's mean-level social anxiety symptoms ($M = 32.79$, $SD = 13.83$) were marginally higher than those in Menatti et al.'s (2015) sample of people with diagnosed SAD ($M = 30.11$, $SD = 11.84$), suggesting that our sample had clinical levels of social anxiety indicative of SAD. Our sample's average depression symptoms at baseline ($M = 11.42$, $SD = 5.41$) indicated moderate depression (Kroenke et al., 2001), and their average loneliness at baseline ($M = 55.46$, $SD = 11.28$) was higher than that reported by participants in the most recent published G4H trial, which targeted those with severe loneliness ($M = 51.95$, $SD = 9.94$; Cruwys, Haslam, Rathbone, et al., 2022). Together these data suggest that we successfully recruited a sample with clinical-level symptoms. Yet, our sample size was somewhat smaller than intended. Therefore, a post-hoc power analysis was conducted using Murayama et al.'s (2022) online application (https://koumurayama.shinyapps.io/summary_statistics_based_power/); this application uses summary statistics from a MRMM model to determine power for future studies (initially designed for a priori rather than post-hoc power analyses). Using the results of H1, which examined the changes in social anxiety symptoms from baseline to programme completion (see Primary outcomes section below)—a t-value of −3.40, level 2 sample size of 33, and 1 cross-level interaction—a minimum sample size of 33 provided 90% power to detect H1's effects with an alpha of .05, increasing our confidence in the validity of our findings.

Primary outcomes

Improvements were found in both primary outcomes, supporting H1 and H2. Specifically, on average, social anxiety symptoms decreased significantly over time, with a small and significant decrease from baseline to programme completion ($t[38.35] = -3.40$, $p = .002$, $d = -.26$) and a moderate decrease from baseline to follow-up ($t[38.68] = -5.29$, $p < .001$, $d = -.45$); see panel A, Figure 3. Loneliness also decreased significantly over time, with a large decrease between baseline and programme completion ($t[45.72] = -7.34$, $p < .001$, $d = -1.10$) and between baseline and follow-up ($t[46.41] = -6.72$, $p < .001$, $d = -1.08$); see panel B, Figure 3.

Secondary outcomes

Similar improvements were found in the secondary outcome variables, supporting H3 and H4. On average, participants' depression symptoms decreased significantly over time, with a moderate decrease between baseline and programme completion ($t[46.26] = -3.82$, $p < .001$, $d = -.55$) and between baseline and follow-up ($t[46.87] = -3.88$, $p < .001$, $d = -.60$); see panel C, Figure 3. Changes in well-being scores were also found over time, with a large improvement between baseline and programme completion ($t[47.33] = 5.73$, $p < .001$, $d = .95$) and between baseline and follow-up ($t[48.44] = 5.72$, $p < .001$, $d = 1.00$); see panel D, Figure 3.

Qualitative findings

Analysis of data from semi-structured interviews revealed four key themes, which are described below and in Table 2. Pseudonyms are used to distinguish between participants (noting participants' gender and age in brackets).

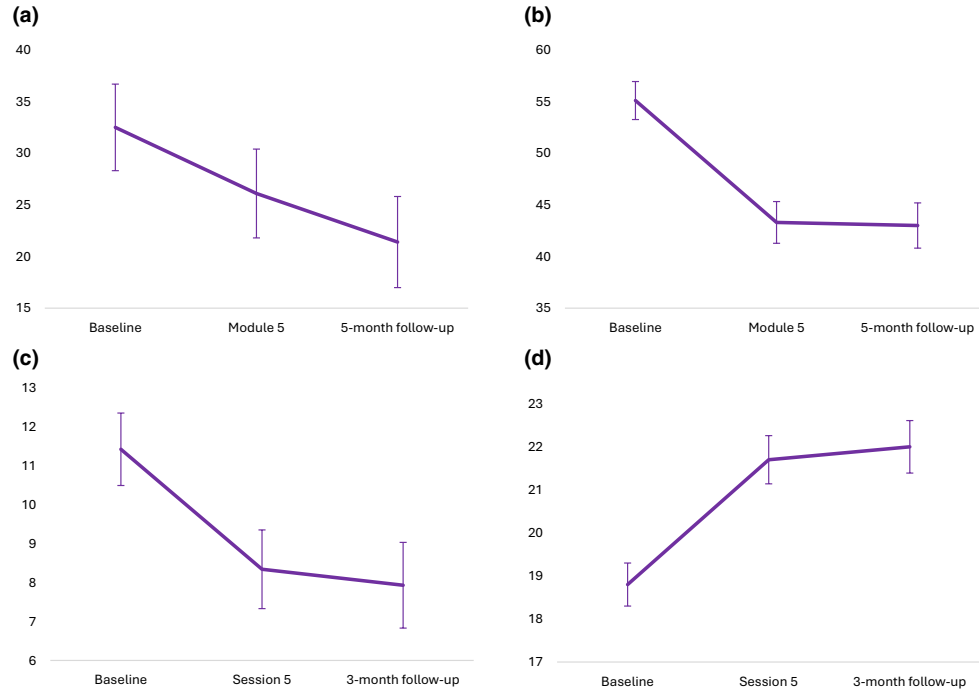

FIGURE 3 Changes in participants' social anxiety symptoms (a), loneliness (b), depression symptoms (c), and well-being (d) from baseline to 5-month follow-up (3 months after program completion); error bars represent the standard error of each analysis.

Theme 1: GROUPS 4 HEALTH is a trial by fire

Consistent with the quantitative findings, participants described feeling quite anxious about taking part in the G4H programme, something that they described as reaching a peak in their first session of treatment:

> … [I felt] uncomfortable mostly. How do I describe it? Like social awkwardness? Silence. Not, not sure what to say, because I'm not sure how others would react to what I might have to say. If they might find it… well, they might not get what I have to say or, yeah, I don't… I'm not sure how to word it. But yeah, it's awkward
>
> (Nick, Man [M], 19)

Despite some aspects of the programme being experienced as anxiety-provoking, most felt that the programme helped them to directly challenge their anxiety, and that this was what they felt was most beneficial for their mental health long-term:

> … sometimes you may not feel like doing social things, but just like, push yourself to do it, and like that can be positive for your mental wellbeing
>
> (Hilary, Woman [W], 38)

In this way, G4H was something of a 'trial by fire' for participants, where they felt overcoming their anxiety in the first session was key to the improvements they subsequently experienced. Participants described their initial nervousness including key symptoms of social anxiety, such as self-focused attention and safety behaviours. However, they also described how these symptoms reduced rapidly across the programme:

TABLE 2 Additional participant quotations from semi-structured interviews.

Theme			
GROUPS 4 HEALTH is a Trial by Fire	*I'm way more open in last session than first session. And I guess I… as time goes on I also feel more comfortable interacting with not just the facilitators, but also the other group participants* – Cerys (W, 23)	*During the first session, I felt a little bit anxious. But, it got… relieved… during the session, and after I get to know the other participants… That's the difference actually. Between sessions actually changed, because after I shared my experiences with people, I felt more secure because everybody was really accepting* – Dale (M, 31)	*I guess my fear is like, I don't know–like, when you share parts of your life or you're vulnerable or whatever, you are worried you'll be judged. Or you don't know other people's belief systems, or–especially if you haven't met them before… It's just scary saying things to people, especially when you don't know them so well… But because, after the first session, it wasn't really focused on that [anxiety] then I guess I was more relaxed* – Hilary (W, 38)
GROUPS 4 HEALTH Scaffolds Vulnerability	*So I feel like a lot of comfort that I felt and all the familiarity that we developed over time is because we've all developed a sense that we could talk and speak our mind. I see that others are doing the same, so I feel like I could place my trust in them to express my, you know, emotions, since they are placing their trust [participant's emphasis] in me by talking like that. It's a mutual thing that develop* – Nick (M, 19)	*… like that last session when we did our little… I think it was a bonding map? Yeah, it was, I was really personally invested because when we did them the first time we'd been talking about, you know, here is what like… people would say, "Here's what I struggle with". Like, "I don't feel close to my family" or something. And I'd say, "Oh, you know, that's really hard". Or "Here's something you could do", you know? And then at the end you might see that they're [the people you gave advice to] like, closer with their family, or you might see that they're closer with their friends* – Felix (NB, 23)	*Emotionally, I feel, I feel like a little bit more comfortable with, with connecting with people. Because, before, I was a lot more apprehensive, I didn't really know what to expect. But afterwards it… because I've had these positive experiences of connecting with complete strangers, I can feel more confident in doing the same in the future. Just go to people and strike up conversations* – Nick (M, 19)
GROUPS 4 HEALTH Activities Builds Social Confidence	*I'd say I'm more optimistic about my social groups, particularly with my [group] just being more – not over-thinking it too much and just – I think it's like a shift of the mind, like thinking the positives. And um I think one of my goals from session was to like do stuff outside of [the group], because it's–instead of just becoming a social activity – it's becoming a bit more of a* friendship. *So I feel like I've developed those a bit more, which I'm happy about* – Georgia (W, 19)	*Before the group therapy, I felt like I'm not connecting to people that much, and I felt a little bit lonely. But after mapping my social map I realized that… I'm not that lonely [laughs]. I'm not that lonely, I have groups that are really supportive, and I have people who care for me. It's just I… there was some people that I'm not connecting well with and I'm not maintaining my connection. I've been just maybe looking for some new connection instead of strengthening the old ones* – Dale (M, 31)	*I guess the group gave me more awareness of like, "Okay, like, sometimes you may not feel like doing social things, but just like, push yourself to do it, and like that can be positive for your mental wellbeing". Like it gave me a better awareness of that* – Hilary (W, 38)

TABLE 2 (Continued)

Theme			
Establishing a Sense of Safety Within the Group	*The rules that we set in the first session… this set like the bottom line, so that everyone knows what to expect and what to not expect in the session* – Cerys (W, 23)	*I guess the structure of it. I guess um the- the booklet, like there was a structure to follow. Um but at the same time it wasn't like super like rigid and like, "Why haven't you done this section?" and it was just like a reference that they [the facilitators] referred to* – Hilary (W, 38)	*I think just like, yeah, that going back to that culture of openness. I'm not sure how it came about, but we definitely did do like a rule–creating some rules. Maybe that opened up the discussion or people like talking?* – Georgia (W, 19)
	I mean, as one might expect from a social anxiety group, we did have like two people that were reticent to volunteer but like, would say things when they were asked. And then there was at least one person that was like really *[participant's emphasis] shy and sort of had to be prompted. And they did such a good job… like they made sure everyone said something every single time, but like, also didn't put anyone on the spot, but especially, like, the quieter members, they were like, "What do you think about this?"* – Felix (NB, 23)	*It was a very positive experience, facilitators were open. And they helped to kind of drive the conversation. Because, as a person with social anxiety, I am really bad at keeping the conversation going [laughter], finding new topics and keeping it engaging and having facilitator who are really empathetic and open, and also a little bit more extraverted than myself made it really nice* – Dale (M, 31)	*I think it's the way that they react. When I, when anyone share any kind of experience. Um, they're very positive. Non-judgemental, that people feel safe when they have to disclose something that is a little bit more like private… think if you feel comfortable with that facilitator, it helps you a bit to learn and to engage in the therapy* – Cerys (W, 23)

> Like in the first session, I was really nervous and a little bit too nervous to focus on what other people were saying. I was sort of just rehearsing what I was going to say. But then after that I, you know, focused more on people, because we were bonding… Like, [my] focus went from internal to like external
>
> (Felix, Non-binary [NB], 23)

In this way, joining G4H appeared to act as an informal *behavioural experiment*, whereby participants learnt through experience of feared situations—joining and participating in a group with others who shared similar fears—that they not only have the capacity to tolerate feelings of anxiety, but also these feelings reduce over time. This was captured succinctly by one participant's description of their overall experience of the programme:

> It helped me to alleviate my social anxiety
>
> (Dale, M, 31)

Thus, future facilitators should be mindful of the role of G4H as an informal behavioural experiment and work to highlight the changes in participants' beliefs across the course of the programme. For instance, facilitators could specifically ask about participants' experience of anxiety at the beginning and end of Module 1; this informal data could be used to highlight reductions in participants' initial anxiety, their ability to tolerate distress, and their ability to face challenging tasks as well as to normalize experiences of social anxiety.

Theme 2: GROUPS 4 HEALTH scaffolds vulnerability

Participants described the process of sharing their perspective with others in the group as a vulnerable experience. However, they identified that challenging themselves to be vulnerable was a positive process overall, particularly when those experiences were validated. This also appeared to be key to reducing their anxiety:

> After I shared my experiences with the people, I felt more secure because everybody [was] really acceptive
>
> (Dale, M, 31)

Crucially, though, the reciprocity of this process was also important to participants, who viewed their fellow group members' vulnerability as a signal of trust:

> … at first it was like, 'Oh, I don't know these people.' But seeing some of the other group members like share a bit of their experiences, I'm like, 'Oh, okay, I can trust these people'
>
> (Georgia, W, 19)

Participants also described how this experience of reciprocal trust and safety could be a stepping stone and scaffold to experiencing such trust outside of the G4H group:

> Because I've had these positive experiences of connecting with complete strangers, I can feel more confident in doing the same in the future. Just go to people and strike up conversations
>
> (Nick, M, 19)

Thus, the G4H group was seen as offering an initial, safe way to test out forming new connections with others before participants translated this into their everyday lives. In this way, participants' experiences in G4H—where their vulnerability was well-received—can be seen as another kind of informal behavioural experiment, targeting the defining feature of social anxiety: fear of negative evaluation. Again, this process is something that can be amplified by future facilitators—that participants' initial beliefs about themselves (e.g., as being unable to enact change in their social world) and others (e.g., as critical or unsupportive) can be misleading. In particular, these discrepancies could be highlighted in Module 4 to boost participants' confidence to make behavioural changes between this session and Module 5. Equally, such changes could also be reinforced during Module 5 in the hopes to promote further behavioural change once the program has ended. Another crucial point to highlight is that, while sharing information about oneself can be anxiety-provoking, it is through this sharing that participants felt most connected with their fellow group members. Indeed, it is possible that this corrective feedback—of having self-disclosures be well-received—may halt the progression of any anxiety felt within the group setting into post-event rumination (or processing), a process which maintains social anxiety symptoms (Clark & Wells, 1995; see also Chen et al., 2015, 2018).

Theme 3 GROUPS 4 HEALTH activities build social confidence

Throughout the interviews, the majority of participants cited the reflective and safe space that the G4H programme created for participants, and this was seen as a key component of its benefit:

> This group therapy just helped me to, to think about the nature of having that friends and yeah, and meeting new people, I guess… the group inspired me to think about my social life, not just in Australia, but in [my home country] as well… And I feel like, okay. So, for sometimes I can rely on my [home country] friends, even though they're not like physically accessible
>
> (Cerys, W, 23)

Participants also appreciated G4H's emphasis on pragmatic behavioural change, culminating in goal setting at the end of Module 4, where participants are encouraged to reconnect with an existing group and/or join a new group:

> So I mean, one thing that I did that is like a concrete change is like, you know how at the end we had that like one goal, that one thing we're going to work on. So I did what I said I was going to do and I joined a club… so now I do that for two times a week for 2 hours each…. And I think that's definitely made my life a lot better
>
> (Felix, NB, 23)

> I felt some need to… for example, need [to] do some recreational activities with other people together. And then, for example, creating my value pie [a G4H exercise], I found some things that I'm interested in. Then I've realized that, instead of going out and looking, trying to connect with random people, I could use that fact and find, uh, for example, some groups that have similar interests to me
>
> (Dale, M, 31)

Each of these social changes that participants described appeared to be enabled by an increased sense of social confidence, where participants could reflect upon, understand, and effect change in their social worlds using the knowledge and skills taught in the G4H programme. This social confidence was particularly notable as a counterpoint to the social anxiety that all participants

experienced at the start of the program. As discussed in previous sections, future facilitators could highlight participants' bravery in enacting behavioural change and discrepancies in participants' beliefs before and after such changes (e.g., from believing that they were unable to tolerate anxiety beforehand but learning that they could do so). Another important point to discuss here could be the usefulness of referring back to the G4H participant workbook and re-completing activities to further develop participants' social worlds.

Theme 4: Barriers and facilitators to a sense of safety within the group

Given the broader goal of this study to investigate the feasibility of running G4H in populations with clinically elevated social anxiety symptoms, enablers and barriers to participants' in-session engagement were explored. In particular, several factors appeared to improve participants' sense of safety within the group and thus enhanced their ability to participate, including icebreakers, establishing clear group rules, and using the participant workbook. For example:

> … ice-breaker was good – just to have that openness of discussion
>
> (Georgia, W, 19)

In the authors' experience, these aspects of the G4H programme were as important as its content in supporting participants' ability to engage with the group. For our participants, use of icebreakers—either as a formal Module 1 task or by initiating casual conversation between group members in the later sessions—supported ongoing conversation throughout the remainder of the session as well as broader group bonding. Creating clear group rules and using the workbook also appeared to support participants to engage more fully in the groups, likely because these create a sense of structure and safety which in turn may lessen anxiety about how to act within the therapy group. It is recommended that future facilitators consider these points when establishing therapy groups in people with elevated social anxiety. Crucially, through this line of questioning, participants were offered the opportunity to suggest changes to the program to improve their experience. However, very few suggestions were offered and, among those that were, there was little consistency in participants' recommendations (e.g., one participant requested skills to manage anxiety, another expressed a desire for an additional follow-up session).

However, participants also reported factors that negatively impacted their ability to engage fully in the program. A major disruption to establishing a clear connection with the group was inconsistent attendance and dropout in some groups, which directly affected participants' ability to bond with each other and undermined their sense of safety within the group:

> They [the other participants] are open. It's just that they are not showing up [laughs]… I mean, speaking from my experience. I'm the only one who showed up every session. So um, I don't feel the bondings with other participants… I feel like, oh, not sure to what degree I can disclose myself because the peoples are always changing. So that might hold me back a little bit… I have to adjust every week
>
> (Cerys, W, 23)

Thus inconsistent attendance risked participants' felt safety to be vulnerable as identified in Theme 2. Other elements of the group, however, appeared to reduce this fear. One essential component to a group's success lay in facilitation. Facilitators were viewed as non-judgemental and supportive, and scaffolded group discussion when the participants found it challenging:

> … the facilitators have done a great job in [enticing] us to talk about things. And you know when to talk, but you also know when to stay silent, because sometimes, well, a lot of times, it's just us talking, which is crazy because we're socially anxious people and you somehow made us to talk. It's kind of magical
>
> (Nick, M, 19)

Together, participants' responses suggest that the key to effective facilitation of G4H in this population is creating a safe, structured, and consistent environment where participants can fully engage with the purpose of the group—developing social connection—rather than worrying about their safety within it. Thus facilitators should remain mindful that certain elements of the G4H programme like the group rules and workbook have both a practical function (supplementing verbal content and guiding the group, respectively) but also provide a sense of safety and structure in the group for people with social anxiety. Equally, facilitators should be aware that disruptions to the group, like poor attendance, may be felt particularly strongly among people with social anxiety due to their fear of negative evaluation. In regard to this latter point, it may be that re-introducing and re-orienting participants to the rules of the group may work to counter some of participants' fears when their own, or others', attendance has been disrupted.

DISCUSSION

The current study found initial evidence to support the use of G4H in people with clinically elevated social anxiety symptoms. Supporting our hypotheses, participants' social anxiety symptoms, loneliness, and depression symptoms all reduced substantially from baseline to 5-month follow-up, while their well-being increased. Importantly, the trends of these improvements suggested continued gains following treatment completion. In particular, the effect sizes for loneliness were large, while improvements in social anxiety were small-moderate. The effect sizes for depression and well-being were in the moderate and large ranges, respectively. While promising, these findings are qualified by the lack of control group. However, participants identified that their experiences within their G4H group were corrective, challenging their anxiety and facilitating vulnerability in ways that were crucial to the growth of their social confidence, providing more support for the program's efficacy within this population. Participants also outlined elements of the G4H programme that enhanced their engagement and thus may have facilitated their treatment gains, providing evidence for program acceptability and feasibility.

Current research and best-practice guidelines recommend individual CBT as the frontline treatment for SAD (Mayo-Wilson et al., 2014; National Institute for Health and Care Excellence, 2013). However, there is also evidence to suggest that remission is not achieved for more than half of clients (Springer et al., 2018). A potential explanation for this poor prognosis is that some core perpetuating factors of SAD are not effectively targeted in traditional treatment models. For instance, loneliness has been implicated in the maintenance of social anxiety (e.g., Lim et al., 2016; Maes et al., 2019). Yet, loneliness is not addressed in current maintenance models and, by extension, in recommended treatment approaches. Loneliness may be a particularly challenging perpetuating factor to target. For example, loneliness may be difficult to address in traditional exposure tasks and behavioural experiments because these typically centre around one-off interactions (e.g., initiating small talk with a cashier, presenting at a work meeting). These challenges may be further compounded when people feel disempowered to manage their existing social connections. By contrast, G4H targets loneliness directly by encouraging participants to reconnect and join new groups and teaching them skills to achieve this. In this way, the unique content of G4H offers a potential solution and a means to enhance existing treatments.

Implications

Our results provide initial evidence that engagement in the G4H programme improves mental health and well-being among people with clinically elevated social anxiety symptoms. This finding extends previous trials, which have found improvement in similar outcomes (e.g., Haslam et al., 2016, 2019), by demonstrating these benefits can be seen in a sample of people with baseline social anxiety symptoms akin to a diagnosed SAD sample. Crucially, these effects emerged in the context of adherence to the original G4H programme. This suggests that G4H requires no significant modifications to be successfully applied within this population when used alongside other treatments (as was the case for a proportion of our sample). However, further interrogation of program adaptation would be useful in the context of delivering G4H as a standalone treatment. In this case, it may be that additional modifications to G4H are needed, such as psychoeducation on (social) anxiety or a rationale for exposure; such adaptations may be particularly helpful for participants with more severe symptoms at baseline.

One potential mechanism of G4H's efficacy is that it facilitates exposure to feared situations and provides a corrective experience in a supportive environment, serving as an informal behavioural experiment. Here, our participants identified two interconnected features of the G4H programme that may help it to function as a behavioural experiment: (1) learning to tolerate anxiety, and (2) shared vulnerability with other members of their G4H group. Participants reported that they were more anxious in the initial session, highlighting that this heightened anxiety was temporary and challenging their beliefs about their ability to tolerate such distress. Participants also reported that mutual vulnerability between themselves and other participants enabled meaningful social connection with others who knew what it was like to live with social anxiety. Consistent with Oren-Yagoda et al.'s (2022) theorizing, participants' ability to be open with fellow G4H members, and for this to be well received, may directly counter the defining feature of social anxiety: fear of negative evaluation. Thus, while group therapy may appear a counter-intuitive choice for treating social anxiety because of participants' fear of negative evaluation, the G4H programme appeared to facilitate treatment gains precisely because of the opportunity for corrective social experience that it provides.

Additionally, the G4H programme's emphasis on behaviour change—reconnecting with existing, or joining new, groups—not only challenges participants' beliefs about their ability to navigate social situations but also facilitates ongoing exposure. In this way, G4H may be seen as supporting participants to engage with initial steps on the exposure hierarchy and scaffolding the development of meaningful social connections, which then facilitate further exposure and increase participants' sense of self-efficacy. The social confidence instilled through the G4H programme and ongoing exposure may, in turn, counter participants' maladaptive cognitions and thus maintain treatment gains. Previous qualitative findings have similarly found that G4H creates a sense of efficacy in people's ability to effectively manage one's social groups (Cruwys, Haslam, Haslam, et al., 2022). This approach again contrasts with existing social anxiety interventions. Unlike G4H, CBT for SAD does not directly address loneliness symptoms by teaching skills and providing opportunities to develop people's social connections. Similarly, while social skills training directly teaches interpersonal social skills, the assumption that social anxiety is associated with a deficit in social skills has been questioned (Stravynski et al., 2014). G4H fills this treatment gap: through its strong theoretical underpinning it develops skills and provides opportunities to build *group-based* social connections. Together, the results of this study suggest that additional consideration of G4H as a treatment tool among people with social anxiety is warranted. Furthermore, given previous evidence that G4H may be particularly beneficial among people with more severe mental illness symptoms at baseline (Cruwys et al., 2023), further study of the G4H programme in other vulnerable populations is also needed.

Strengths, limitations and future directions

While the integration of quantitative and qualitative data was considered a major strength of the current research, there were limitations of our study design and challenges in implementing the G4H

programme among people with clinical social anxiety symptoms. Of the eligible participants identified through our screening process, many (63.33%) chose not to commence the G4H programme, hampering our ability to reach our recruitment target of 80 participants. This may speak to the fact that, while group therapy for SAD is efficacious (e.g., Barkowski et al., 2016), avoidance of feared social situations is a core feature of SAD. Importantly, though, recruitment challenges are commonly experienced in group therapy program evaluations (Biggs et al., 2020). A potential counter to this challenge is establishing early contact with the research team. Within our trial, participants with unclear eligibility (e.g., potential suicide risk) had a phone conversation with a member of the research team before joining. In the research team's experience, this contact aided in transitioning eligible participants into commencing the program. Our participants also identified that forming an initial connection with other participants and group facilitators motivated further program engagement. A similar process also occurred within the therapy groups themselves, whereby irregular attendance by other participants was viewed as disruptive to the process of group bonding. Such attendance issues are again common in intervention studies (Biggs et al., 2020) and may be unavoidable. However, facilitators may play an important role in re-establishing the sense of safety within the group in the following session (e.g., by providing a short catch-up session). Finally, while our results are promising, the current study's lack of control group limits the conclusions that can be made with our data and instead our findings can be seen as an initial test of the program's utility in people with clinical social anxiety symptoms. To evaluate G4H's efficacy further, controlled tests of the program are required, such as comparison between G4H and a matched control group or an established treatment for social anxiety like group CBT (e.g., Heimberg & Becker, 2002; Hofmann & Otto, 2018). If comparing G4H to an established treatment, particular attention should be paid to its comparator in order to isolate the effects of G4H's content effectively. As such, comparators should be dose-controlled and group-based as social identity processes influence group therapy outcomes more broadly (Cruwys et al., 2014).

Given that G4H complements established treatments for SAD like CBT, future studies could also explore the combination of these treatments in practice as well as the mechanisms that underlie G4H's benefit. Specifically, while previous research has found G4H to be particularly effective in people with severe social anxiety symptoms at baseline (Cruwys et al., 2023), it is possible that this population may also benefit from CBT for SAD. Future research might assess how G4H and CBT could be optimally combined and/or sequenced. For example, it may be that clients are more open to engaging in group-based treatment after an initial course of CBT for SAD. Here, G4H could serve to reinforce the experiential component of CBT and prevent relapse, with the development of group-based connections promoting ongoing exposure and reducing loneliness. Future research could also determine the mechanisms through which symptom improvement occurs. Findings from our qualitative analysis suggest that such improvement may occur through several mechanisms like a sense of trust or identification with fellow group members, reduced maladaptive cognitions, and/or via reduced experience of other maintaining factors (e.g., self-focused attention, post-event processing).

CONCLUSION

This study found initial evidence that G4H was efficacious in reducing social anxiety symptoms and loneliness among people with clinical levels of social anxiety. G4H was also found to have positive impacts on depression symptoms and well-being in this population. Follow-up interviews suggested that G4H may have achieved this positive change by challenging participants' anxiety—both by participants attending the group in the first place and through positive experiences of sharing vulnerability with others. At the same time, G4H provides participants with pragmatic guidance on *how* to effect change within their social worlds. This is consistent with prior research, which has demonstrated support for the efficacy of G4H in improving mental health, including social anxiety symptoms (Cruwys et al., 2016; Haslam et al., 2019). Our trial provides the first targeted evaluation of G4H among people

with SAD, as well as insights into program acceptability, feasibility, and how to more effectively implement the programme among this population in the future.

AUTHOR CONTRIBUTIONS

Jessica L. Donaldson: Conceptualization; methodology; formal analysis; resources; data curation; writing – original draft; writing – review and editing; visualization; investigation; project administration. **Alysia M. Robertson:** Conceptualization; methodology; investigation; resources; data curation; writing – review and editing; project administration. **Tegan Cruwys:** Conceptualization; methodology; resources; writing – review and editing; supervision; funding acquisition. **Joanne A. Rathbone:** Methodology; writing – review and editing; supervision; conceptualization. **Catherine Haslam:** Writing – review and editing; supervision. **Junwen Chen:** Writing – review and editing; supervision. **Amy Dawel:** Writing – review and editing; supervision.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

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

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