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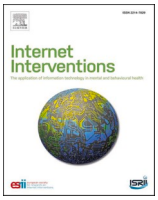

Improving adherence to a web-based cognitive-behavioural therapy program for social anxiety with group sessions: A randomised control trial

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ABSTRACT

Individuals with social anxiety disorder (SAD) commonly receive non-evidence based, ineffective treatments. Cognitive behaviour therapy (CBT) has been demonstrated to be the gold standard treatment for treating SAD. Scalable web-based CBT programs ensure evidence-based treatment procedures, but low treatment adherence remains problematic. This study aimed to test whether adding group sessions to a fully automated web-based CBT program, Overcome Social Anxiety (OSA), would increase treatment adherence. A total of 69 participants were provided access to a web-based program, and randomly allocated to three conditions: 1) An experimental condition involving an addition of three online group psychoeducation sessions; 2) a placebo condition involving an addition of three online progressive muscle relaxation (PMR) group sessions, or 3) a control condition where participants did not receive group sessions. Adherence was operationalised as number of OSA modules completed. Treatment adherence significantly differed between the conditions. On average, participants assigned to the placebo condition completed significantly more of the program compared to those in the control condition. Further, all conditions produced a significant improvement in BFNE and QOLS. No significant difference in treatment efficacy was found between groups on the SIAS, BFNE or QOLS. The current results indicate PMR can improve treatment adherence for scalable social anxiety interventions.

1. Introduction

1.1. Social anxiety disorder

Social anxiety disorder (SAD) is a common and debilitating disorder that involves pervasive fear of social situations in which the individual could potentially be scrutinized by others, leading the individual to avoid such situations, or endure them with intense anxiety (APA, 2013; Kessler et al., 2005, 2012). SAD can functionally impair multiple aspects of an individual's life including romantic relationships (Sparrevohn and Rapee, 2009), social life, friendships and family relations (Schneier et al., 1994). SAD is associated with reduced likelihood of finishing higher education, a decrease in work productivity and lower income (Katzelnick et al., 2001). A SAD diagnosis increases the chance of further mental health difficulties, such as a depressive disorder or suicide attempt (Beesdo et al., 2007; Katzelnick et al., 2001). Furthermore, substance abuse and dependence can develop as individuals try to ease their discomfort in feared social situations (Buckner et al., 2008).

Only one third of individuals affected by SAD recover without treatment (Bruce et al., 2005). One barrier to treatment seeking is the fear of judgement of others (Olfson et al., 2000). Thus, despite effective treatments being available, SAD commonly remains undertreated.

1.2. Current treatments of social anxiety

At present, cognitive behavioural therapy (CBT) is the gold standard treatment for SAD (Lincoln et al., 2003; Mayo-Wilson et al., 2014; Taylor, 1996). CBT involves addressing unhelpful behaviours which are believed to maintain SAD, such as avoidance, safety behaviours, and self-focused attention (see further, Clark and Wells, 1995; Rapee and Heimberg, 1997). Studies have shown that CBT can significantly reduce anxiety symptoms (e.g., Andersson, 2009). Both individual and group-

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delivered CBT treatment have been shown to greatly reduce SAD symptoms, both at immediate post-test and long-term follow-up (Fogarty et al., 2019; Stangier et al., 2003). A meta-analysis showed that treatment of SAD using only two components of CBT (cognitive restructuring and exposure exercises), produced a large effect size on SAD symptom reduction that continued to increase after the treatment ended (Taylor, 1996). Furthermore, randomised controlled trials have demonstrated that CBT outperforms other treatments, such as psychodynamic therapy (Leichsenring et al., 2013).

When an anxious person seeks treatment, there is a low chance that they will receive evidence based treatment recommended by international guidelines (Powers and Deacon, 2013; Stobie et al., 2007). Surveys show that cognitive behavioural therapists are frequently opting for non-evidence based methods and omitting the exposure-based component of CBT (Hipol and Deacon, 2013). This is an alarming trend, given that exposure therapy is a vital part of effective interventions, and is endorsed as an essential treatment component for anxiety disorders by NICE guidelines (NICE, 2013).

1.3. Computerised CBT treatment programs

Computerised CBT programs offer a solution to these problems, given that a computer program can be guaranteed to adhere to effective evidence-based manuals. This type of treatment can therefore be more transparent compared to traditional therapy and increase opportunity for accountability. In addition to ensuring consistent and evidence-based treatment, web-based interventions are cost-effective compared to in-person treatment (Richards et al., 2018).

Whilst computer-based therapies have existed in some form for decades (Barak, 1999), in more recent years, they have evolved to web-based, individualized, interactive programs, allowing users to access help for a variety of psychological problems from the comfort of their own home and at their own pace. Systematic reviews and meta-analytic findings have established the impressive effect sizes and cost-effective nature of web-based treatments (Hedman et al., 2012; Spek et al., 2007). Further, research has shown that web-based CBT programs can be as effective as traditional in-person CBT (Hedman et al., 2012).

Computerised CBT can be categorised into open access and closed access, as well as therapist-guided and unguided or automated programs (Andersson et al., 2009, 2013). In the category of open access, anyone can partake in the program, whilst closed access requires patients to undergo screening before using the program. In most cases, closed access and therapist-guided programs have a greater effect compared to unguided and open access programs (Andersson et al., 2009, 2013). However, therapist-guided programs require additional therapist time and resources, limiting the accessibility and scalability of these programs (Menzies et al., 2021). Furthermore, Titov et al. (2008) showed that despite guided programs outperforming unguided ones, unguided programs produced lasting improvements for those affected with social anxiety (Furmark et al., 2009).

Several authors have previously outlined the potential benefits of "blended" CBT; that is, interventions which combine traditional face-to-face therapy with online therapy (e.g., Kemmeren et al., 2016). For example, Fitzpatrick et al. (2018) propose that blended approaches allow clients to take more of an active role in online treatments, increase engagement, and allow clients to review and consolidate content of online programs. However, most blended interventions have focused on supplementing face-to-face therapy with online modules (e.g., Carroll et al., 2008; Richards and Simpson, 2015), with no studies examining the use of online group sessions as a supplement to a self-guided online CBT intervention. Thus, it remains unclear whether such an addition may help improve adherence to online standalone programs.

1.3.1. Treatment adherence

When measuring adherence, module completion was found to be the most related to outcomes in psychological health interventions (Donkin et al., 2011). Adherence is an essential factor in the effectiveness of treatment and is therefore immensely important when designing online therapies (Hilvert-Bruce et al., 2012). However, low adherence to web-based treatment is a well-known problem in the field, and a simple solution has yet to emerge. Adherence rates tend to fluctuate drastically between different computerised CBT programs (Fleming et al., 2018). These fluctuations can be explained by differences in interactions, including those between patient and therapist, the dialog support and technological differences (Kelders et al., 2012). Further, symptoms also appear to influence completion rates. For example, a correlation has been found between depressive symptoms and non-adherence (DiMatteo et al., 2000).

In systematic reviews of the impact of guidance in web-based treatment programs, completion rate was found to be improved by therapist interaction, as well as with shorter sections of intervention at a time (Kelders et al., 2012; Baumeister et al., 2014). Another meta-analysis on internet therapies demonstrated that adherence seemed depended on level of therapist support (Spek et al., 2007). Furthermore, supporting the crucial role of therapist support, Paxling et al. (2013) also found that therapist encouragement (such as by email) was associated with better adherence to online CBT interventions for anxiety.

Given the body of findings suggesting that increased therapist contact improves adherence, the obvious strategy would be to add a therapist element to web-based therapy programs. However, given that ease of administration and low cost are essential components for the scalability of web-based interventions, it is important to try to find a middle ground that sacrifices neither.

1.4. Overcome Social Anxiety

Overcome Social Anxiety (OSA) is a self-guided, fully automated online CBT program, designed to assist in reducing social anxiety symptoms (see further, Helgadóttir et al., 2009a, 2009b, 2014). It is based on a program that was developed for individuals who both stuttered and struggled with anxiety. OSA comprises an assessment battery and seven core modules. The program provides the user with personalized case formulation and individualized feedback using a large database of audio and text files.

The intervention begins with assessment questions, which are designed both to take a pretreatment measure of users' symptom severity and to individualize the treatment to each user. Each module was designed to achieve a particular clinical goal. Module 1 introduces users to the program and their virtual psychologists, educates users on common cognitive errors, and explains the relationship between cognitions, behaviours, and emotions. Module 2 presents users with personally relevant anxious thoughts (based on prequestionnaire responses) and asks users to challenge those thoughts through writing exercises. In Module 3, users select symptoms and anxiety-inducing situations and cognitions, which the intervention then uses to individualize the treatment to users' unique experiences of social anxiety. This model is then applied to Module 4 where users are guided through a series of behavioural experiments to target safety behaviours and avoidance. Module 5 continues to help users adjust their negative beliefs, with a particular emphasis on anger. Module 6 targets biased attentional processes through skills-based attention training and rescripting of faulty and negative imagery. Finally, Module 7 reviews the material covered in the first six core modules and provides users with psychoeducation to help them maintain treatment gains. Afterwards the program presents the same assessments questions and uses this to create histograms to show users the difference between their pre- and posttreatment symptom severity. The program then provides users with an individualized PDF containing all program materials, which users can employ to help maintain treatment gains into the future.

When compared to face-to-face therapy conducted by a clinical psychologist, it was equally effective at reducing stuttering (Menzies et al., 2019a, 2019b). The original program showed a comparable

quality of interactions with regard to therapeutic relationships to face-to-face treatments (Helgadóttir et al., 2009b). In a trial of that program, 78% of those who had a diagnosis of SAD at the start of treatment, no longer met the diagnostic criteria at the end of treatment, and notably the remaining 22% had not completed the program (Helgadóttir et al., 2014). The efficacy of OSA has also been empirically shown both in a randomised controlled trial and naturalistic setting, demonstrating improvements in both social anxiety symptoms and depression (McCall et al., 2018; McCall et al., 2019).

In comparison to other unguided programs, OSA's precursor program (CBTPsych) had the highest open access real-world completion rates for computer treatments targeting anxiety, depression or mood enhancements (Fleming et al., 2018). Its naturalistic setting or real-world completion rate of 19.5% outperformed all other programs reviewed, the majority of which reported completion rates of less than 5%. McCall et al. (2019) confirmed that the high adherence rates also applied to the program targeting social anxiety in an unguided community sample, with 27.7% of users fully completing the intervention. However, these adherence rates are low when compared to adherence in guided interventions. Therefore, further research is needed to solve how one can improve adherence in unguided interventions.

1.5. The current study

Our goal in the present study was to look for ways to improve to the fully automated web-based CBT program OSA. Increasing therapist guidance in web-based treatments translates into higher adherence (Andersson and Cuijpers, 2009). This is consistent with research showing that mutual collaboration in traditional in-person therapy can improve both treatment adherence and outcomes (Martin et al., 2005). Whilst adding individual therapist support would require a significant amount of additional resources and time, limiting the scalability and accessibility of web-based treatments, these effects may potentially be mirrored through online group sessions. In studies on computerised therapies for psychotic disorders, peer-to-peer interactions and support groups have led to improvements in adherence to evidence based therapies (Biagianti et al., 2017).

According to a meta-analysis on patient adherence to medical treatments through social support, all types of social support significantly affect the adherence (DiMatteo, 2004). Furthermore, as human support is a determining factor in adherence (Mohr et al., 2011; Spek et al., 2007), the user may have the chance to feel supported by other participants as well as the host through online group sessions.

Psychoeducation is often a large portion of group therapy sessions, where the host explains theories behind psychological problems to increase patients' understanding of how and why the treatment should work. Psychoeducation is effective in improving the clinical course of treatment (Tursi et al., 2013), can reduce psychological distress (Donker et al., 2009), and is linked to increased adherence (Colom and Lam, 2005). Thus, adding psychoeducation group sessions, led by a therapist, may potentially improve adherence to OSA as well as enhancing treatment outcomes. Further, we included a placebo group in addition to a control group to account for the extra therapist time and attention. We used therapist-led progressive muscle relaxation since this has been shown to have minimal effect on social anxiety symptoms (Al-Kubaisy et al., 1992; Rodebaugh et al., 2004a, 2004b).

Our primary hypothesis was that by offering psychoeducational online group sessions to the OSA program, adherence to OSA would increase. That is, it was expected that participants who attend psychoeducation group sessions would complete more OSA treatment modules than participants who attend placebo group sessions, consisting of relaxation strategies, and those who do not receive any group sessions. Our secondary hypothesis was that psychoeducation group sessions would further reduce symptoms of social anxiety and increase life quality for a non-clinical sample, compared to the other conditions.

2. Method

2.1. Participants

A total of 132 university students applied to participate in the study. Of these, 85 met inclusion criteria by indicating high social anxiety (see below), and 69 answered the pre-treatment questionnaires and were accepted into the study. The final sample was 82.7% female and had a mean age of 29.0 years (range: 19–56 years). All participants were Icelandic and English-speaking Icelanders. OSA is presented in English, whereas all other communication was in Icelandic.

Accepted participants were evenly split into three groups using a randomisation formula in Microsoft Excel version 16.46. Each participant was given a random number between 0 and 1, generated by the randomisation formula. The numbers were then organized in an ascending order and participants with the lowest numbers were assigned to the control group, the second lowest to the experimental group and the highest to the placebo group.

2.2. Measures

The eligibility questionnaire included three items from the Mini-Social Phobia Inventory (Mini-SPIN), a brief self-rated screening instrument for generalized SAD (Connor et al., 2001) and four social anxiety assessment items from the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013). Its items assessed the respondent's symptoms of social anxiety in the previous week, with scores ranging from 1 (“not at all”) to 5 (“extremely”). To meet the inclusion criteria and be deemed eligible for the study, participants had to score 4 or higher on at least one item of the questionnaire, in line with previous studies (McCall et al., 2018). The items on the Mini-SPIN and DSM-5 SAD were translated into Icelandic and then back-translated to confirm the accuracy of the initial translation. The following three questionnaires were administered at pre- and post-treatment to evaluate efficacy:

The Social Interaction Anxiety Scale (SIAS; Mattick and Clarke, 1998): The SIAS is a 20 item self-report questionnaire which measures anxiety in social situations. The questionnaire's validity and reliability have been demonstrated in English (Mattick and Clarke, 1998) as well as in an Icelandic translation (Ólafsdóttir, 2012).

Brief Fear of Negative Evaluation (BFNE; Leary, 1983): BFNE is a 12 item self-report questionnaire that measures an individual's fear of the negative evaluation of others (Leary, 1983). The scale's validity and reliability has been demonstrated for the English version (Rodebaugh et al., 2004a, 2004b).

Quality of Life Scale (QOLS; Burckhardt and Anderson, 2003): is a 16 item self-report questionnaire that measures contentment with one's life. The scale has proven to be both reliable and valid in English (Burckhardt and Anderson, 2003). The psychometric properties of the Icelandic translation have been tested on a clinical Icelandic sample, and both its validity and reliability have been demonstrated (Björnsson et al., 2018).

2.3. Design and procedure

The study's protocol was approved in full by the Icelandic National Bioethics Committee (clinical study registration number: VSN-20-113). Information about the study and a link to apply was sent by email to students of three Icelandic universities. Potential participants were informed that the study's goal was to increase adherence to Overcome Social Anxiety, a fully automated web-based cognitive behavioural therapy program treating social anxiety symptoms, through the addition of relaxation and psychoeducational group sessions. Eligible participants were emailed a four-month access to the OSA program. During the four-month period, all participants of all three groups received the same

automatic email notifications, reminding them to log back in, when 3, 7, 10, 14, 21 and 28 days had passed since the last log in, as well as emails congratulating them on completing a module. After 4 months link to the post-treatment questionnaires, SIAS, BFNE and QOLS, were emailed. This study was a three-arm single-blinded randomised controlled trial (RCT), testing the effectiveness of three conditions regarding treatment adherence.

2.3.1. Experimental condition

Those in the experimental group received access to the OSA program and an invitation to three group psychoeducation sessions. The social anxiety psychoeducation provided was based on the materials of the OSA program. Each session included material corresponding to the modules of the program which the participants had been asked to complete prior to the session. The first session covered causal thoughts and cognitive errors, and why and how to challenge them; the second session covered the maintaining factors of SAD and behavioural experiments; and the third and last session covered unhelpful thoughts, attention training, image rescripting, post-event processing and relapse prevention. Each session included 8–10 slides, shared through Zoom, and was designed to last around 45 min. During the session, participants were asked questions to check their understanding, which they could answer through a chat function or by speaking. Participants were encouraged to participate in the discussions and ask questions but assured that it was not mandatory.

2.3.2. Placebo condition

Participants in the placebo group received access to the OSA program and three online relaxation group sessions. The placebo group was included to control for the extra time and therapist attention given to the experimental group in comparison to the control group (Al-Kubaisy et al., 1992). Group sessions involved a therapist-led progressive muscle relaxation (PMR) exercise spanning 45 min, to match the length of the experimental condition. The script was adapted from The Relaxation and Stress Reduction (Davis et al., 2008). This type of relaxation is often used as a control condition since it has been shown to have minimal effect on social anxiety symptoms (Al-Kubaisy et al., 1992) and is generally not considered a sufficient treatment for SAD on its own (Rodebaugh et al., 2004a, 2004b).

2.3.3. Control condition

Participants in the control group simply received access to the OSA program, with no additional group component.

2.4. Statistical analysis

2.4.1. Power

A power analysis indicated that the total sample size required for a power level of 0.80 at the $p < .05$ level of significance, 1-tailed, assuming a large effect size $f = 0.5$ ($\eta^2 = 0.2$) was 42 participants divided across three groups. Since a previous study on the OSA program among university users had a 40% drop-out rate (McCall et al., 2018) this study's researchers aimed for doubling the needed participants to increase the likelihood of adequate power level after anticipated dropout.

2.4.2. Adherence

The primary dependent variable was adherence, measured by the number of modules completed in the program by each participant. A one-way between groups ANOVA was conducted to compare differences in adherence among the three conditions. The data sample did not have any outliers but was skewed and therefore not normally distributed, assessed by box plots and confirmed by the Shapiro-Wilk test of normality, and there was homogeneity of variance, assessed by Levene's test of homogeneity of variances ($p = .519$). Since the groups were similarly skewed and ANOVA is robust for violation of normality in regards to Type I error (Blanca Mena et al., 2017), the violation was noted and the test was performed. To identify which group differed from another, a post-hoc Tukey's Test was performed. The test was performed using data from all participants assigned to the control group and those who had attended at least one group session in the other two groups.

2.4.3. Efficacy

The secondary dependent variable was the effectiveness of the treatment, measured in changes in SIAS, BFNE and QOLS scores. As when testing differences in adherence, only data from participants in the control group and from the participants that attended at least one group session in the experimental group and the placebo group were used. A paired-samples *t*-test was performed for each group to determine whether the pre-treatment scores differed significantly from the post-treatment scores. Using box plots, the data was determined to be normally distributed apart from scores on QOLS for the placebo group, and no extreme outliers were detected. Due to this violation, the power of the test is affected, whilst the test is still robust to Type I error (Wiedermann & von Eye, 2013). A one-way ANCOVA was then used to see if there was a significant difference in effectivity of the treatment depending on the group condition. All assumptions were met, except for standardized residuals for the overall model for scores on SIAS for the relaxation group, which were not normally distributed, assessed by Shapiro-Wilk's test ($p < .05$). This violation does not affect Type I error substantially (Olejnik & Algina, 1984).

3. Results

3.1. Adherence measured in completion rates

Participants in the experimental group attended on average 1.00 group sessions ($SD = 1.14$) and 52.38% ($n = 11$) attended at least one session. Participants in the placebo group attended on average 1.18 group sessions ($SD = 1.26$) and 54.54% ($n = 12$) attended at least one session. Completion rates of all seven modules of the program for total participants were 18.18% ($n = 66$), highest for the placebo group 27.27% ($n = 22$), second highest for the control group 17.39% ($n = 23$) and lowest for the experimental group 9.52% ($n = 21$). Participant's flow through the OSA modules and the study itself can be seen in Fig. 1.

The results demonstrated a statistically significant difference between the groups in adherence, operationalised by average module completion, $F(2,43) = 5.06$, $p = .011$, $\eta^2 = 0.19$, 95% $CI = 0.12–0.036$. Specifically, the placebo group demonstrated significantly greater adherence ($M = 4.75$, $SD = 2.70$) compared to the control condition ($M = 1.83$, $SD = 2.62$; $p = .008$). The experimental group ($M = 3.00$, $SD = 2.37$) did not statistically differ from adherence rates in the other two groups.

3.2. Efficacy on psychometric tests

The secondary outcome was the effectiveness of the program. No significant difference between the groups was found in post-treatment scores on the SIAS, $F(2,35) = 1.18$, $p = .319$, $\eta^2 = 0.063$, the BFNE, $F(2,35) = 1.19$, $p = .318$, $\eta^2 = 0.063$, or the QOLS, $F(2,35) = 0.843$, $p = .439$, $\eta^2 = 0.046$. That is, there was no difference between the three conditions on any of the post-intervention efficacy outcome measures. Further analyses were conducted to examine differences between pre- and post-treatment scores. Significant difference was found in pre- to post-treatment scores on BFNE for participants within each of the three conditions (all p's $< .013$), as well as in total across the conditions ($p < .001$). Further, a significant increase was found on the QOLS for the total sample ($p = .014$), but not within the three conditions (all p's $> .054$). Further, no significant change in SIAS scores was found within any of the three conditions (all p's $> .232$), and whilst the SIAS scores had a slight reduction for the overall sample, this change was not significant ($p = .09$). Descriptive statistics for participants' scores and statistical tests for change in pre- to post-treatment scores can be seen in Table 1.

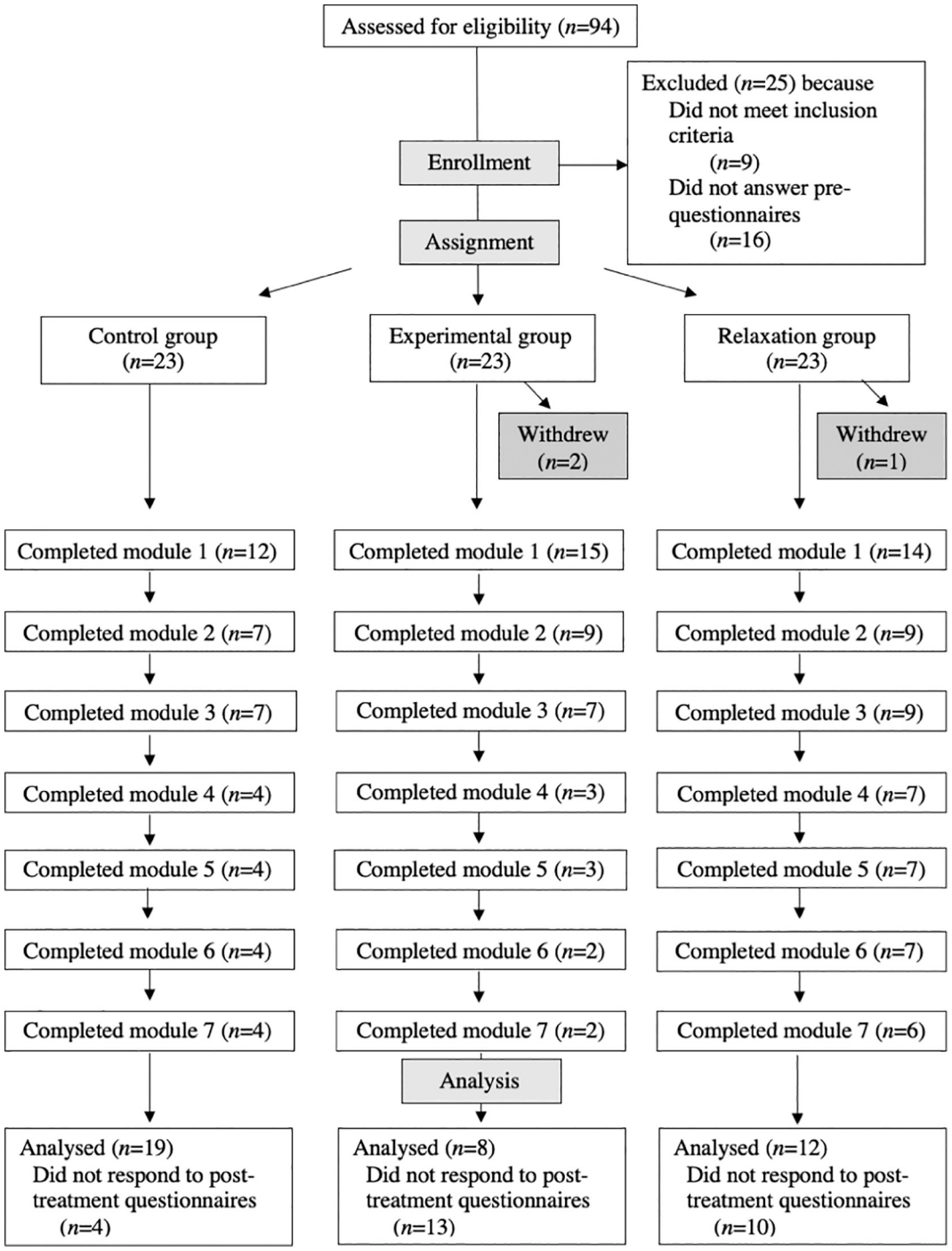

Fig. 1. Flowchart of participants through each stage of the study and modules of the OSA. Note: n = number of participants. Analysed data refers to effectivity calculations, not adherence.

4. Discussion

This study aimed to examine whether adding online social anxiety psychoeducation group sessions to a web-based CBT program for social anxiety would increase adherence. However, the current data did not support this hypothesis. Surprisingly, the condition designed to serve as a placebo condition, where the online group sessions consisted of a PMR exercise, produced the highest adherence of the groups and significantly differed from the control group.

These results build on previous research that shows that increased support can lead to greater adherence (Kelders et al., 2012; Spek et al., 2007). However, the fact that PMR group sessions, rather than additional SAD psychoeducation group sessions, had a bigger effect on adherence was not in line with what was predicted. Delivering additional psychoeducation on social anxiety in an online group session, alongside a CBT program which includes these components, did not have a significant effect on treatment adherence. It is possible that the overlap in information provided between OSA and these additional group sessions explains the failure to improve adherence. For example, the repetition of content may have led to user fatigue or led participant to feel that they had already mastered CBT and no longer needed to proceed through the online program.

Table 1
Descriptive statistics for pre- and post-treatment scores.

Condition (n)	Control (19)	Experimental (8)	Placebo (12)	Total (39)
SIAS				
Pre-treatment *M* (*SD*)	31.21 (9.11)	32.35 (11.96)	27.25 (8.66)	30.21 (9.57)
Post-treatment *M* (*SD*)	30.37 (10.28)	26.38 (11.17)	23.83 (10.00)	27.54 (10.52)
Change				
M (*SD*)	0.84 (8.11)	5.88 (12.94)	3.42 (9.39)	2.67 (9.57)
Paired *t*-test (*df*)	0.45 (18)	1.28 (7)	1.26 (11)	1.74 (38)
p value	.66	.240	.233	.090
Cohen's *d*	0.10	0.45	0.36	0.28
BFNE				
Pre-treatment *M* (*SD*)	38.21 (6.20)	40.63 (5.26)	39.33 (4.68)	39.05 (5.53)
Post-treatment *M* (*SD*)	33.47 (7.57)	32.00 (5.40)	30.75 (6.58)	32.33 (6.82)
Change				
M (*SD*)	4.74 (7.44)	8.63 (4.75)	8.58 (6.53)	6.72 (6.82)
Paired *t*-test (*df*)	2.78 (18)	5.14 (7)	4.55 (11)	6.15 (38)
p value	.012*	.001*	<.001*	<.001*
Cohen's *d*	0.64	1.72	1.32	0.99
QOLS				
Pre-treatment *M* (*SD*)	75.74 (9.31)	68.25 (13.41)	72.50 (9.86)	73.21 (10.53)
Post-treatment *M* (*SD*)	77.89 (13.70)	77.75 (16.90)	77.58 (12.32)	77.77 (13.62)
Change				
M (*SD*)	−2.16 (11.43)	−9.50 (4.68)	−5.08 (8.22)	−4.56 (11.04)
Paired *t*-test (*df*)	−0.82 (18)	−2.03 (7)	−2.14 (11)	−2.58 (38)
p value	.421	.082	.055	.014*
Cohen's *d*	−0.19	−0.72	−0.62	−0.41

Note. BFNE = Brief Fear of Negative Evaluation; SIAS = Social Interaction Anxiety Scale; QOLS = Quality of Life Scale.
* Significant at $p < .05$.

Alternatively, the use of PMR for the placebo group may also explain these results. Research has shown that PMR can be used as supportive intervention that impacts adherence to cancer treatment (Pelekasis et al., 2017) and to medical device usage (Wang et al., 2012). However, to our knowledge, a link has not been drawn between PMR and increased adherence to computerised CBT programs. One possible reason for the improved adherence could be the instant reduction of state anxiety and psychological distress brought about by PMR (Vancampfort et al., 2013). In contrast, CBT involves strategies which may produce long-term improvements in anxiety and distress tolerance but may not provide a 'quick fix' to physical anxiety symptoms. In short, CBT takes time to achieve reductions in anxiety, whilst relaxation strategies do not. The immediate relief brought by PMR may motivate users of the program to continue with it, since they have experienced this momentary lowered anxiety level through relaxation, unlike users who did not have access to the relaxation sessions. Further, introduction of relaxation techniques not covered in OSA may have also equipped the placebo group participants with additional skills to manage anxiety-provoking situations (Öst, 1987), such as whilst doing behavioural experiments. More research is needed to fully clarify the mechanisms by which additional relaxation sessions may improve adherence to web-based CBT interventions.

Our secondary outcome was confirmed; on average, participants demonstrated improvements in social anxiety after using the OSA intervention on the BFNE, and quality of life on the QOLS. One possible interpretation for the difference in results between the SIAS and BFNE is that SIAS is more behavioural in nature (that is, it focuses on anxiety in situations that require social interactions). Since this study was conducted during COVID-19 restrictions, opportunities for going to social gatherings were limited. In contrast, the BFNE is more cognitive in nature, and measures cognitive rather than behavioural change.

Participants in the experimental group showed the biggest difference in scores on SIAS, BFNE and QOLS. The effect sizes in the current study are consistent with the literature on the effectiveness from this approach to delivery of unguided interventions. However, the adherence was overall lower; this may be explained by the COVID-19 pandemic (Gunn et al., 2019; Helgadóttir et al., 2009a, 2009b, 2014; McCall et al., 2018, 2019; Menzies et al., 2019a, 2019b).

4.1. Limitations

One limitation is that our study took place doing the COVID-19 pandemic, which may have affected the study in various ways. Opportunity for exposure exercises instructed in OSA may have been reduced. Also, due to the sample consisting of only university students, their inboxes were being flooded by university administration emails with COVID-19 updates, which may have caused OSA program emails and group session reminder emails to go unnoticed. Further, Icelandic universities had to shift almost exclusively to online classes, so attending an online group session after a whole day of online university lectures may have been less appealing than we had hoped. Intense social restrictions may also have affected the users' motivation to continue with their treatments, since anxiety-provoking social situations were far fewer. Thus, in the absence of usual social situations and regular face-to-face interactions, it is possible that motivation to overcome SAD was lower than it may have been prior to the pandemic. Furthermore, due to the small sample size and high dropout rate, the findings of the current study should be interpreted with caution.

5. Conclusions

In conclusion, the current results indicate PMR can improve treatment adherence for scalable social anxiety interventions. This finding has important implications for bolstering completion of online treatments for anxiety disorders. Future research with a larger sample should aim to explore the mechanisms by which additional relaxation group sessions may improve adherence to online CBT treatments.

Declaration of competing interest

F. D. Helgadóttir is an owner of AI-Therapy. F. D. Helgadóttir and R. G. Menzies are owners of OSA. Neither FDH nor RGM provided funding for the study. Neither had access to the data nor conducted any data analyses. All other authors declare no conflicts of interest.

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